

**University of Minnesota
Graduate School**

Minutes, Graduate School Executive Committee
Meeting of Wednesday, May 25, 1994
1:15 p.m., Dale Shephard Room

Present: Faculty representatives--Professors Kent Bales, Edward Cushing, Laë'l Gatewood, Michael Graves, Kevin Janni, Nancy Johnston; Administrative representatives--Deans Mark Brenner, Stephen Hedman, Ted Labuza, Charles Louis, Anne C. Petersen (chair), Kenneth Zimmerman; Duluth representative--James C. Klueg; Graduate School Fellowship Committee representative--Dean Charles Louis; Student representatives--Yvonne Boldt, Susan Giovengo, Pamela Regan, Anne Sales, Azra Sayeed; Civil Service representative--Andrew LaChapelle; staff--Myrna Smith, Andrea Scott, Karen Starry; guests--Professors William Ammentorp, Rose Brewer, Patrick Brezonik, Raymond Duvall, K.S.P. Kumar, Lance Neckar, Jean Quam, Julia Robinson, Madelon Sprengnether, Wei-Tek Tsai; secretary--Vicki Field

(Associate Vice President Brenner convened the meeting for Vice President Petersen, who had been delayed by a previous appointment but joined the meeting shortly after it began.)

I. FOR ACTION

A. Approval of the Minutes of the February 28, 1994, Meeting

The minutes were approved as submitted.

B. Proposal for a Free-Standing Minor in Studies in Africa and the African Diaspora for the Master's and Ph.D. Degrees

Professors Johnston and Bales reported that the Social Sciences, and the Language, Literature and Arts, Policy and Review Councils, respectively, had voted their unanimous and enthusiastic approval of the proposed minor. Following a brief consideration of the place of minor-only programs in the Graduate School's governance structure and program review process, Executive Committee members voted unanimously to approve the proposal.

C. Request to Change the Name of the Graduate Degree Program (M.S. and Ph.D.) in Biophysical Sciences to Biophysical Sciences and Medical Physics

Professor Janni reported that the Physical Sciences Policy and Review Council had approved the requested name change. Executive Committee members voted without dissent in favor of the request. (There was no discussion.)

D. Proposal for a Professional Master of Computer and Information Sciences (M.C.I.S.) Degree Program

Professor Janni recalled the Executive Committee's approval in May 1993 of a coursework-only option for the M.S. degree in this field that was intended to serve an employed clientele only until the faculty could put

into place a professional master's degree program. The present proposal would replace the temporary coursework-only M.S., he explained. Professor Tsai, Director of Graduate Studies, confirmed that the proposed degree program was identical to the coursework-only M.S. approved last spring. Professor Gatewood believed the proposed program to be a good model. She alluded to a similar degree opportunity at the University of St. Thomas and inquired how the proposed program differed from the St. Thomas degree. Professor Tsai stated that the University of St. Thomas offers a master of software engineering degree; the proposed degree program will be broader than this.

Executive Committee members voted unanimously in favor of a motion to approve the proposal.

E. Proposal for a Free-Standing Minor in Development Studies and Social Change for the Ph.D. Degree

Professor Johnston reported that the Social Sciences Policy and Review Council had voted its unanimous endorsement of the proposal. The Council, in its discussion, had recognized that most students who will complete a minor in this field are supported by the MacArthur Program (MacArthur Interdisciplinary Program on Peace and International Cooperation) and are already engaged in the kind of study the minor seeks to formalize. The minor would add structure to these curricular opportunities, Professor Johnston stated. She moved approval of the proposal, and a second was offered. Professor Janni drew attention to admissions requirements for the program and noted that, initially, admission would be limited to participants in the MacArthur Program. Professor Duvall, Associate Director of the MacArthur Program, commented on this aspect of the proposal and explained that resource constraints will limit initial availability of the minor to MacArthur participants. He elaborated on the diverse backgrounds and interests of MacArthur students and said the faculty anticipate that about a dozen students will apply to the minor each year. Associate Dean Zimmerman reported that the Social Sciences Council had also discussed initial, limited availability of the minor, and he stated that concerns in this regard had been resolved to the Council's satisfaction. Professor Duvall added that a new grant from the John D. and Catherine T. MacArthur Foundation will provide fellowship support for five students already enrolled in graduate programs here, in addition to the support now provided for first-year students. He noted that current funding will carry the program through the year 2002. In response to a question from Ms. Sayeed, Professor Duvall said the MacArthur Program encompasses a large part of the University, including the liberal arts, biological sciences, public affairs and law. Ms. Sayeed said she would like to see programs within the College of Pharmacy included, and she observed that her graduate program, Social and Administrative Pharmacy, has interests in developing countries.

Executive Committee members voted unanimously in favor of the motion to approve the proposal.

F. Proposal for a Master of Fine Arts (M.F.A.) Degree Program in Creative Writing

Professor Bales reported that the Language, Literature and Arts Policy and Review Council had approved the proposal on a unanimous vote. In its discussion, the Council had expressed surprise that this degree program was only now being proposed. Members had also wondered about the program's relationship to the writing program at Iowa. In regard to the second point, Professor Bales emphasized the Twin Cities' rich intellectual community as an attractive and stimulating environment for writers. In response to a question about whether the program would be appropriate for a student who had just graduated with a baccalaureate degree, Professor Sprengnether, Director of the English Department's Creative Writing Program, replied that it would; the program is expected to attract a mix of students. To a query from Professor Gatewood concerning the role of Continuing Education and Extension (CEE) in the proposed program, Professor Sprengnether explained that many English courses are offered in the late afternoon and may be taken by students who are completing an M.A. degree in English. Ms. Smith asked about the program's effect on the Ph.D. degree in English with a writing focus. Professor Sprengnether responded that the M.F.A. degree will replace the M.A. degree with an emphasis in writing; the Ph.D. degree program in writing will be reviewed soon.

On a unanimous vote, Executive Committee members approved the proposal for an M.F.A. degree in Creative Writing.

G. Request to Discontinue the Master of Arts (M.A.) Degree in Social and Philosophical Foundations of Education, and the Ph.D. Degree in Educational Policy and Administration with an Emphasis in SPFE, and to Offer Instead a Free-Standing Minor in Social and Philosophic Studies of Education for the Master's and Doctoral Degrees

Professor Graves reported that the Education and Psychology Policy and Review Council had unanimously approved these related proposals. Professor Ammentorp, Director of Graduate Studies, explained that declining interest in a degree in this field led to the request to disestablish the M.A. and Ph.D. degrees with a SPFE focus; however, need exists to continue to offer a coherent body of coursework in this area. Executive Committee members voted without dissent in favor of the proposals. (There was no discussion.)

H. Proposal to Consolidate the Master of Arts (M.A.) Degree in Educational Administration and in Education/Higher Education Under a Single Title, Educational Policy and Administration

Professor Graves moved approval on behalf of the Education and Psychology Policy and Review Council. The motion was seconded and unanimously approved. (There was no discussion.)

I. Proposal for a Collaborative Regional Master of Social Work (M.S.W.)
Degree Program Offered Via Distance Education

Professor Johnston reported that the Social Sciences Policy and Review Council had approved the proposal on a unanimous vote. The proposal results from the School of Social Work's receipt of Strategic Investment Pool (SIP) funds to develop a collaborative regional program using distance education technology. Moorhead State University (MSU) was selected as the initial site, in part because of MSU's experience with a similar outreach program offered by the University of Minnesota's School of Nursing. Professor Johnston moved approval of the proposal, and the motion was seconded.

Discussion ensued. Brief consideration was given to whether the proposed offering of courses at MSU required consideration beyond the University's Board of Regents. Associate Dean Zimmerman confirmed that guidelines of the Minnesota Higher Education Coordinating Board suggest that the proposal would need to be forwarded to that agency. Professor Quam, Director of the School of Social Work, elaborated on the offering of part of the M.S.W. curriculum at MSU, explaining that courses offered on the Moorhead campus would be identical to those offered here. Students at Moorhead would also have to meet the same course completion requirements. Eight to ten participants are expected at MSU; by comparison, the weekend M.S.W. program here enrolls about 20 students, Professor Quam said. In response to a question from Associate Dean Hedman about recognition of teaching effort, she explained that MSU faculty will receive credit if they teach M.S.W. courses; University of Minnesota faculty will receive credit for the courses they teach. MSU has agreed to make its distance education broadcasting facilities available to the program, Professor Quam added. To Professor Gatewood's query concerning the adequacy of library resources, Professor Quam stated that MSU was chosen in part because it offers an undergraduate degree in social work and has good library resources in this area. MSU will also make a computer available to M.S.W. students, and the faculty here are also considering a toll-free, 1-800 telephone number. Professor Graves asked about the percentage of coursework that M.S.W. students could complete at MSU. Professor Quam replied that one-half to two-thirds of the courses might be distance education courses; the remainder would be "face-to-face" courses taught on the Moorhead campus. Students may also come to the Twin Cities for some of their coursework. Associate Dean Hedman alluded to possible difficulties posed by calendar differences between the two institutions; as distance education initiatives expand, ways will need to be found to surmount these differences.

At Vice President Petersen's invitation, Professor Quam commented on the SIP allocation and on the School's inability to meet the significant demand in outstate Minnesota for advanced social work education. Social Work faculty anticipate even greater collaboration with the state university system and with the University's Duluth campus, she said. Vice President Petersen stated that the model proposed by Social Work was a good one. If the University of Minnesota does not step in to meet

such needs where it can, others will do so instead. Professor Gatewood suggested that an informal advisory committee be assembled to examine the MSU and other models.

Executive Committee members voted unanimously to approve the Social Work proposal.

J. Proposal for a Master of Science (M.S.) and Ph.D. Degree Program in Water Resources Science

Professors Cushing, Johnston and Janni reported that their respective Policy and Review Councils had approved the proposal. Professor Janni mentioned that his Council, in its discussion, had considered the viewpoint of the Department of Geology and Geophysics, in particular. He moved approval of the proposal. The motion received a second and discussion ensued.

Vice President Petersen drew attention to correspondence distributed at the meeting that described the nature of consultation with the department heads in Civil and Mineral Engineering, and in Geology and Geophysics, and she invited Professor Brezonik to elaborate on the consultative process followed in bringing the proposal forward. Professor Brezonik described his recent discussions with department heads and other faculty in the two named departments, as detailed in his May 24 letter to Vice President Petersen and in his response of May 23 to Dean F.A. Kulacki's May 11 memorandum. He noted that the head of Civil and Mineral Engineering has continuing, general concerns about interdisciplinary graduate programs and the way in which faculty effort--especially advising effort--is credited. Vice President Petersen concurred that this is an important issue and said administrators must ensure that credit is appropriately allocated.

Professor Gatewood reported that the Health Sciences Council had considered the proposal as a point of information. In her subsequent discussions with several faculty members, questions arose about strengths in the area of water resources science at Duluth, which were perceived to be mostly in aquatic biology, and whether an individual would be named to oversee program affairs at UMD. In response to the first concern, Vice President Petersen pointed out that the director of the Minnesota Sea Grant Program is now located at Duluth. A new center--the Large Lakes Observatory--will also be situated there; the head of this center has just been recruited, and six new faculty will be appointed. In addition, UMD's strategic plan lists water resources as an area in which the campus wishes to expand, Vice President Petersen concluded. Associate Deans Labuza and Hedman are exploring distance technology to facilitate meetings between the two campuses. In reply to the second concern, Professor Brezonik stated that a co-director of graduate studies would be named for the Duluth campus. There is much enthusiasm for the program among water-oriented faculty at UMD, he added. With respect to faculty strengths at Duluth, Professor Brezonik conceded that the majority of faculty at UMD who would participate in the program are in the area of water biology; however, faculty

appointments made in connection with the new Large Lakes Observatory will present the opportunity to add expertise in the area of physical hydrology. Vice President Petersen also mentioned a strategic planning committee on water issues whose report is expected soon and will speak to some of these issues. This group is very supportive of the proposal for a degree program in Water Resources Science. Vice President Petersen said the University's strengths in this area are too dispersed and there is need for integration.

Executive Committee members voted unanimously in favor of the motion to approve the proposal.

K. Request to Increase the Required Credits for the Master of Architecture (M.Arch.) Degree from 78 to 126 Credits for Students Who Hold a Nonarchitectural Degreee or a Four-Year, Pre-Professional Degree

Professor Janni reported that the Physical Sciences Policy and Review Council had voted its unanimous support of the request, and he moved its approval by the Executive Committee. The motion was seconded. Professor Robinson commented briefly on the accreditation requirements that motivated the request, and on the shift in the program to make the M.Arch. the first professional degree in the field. Depending on their background, students can complete the degree with fewer credits, Professor Robinson clarified.

Executive Committee members approved the request on a unanimous vote.

L. Request to Permit Three Faculty from the Major Field to Constitute the Final Examining Committee for the Master of Landscape Architecture (M.L.A.) Degree

Professor Cushing reported that the Biological Sciences Policy and Review Council had approved the request after some discussion. Following a brief consideration of practices in other professional degree programs and a similar exception already approved for one or two of these, Executive Committee members voted unanimously in favor of the request.

II. FOR INFORMATION AND/OR DISCUSSION

Associate Dean Labuza made a brief presentation on each of several items: Concerning the development of a Gopher menu for the Graduate School, he drew attention to a draft outline of elements that might be included on the Graduate School's Gopher, and he asked for suggestions from Executive Committee members. He also described the World-Wide Web file created by the Food Science graduate program, and he elaborated on its potential for recruiting graduate students. In regard to issues surrounding the graduation ceremony for Ph.D. students, he called attention to his e-mail message of April 28 to directors of graduate studies. Eligibility to participate in the ceremony is in part affected by the Graduate School's early graduation, which takes place in May.

The Graduate School will further examine this issue over the summer. With respect to the status of program management evaluation form review, Associate Dean Labuza reported that forty-nine programs on the Twin Cities campus, and two at Duluth, have been approved through this process to assume increased responsibility for graduate admissions. He also commented on the nature of the information provided on the forms and on aspects of the review process. Concerning development of a Graduate School exit survey, Associate Dean Labuza noted the draft survey that had been circulated with the agenda, and he stated that work on the survey would continue over the summer. Also mentioned in Associate Dean Labuza's report were a University affirmative action statement, currently in preparation, that will include reference to graduate students; wording with respect to students with disabilities that the Graduate School will recommend for inclusion in graduate student recruitment materials; and data (from the National Survey of Earned Doctorates) showing the employment status of doctoral degree recipients at graduation for a ten-year period, 1982-1992. The Graduate School recently sent each program data relevant to it, together with aggregate data for all graduate programs. A brief discussion followed Associate Dean Labuza's remarks.

III. FOR INFORMATION

A. Graduate School Report

Vice President Petersen stated that the proposed plan for reorganization of the University's central administration calls for three provosts that would report directly to the President. Under this scheme, the Graduate School and research are positioned at the "top of a ladder" that would report to a vice president for academic affairs. Also reporting to this individual would be 'undergraduate education,' 'CEE and outreach,' and 'student life.' The Graduate School and research would still be combined (which in her experience is increasingly the trend, Vice President Petersen said), but would not be at the highest decision-making level within the University and would therefore not be in accord with the administrative structures of Minnesota's peer institutions. The position of Vice President for Research would moreover be retitled "Associate Vice President."

A discussion ensued in response to Vice President Petersen's invitation to comment on the proposed reorganization. Of principal concern in this discussion was the loss of a voice for research and graduate education at the institution's top decision-making level under the proposal. One Committee member spoke to the University's tripartite mission under U2000 (research and discovery, teaching and learning, and outreach and public service) and said some within the institution are asking for a broader discussion of the reorganization plan, as it does not appear the plan will benefit graduate education and research. It was noted that the structure was developed by an outside consultant and that, although there might be some flexibility in the proposed titles, a real question is whether the institution's functions will be served in the new structure. Following another Committee member's suggestion that the

Executive Committee should make a statement to the President about the proposed administrative reorganization, it was decided that individual Committee members, including graduate student members, should address their concerns in writing to the President. As the reorganization plan had not yet been circulated to faculty or graduate students, Vice President Petersen stated that she would circulate a copy to Committee members. In response to a question about whether the University Senate's faculty research committee would discuss the reorganization plan, Associate Vice President Brenner replied that it would, as would the Senate's finance and planning committee. The timeframe for deciding the reorganization was not known.

B. Status Report on the Ed.D. Degree as Offered in an Experimental Mode to Train for Administrative Leadership in Two-Year Institutions of Higher Education

Professor Ammentorp drew attention to the status report, entitled "Access to Excellence: Restructuring the Graduate Experience," that had been circulated with the agenda, and he commented briefly on this document. He noted that the program is stimulating in part because of the issues it raises about non-traditional approaches to graduate study.

C. Report from the Graduate School Fellowship Committee

Assistant Vice President Louis reported that the Fellowship Committee is currently in the midst of deciding dissertation fellowship awards for next year. Eighty-five first-year fellowships were accepted for 1994-95, more than in any previous year. Ms. Smith drew attention to material distributed at the meeting that described the purpose of the Graduate School fellowship programs, selection/award criteria, and guidelines for directors of graduate studies in preparing nominations and applications. Noted also was the membership of Graduate School selection committees for 1993-94, including the Graduate School Fellowship Committee. Professor Gatewood observed that none of the Health Sciences Policy and Review Council's member programs were represented on the Fellowship Committee, and she recommended that each Council be invited to name at least one faculty member to serve on this committee. The Health Sciences representative could also provide feedback to the Council about the fellowship selection process. Ms. Smith explained that the Graduate School asks all directors of graduate studies and department heads to suggest faculty members for inclusion on the Fellowship Committee. Assistant Vice President Louis added that membership on the committee rotates and that health sciences programs have been represented in the past.

D. Report from the General Research Advisory Committee

Assistant Vice President Louis reported that since the beginning of this academic year, the Graduate School Research Advisory Committee (GRAC) has made seventy-one faculty research awards, representing slightly over \$900,000. The number of requests totalled 135. Thirty-five additional awards were made through the Health Sciences Research Advisory

Committee, totaling approximately \$600,000. Requests numbered 65. The Graduate School's grant-in-aid funds amount to about \$2 million annually, of which \$1.4 million has been distributed to date. Vice President Petersen noted that the Health Sciences budget was decreased last year. She also mentioned the publication, *Research Review*, which contains a Graduate School insert with helpful news about issues related to the Graduate School and funding opportunities available through it.

E. Report from the Council of Graduate Students

Ms. Sales reported that COGS continues to work on some of the same issues that have been of concern in the past. Details of the health insurance benefits program for graduate assistants need to be decided soon, and COGS is working to ensure that the pay increase for faculty and civil service staff will apply to graduate assistants as well. Vice President Petersen extended her thanks to COGS for its efforts in attempting to resolve the issue of fringe benefits for graduate assistants.

F. Report of Board of Regents Actions Regarding Degree Program Additions, Deletions and Name Changes

Associate Dean Zimmerman reported that the Board of Regents had approved the following Graduate School items since the Executive Committee's February meeting:

- the request to change the name of the graduate degree program (M.S., M.Geo.E., and Ph.D.) in Geo-Engineering to **Geological Engineering,**
- the request to change the name of the Master of Arts (M.A.) degree program in Home Economics Education to **Family Education,** and
- the request to change the name of the graduate degree program (M.S. and Ph.D.) in Physiology to **Cellular and Integrative Physiology.**

G. Date of Next Meeting

Members acknowledged that a second meeting was unnecessary this quarter.

IV. **OLD BUSINESS**

No old business was reported.

V. **NEW BUSINESS**

No new business was reported.

The meeting was adjourned at 3:12 p.m.

Respectfully submitted,
Vicki Field, Assistant to the Dean

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Department of Afro-American
& African Studies

808 Social Sciences Building
267 19th Avenue South
Minneapolis, MN 55455
612-624-9383
612-624-9847

March 31, 1994

Dean Anne Peterson
The Graduate School
321 Johnston Hall
University of Minnesota

APR - 1 1994

Dear Dean Peterson:

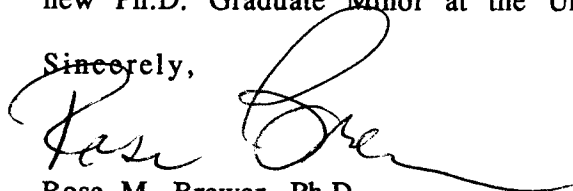
We are submitting the enclosed proposal for a free-standing Masters and Ph.D. Graduate Minor in Studies in African and the African Diaspora. The proposed minor offers graduate students in the humanities, social sciences and several professional programs the opportunity to complete a structured program of study in this interdisciplinary field.

African Studies as a field of study began in this country at Northwestern in 1947. African American Studies emerged out the changes in higher education in the late 1960's. Students pressed for Ethnic Studies Programs, and these were established in major institutions such as the University of Minnesota. Since that time both African Studies and African American Studies have been highly sought out fields at the University of Minnesota. Increasingly, graduate majors find the scholarship of these studies useful in their advanced training.

The proposal is designed to offer Masters and Ph.D. students the opportunity to systematically become a part of this ongoing evolution. The program would, to a large extent, recognize and make formal much of the informal interaction in Afro-American and African studies that already exists among our faculty and students. We believe this program would encourage and broaden the scope of these activities.

This proposal is the result of extensive planning that has been going on during the 1993/94 academic year. Thank-you for your consideration of it as a new Ph.D. Graduate Minor at the University of Minnesota.

Sincerely,



Rose M. Brewer, Ph.D.
Chair and Associate Professor

cc: Departmental Files

Higher Education Coordinating Board
Application Form for New Academic Program

COVER SHEET

- 1) Institution(s) Name. 1) University of MN-Twin Cities
2) _____

If more than one institution, this is a joint
cooperative _____ program (see instructions)

- 2) Program Title (include degree, if applicable)
Graduate Minor in Studies of Africa and the African Diaspora
(Masters and PhD)

Classification of Instructional Program (CIP) code number: _____

- 3) Program Location: to be offered at main campus only X
To be offered at other locations (specify locations) _____

- 4) Implementation Date: 9/1/95

- 5) Program Length: 11 - 19 credits

- 6) Number of Graduates at Full Operation: 35-40 students

- 7) Governing Board Approval Date: _____

- 8) Brief Program Description:

Minor Program in Studies in Africa and the African Diaspora at the Masters and Ph.D. levels. Enrollees are graduate students majoring in traditional Masters or Ph.D. programs offered by units in the social sciences, humanities and the arts, education, health sciences, international development and public affairs. Curriculum will provide a multi-disciplinary, integrated foundation in the study of Africa and peoples of African descent based on a series of core course concentrating in one of the following 2 areas: Social and Behavioral Sciences or Humanities and the Arts.

EXECUTIVE SUMMARY

1. Program Title: Minor in Studies in Africa and the African Diaspora (Masters and Ph.D Level)

2. Program Requirements:

Admission Requirements. Admission to the Graduate Minor Program in Studies in Africa and the African Diaspora is open to all students who have been admitted to the graduate school and to a master's or Ph.D. program in a degree-granting department. Students will be admitted to the Studies in Africa and the African Diaspora minor program through an interview or correspondence with the Graduate Advisor.

The Curriculum. The Minor Program in Studies in Africa and the African Diaspora may be pursued at the Masters and Ph.D level. The minimum number of credits required for the Masters minor is eleven (11) credits, and nineteen (19) credits for the Ph.D minor. The program for each student will be developed in meetings between the student and the Director of Graduate Studies, and formally approved by the Committee on Graduate Programs.

Each student for the minor will be required to take Afro 8xxx (Seminar: Studies in Africa and the African Diaspora). Students for the PhD minor will be required to take one additional seminar focusing on multi-disciplinary approaches to the study of Africa and the African Diaspora, particularly the interrelationships of history, the arts and the social sciences. Remaining courses will be selected from one of the following two (2) broad areas: 1) Humanities and the Arts or 2) Behavioral and Social Sciences. Selected courses must be outside the student's major field of study.

Completion Requirements and Standards. A student electing the Minor in Studies in Africa and the African Diaspora must maintain academic standing following Graduate School standards.

3. Program Demand:

Student Interest in the Program. Current graduate student interest in Afro-American and African Studies courses suggests that from 35 to 40 candidates will be admitted to the Masters and Ph.D Minor programs in the first five years. This estimate could prove conservative if present trends in increased interest and course enrollments observable at the undergraduate level continue and, more importantly, if implied interest by students and practitioners in such graduate fields as education, public affairs and health care areas is realized.

4. Summary Description of Program:

Studies in Africa and the African Diaspora is an area of interdisciplinary research concerned with a systematic understanding of the contemporary and historical experiences of peoples of Africa and of African descent. The Graduate Minor in Studies in Africa and the African Diaspora would provide a focus and mission for students and faculty by organizing a rigorous series of core courses, establishing a seminar program focused on the interrelationships of peoples of Africa and African descent, and attracting highly qualified graduate students. It would provide graduate students with formal recognition, and would encourage scholarly interdisciplinary interaction among traditional liberal arts disciplines and applied and professional programs.

SECTION C

1. Need for the Program

Both at the University of Minnesota and across the nation there is little emphasis on the relationships between peoples of Africa and of African descent. Whereas Graduate Minor programs in African Studies have a tradition that goes back more than 40 years at some universities, and are presently offered at many institutions, Graduate Minor programs in Afro-American Studies are much more recent, and are well-established at few institutions. An integrated study of African peoples and cultures, connecting the study of Africa to that of the African diaspora, is practically nonexistent.

The College of Liberal Arts has taken a significant step to emphasize the importance of cultural diversity by instituting both cultural pluralism and world studies requirements. Yet graduate education has continued, appropriately, to be discipline-centered, with little infusion of multi-cultural and multi-disciplinary perspectives. This has created a situation, for example, in which we now have large numbers of students enrolled in undergraduate courses in Afro-American and African Studies, yet face a deplorable lack of qualified graduate students to help teach these courses. For example, enrollments in survey courses in psychology and literature alone have increased from 150 students in fall term, 1986, to more than 540 students in fall term, 1993. For the department as a whole enrollment has increased well over 300% over the past eight years.

Minnesota has a strong group of faculty interested in a wide range of disciplines related to Studies in Africa and the African Diaspora. Minnesota also has a demand for a graduate minor program in Studies in Africa and the African Diaspora fueled by increased enrollments in undergraduate courses in Afro-American and African related courses, an increasingly diverse Twin Cities' population, and the increasing need nationally for an understanding of the histories and cultures of our entire population.

Besides attracting students from traditional liberal arts graduate majors in such fields as sociology, anthropology, political science, history, geography, English and French, we anticipate growing interest in such important professional fields as education, journalism, health care (e.g., public health and nursing) and public policy. The additional training these students would receive in Studies in Africa and the African Diaspora, and the formal recognition they would receive from a Graduate Minor in Studies in Africa and the African Diaspora, would make them highly competitive in a job market that increasingly is seeking graduates with multi-cultural knowledge and sensitivity.

The creation of a Graduate Minor in Studies in Africa and the African Diaspora would help attract new students to traditional graduate programs, and provide those students with a coherent, interdisciplinary educational program that would greatly enrich their learning.

2. Duplication

This program does not duplicate any existing programs. There are no similar programs at any institutions within Minnesota. Within the Big Ten there are comparable programs in **either African Studies or Afro-American Studies** at Wisconsin, Indiana, Michigan State, and Illinois.

3. Resources required for the program.

This program will increase the productivity and creativity of each faculty member and his/her department. The major 'cost' will be born by each participating faculty member who will help train graduate students, participate in committee work and, over time, organize new courses and research. The benefits to the University, its students and faculty outweigh the marginal costs of the program.

The proposed minor program in Studies in Africa and the African Diaspora will gather, focus and coordinate existing course offerings, and will therefore require minimal resources for implementation. The Director of Graduate Studies (DGS) will be initially assumed with no augmentation of salary or release time. Additional administrative costs will be negligible. The libraries of the University are adequate to support the proposed program. Space and equipment are also adequate. No new faculty members are required to set up the program. We anticipate that one new seminar (Afro 8xxx) introducing students to the theory and methods of Studies in Africa and the African Diaspora will provide a necessary focus to the program, and that over the first five years several new graduate level seminars will be developed by participating faculty.

4. Mission of the institution

The creation of a Minor in Studies in Africa and the African Diaspora fits well into the total educational mission of the University of Minnesota by encouraging interdisciplinary learning and emphasizing the importance of cultural diversity. By encouraging cross-departmental, interdisciplinary research and teaching, it will allow the University to use effectively faculty resources and train students in a socially-important area of knowledge. As suggested above, the Program will enhance the position of the University by attracting more qualified students to existing programs, producing better educated scholars, and facilitating interdepartmental research and teaching among University Faculty interested in this area of research.

APPENDIX

The Proposal to Establish a Masters and Ph.D Minor in Studies in Africa and the African Diaspora

1. Introduction

There exists a sizable, and rapidly expanding, body of knowledge in the social sciences and humanities addressing the cultures of African peoples throughout the world. Much of this scholarship focuses on the African diaspora, and includes the historical, political, literary and artistic contributions, as well as the social, psychological, religious and cultural adaptations of persons of African descent living in North America, the United Kingdom, the Caribbean and Latin America.

Over the past decade faculty affiliated with the Department of Afro-American & African Studies have received an ever-increasing number of requests from masters and doctoral students for assistance in their graduate programs and theses that, in one way or another, require an understanding of the African diaspora. Students in such diverse fields as music, French, English, history, American studies and education have striven for a richer understanding of the scholarship on a wide range of issues concerned with peoples of African descent. These students reflect a growing interest in exploring not just African-American or African scholarly interests, but in increasing our understanding of the similarities and differences between the two.

The Department of Afro-American & African Studies recently revised its undergraduate program to enhance its focus on all peoples of African descent. It offers a single, unified major and requires students to take courses focused on both Africa and the African diaspora. It has also increased the disciplinary depth and scope of the Department's offerings by inviting the expertise of faculty from other departments. As a result there are now courses related to Afro-American and African history, the literatures of the Caribbean, Afro-America, North and Sub-Saharan Africa, African geography, Afro-American sociology, psychology, political science and music.

It is our intention to extend this focus on the African diaspora to fill a growing need in graduate education. Though graduate studies at the university is, quite appropriately, discipline based, there is a place for interdisciplinary approaches as well. The creation of a Graduate Minor in Studies in Africa and the African Diaspora will provide one such vehicle, giving additional opportunities to graduate students and faculty in a variety of disciplines to explore common interests.

2. The Proposed Program

A graduate minor at the Masters and Ph.D level is proposed both to integrate and focus our diverse resources and to enhance the visibility of the University of Minnesota in the advancement of research and graduate education in Studies in Africa and the African Diaspora.

a) Program Objectives.

Establishing a formal degree-related program will accomplish the following objectives:

1. The appointment of a Director of Graduate Studies and the formation of a graduate faculty with interests in Studies in Africa and the African Diaspora will, in itself, do much to encourage the interaction and communication needed to foster development in studies of the African diaspora.
2. Provide for the enhancement of high-quality core courses that emphasize theory and methods in the study of Studies in Africa and the African Diaspora, and the development of new courses focused on interdisciplinary graduate education.
3. Provide an identity, focus and mission for students and faculty interested in Studies in Africa and the African Diaspora, and also a vehicle for them to interact and develop their field. The seminar program in Studies in Africa and the African Diaspora will encourage communication between graduate students and faculty, stimulating both students and faculty with new ideas and perspectives, and will help to create national recognition of the existence and strengths of the program at Minnesota.

4. Provide a central listing in the Graduate School Bulletin of graduate-level courses in Studies in Africa and the African Diaspora. Such a listing would provide general publicity and facilitate more specialized advertising for recruitment of graduate students into existing graduate programs.

5. Facilitate and enhance the current level of interdisciplinary research among graduate students and faculty in Studies in Africa and the African Diaspora.

6. Enhance the training of students in graduate programs for which specialized knowledge of theory and research in Studies in Africa and the African Diaspora would supplement major program requirements.

7. Improve the ability to attract and coordinate outside speakers.

8. Improve the job opportunities for our students by providing them with a formal recognition on their transcripts of their skills in, and commitment to, Studies in Africa and the African Diaspora.

b) Admission Requirements

Admission to the minor program will be contingent upon enrollment in good standing in a recognized degree-granting program within the Graduate School of the University of Minnesota. The admission to the program is therefore limited and granted only by permission of the Director of Graduate Studies in Studies in Africa and the African Diaspora. Students interested in applying to the program would request information from any of the participating faculty or the DGS of the Studies in Africa and the African Diaspora minor. The minor will be formally declared when the student files his/her program and the DGS in his/her major department has signed. These thorough reviews will assure the quality of the students in the program.

c) The Curriculum

Each student for the Masters and Ph.D minor in Studies in Africa and the African Diaspora is expected to have had sufficient background, to include history, in either Afro-American Studies or African Studies to begin graduate-level study.

The program requires a minimum of 11 graduate-level quarter credits for a Masters minor and 19 graduate-level quarter credits for the Ph.D minor. Each student for the minor will be required to take Afro 8xxx (Seminar: Studies in Africa and the African Diaspora). Students for the PhD minor will be required to take one additional seminar, focusing on multi-disciplinary approaches to the study of Africa and the African Diaspora, particularly the interrelationships of history, the arts and the social sciences. Remaining courses will be selected from one of the following two (2) broad areas: 1) Humanities and the Arts or 2) Behavioral and Social Sciences. Selected courses must be outside the student's major field of study.

The program for each student will be developed in consultation among the student, the major advisor and the DGS in Studies in Africa and the African Diaspora.

A list of courses acceptable for the minor follows:

Interdisciplinary Seminars

- Afro 8xxx Studies in Africa and the African Diaspora (3 cr)
- Afro 5701 Proseminar: Afro-American Studies (4 cr)
- Afro 5702 Proseminar: Afro-American Studies (4 cr)
- Afro 5800 African Studies Interdisciplinary Seminar (4 cr)
- Afro 5900 Afro-American Seminar (4 cr)

Topics Courses and Directed Studies

- Afro 5910 Topics in Afro-American and African Studies (4 cr)
- Afro 5970 Directed Studies (1-6 cr)

Module 1: Humanities and the Arts

- Afro 5181 Contemporary Black Theater, 1960 to Present (4 cr)
- Afro 5182 Blacks in American Theater, 1820 - 1960 (4 cr)
- Afro 5551 Use of oral Traditions as Resources for History: Methods (4 cr)
- Afro 5593 The Afro-American Novel (4 cr)
- Afro 5595 Afro-American Poetry (4 cr)
- Afro 5596 Afro-American Autobiography (4 cr)
- Afro 5597 The Harlem Renaissance (4 cr)
- Afro 5598 The Black Renaissance II (4 cr)
- Afro 5301 African Literature: The Novel (4 cr)
- Afro 5341 Proseminar in Contemporary Kenyan Literature (4 cr)
- Afro 5678 African-Arabic Fiction in Translation (4 cr)
- Hist 5447 Problems in East Africa (4 cr)

Hist 5932 African Historiography (4 cr)
 Hist 8430 Topics in the History of African Peoples (3 cr)
 Hist 8944/8945 African History (3 cr per qtr)
 Fren 5289 Topics in African Literature
 Engl 8590 Studies in Afro-American Literature

Module 2: *Behavioral and Social Sciences*

Afro 5072 Racism: Social-Psychological Consequences for Black Americans (4 cr)
 Afro 5145 Development in Africa (4 cr)
 Afro 5200 Black Americans and Mental Health (4 cr)
 Afro 5352 Black Families in Comparative Perspective (4 cr)
 Afro 5876 Proseminar: Approaches to African Development (4 cr)
 Hist 5436 Social History of African Women: 1850 to Present (4 cr)
 Hist 5931 History of Africa: Social Groupings and Conflict (4 cr)
 Pol 5478 Government and Politics of African Countries (4 cr)
 Pol 8605 Government and Politics of Africa (3 cr)
 Geog 5142 Geography of East Africa (4 cr)
 Geog 5143 Geography of West Africa (4 cr)
 Geog 8140 Seminar: Africa (3 cr)

d) Completion Requirements and Standards

Students must maintain academic standards according to Graduate School standards.

3. Education and Social Need for the Program

Student Interest in the Program: Based on present interest shown by enrollment of graduate students in Afro-American and African Studies courses, we estimate that about 10-12 students will enter the program each year. Given the average time students require to complete their Masters and Ph.D degrees, we estimate that the program will have an average enrollment of 35-40 students.

Two general types of students are likely to enroll in this program. One type will be those whose primary research interests are in traditional liberal arts programs such as English and French (in particular those interested in 'emerging' or 'post colonial' literatures), history, anthropology, geography, sociology and political science. Students from these disciplines already show a keen interest in our courses, and they and their advisors may recognize a need to receive formal recognition and supplement their training with a wider grasp of Africa and the African

diaspora. This should lead to their thinking more broadly about their research area, and to be better informed about issues related to their core study.

A second type of student will be those in professional programs such as education, public administration, public health and international development. Students from these areas have shown increased interest in Afro-American and African Studies, but have not had an organized way in which to have these interests recognized.

Employment Prospects. The addition of a formal minor in Studies in Africa and the African Diaspora could significantly improve the employment prospects of our students in several ways. First, they would have additional skills that other students with a narrower, more traditional training would not have, and thus would be more valuable on the traditional academic job market. Second, the minor would help prepare students for new job opportunities where there is clearly a need for employees with a broad, multi-cultural academic background. This would be particularly true in a variety of government agencies as well as in the private sector.

Educational, Research, Cultural and Social Benefits

The recognition of both Afro-American studies and African studies as interdisciplinary fields of study has long been reflected in specialized academic journals and organizations. Disciplines within these broad areas, such as African and Afro-American literature, African and Afro-American history, African geography, etc. are similarly recognized in international organizations fostering their research.

There is a critical mass of faculty and students at the University of Minnesota who share an active interest in Studies in Africa and the African Diaspora. Despite the richness of faculty, student, and course resources, however, the University lacks an organizational and programmatic focus around which to consolidate its considerable strengths in this area. This void creates several problems: a) There is no central listing of available graduate faculty and courses in Studies in Africa and the African Diaspora. This makes it difficult to advertise for and recruit quality graduate students. As a result, some well-qualified students who might otherwise attend the University select other institutions. b) Without of a formal curriculum the education of graduate students in this area may be uneven c) There is no way for graduate students to obtain formal recognition on their records of their expertise

in Studies in Africa and the African Diaspora. d) Interaction among faculty and graduate students with interests in Studies in Africa and the African Diaspora is not as frequent, widespread or fruitful as it might be.

4. Comparison with Similar Programs

There are no similar programs in any institution of higher learning in Minnesota. Similar programs in either Afro-American studies or African studies exist at the University of Wisconsin-Madison, Michigan State, Indiana and Illinois, and at several major universities throughout the country.

5. Quality Control

Qualifications of the Graduate Faculty. Membership in the Graduate Faculty of Studies in Africa and the African Diaspora shall be restricted to those faculty members who are actively involved in and willing to make commitment to research and graduate education in this program. Election to the Graduate Faculty in Studies in Africa and the African Diaspora shall be granted, upon application, to those faculty members of the University of Minnesota who accept and fulfill the responsibilities outlined below. The appointments to the Graduate Faculty will be at the "E" level since the proposal is to establish a minor program in Studies in Africa and the African Diaspora.

(1) The faculty should be actively engaged in research in at least one of the diverse fields that are encompassed, in the broad sense, by Studies in Africa and the African Diaspora. Evidence of this activity would be suggested by refereed publications or recent grant support.

(2) Faculty members should be willing to work with Masters and Ph.D students in existing degree-granting programs.

(3) Faculty members should be willing to serve on committees that the program establishes.

(4) Faculty members should teach or be willing to contribute to the teaching of one or more of the courses listed as part of the curriculum, or should teach a research seminar in the area at least once every five years.

Periodically, but at no less than five-year intervals, the Steering Committee should review the program-related activities of the Studies in Africa and the African Diaspora Graduate Faculty and revise faculty composition accordingly.

Governance of the Program. The Director of Graduate Studies has the primary administrative responsibility for the program. The person to act as DGS will be recommended to the Dean of the Graduate School by a majority vote of the Program faculty and will serve for three years. The DGS will be helped by the Studies in Africa and the African Diaspora Steering Committee. These members will represent the range of disciplines that contribute to Studies in Africa and the African Diaspora. Each year the DGS, in consultation and with approval of the program faculty, will recommend composition of the Steering Committee. Substantial modifications in and departures from existing program guidelines will be subject to majority approval of the program faculty.

Evaluation of the Program. Periodic internal and external reviews will be the primary means by which the program is evaluated. It is expected that the program faculty will take steps to remedy deficiencies identified by such review.

6. Implementation

It is proposed to begin the Minor in Studies in Africa and the African Diaspora in Sept., 1995.

The Initial Faculty. It is proposed that the faculty members listed in Attachment 'A' be the initial faculty. They satisfy the criteria listed in Section 5 (above), they currently teach a course or courses central to Studies in Africa and the African Diaspora, and they represent the broad interests of the program. Once the program is approved, the initial faculty will solicit, review and make recommendations regarding applications for additional members according to the criteria listed in Section 5 (above). The initial group of faculty will recommend an individual to be appointed as the Director of Graduate Studies.

University Resources. The major obligations, commitments and responsibilities of the program will be accomplished by reassignment of efforts. Clearly, the largest burden will fall on the Director of Graduate Studies. Yet we believe that the duties of the DGS and the various clerical duties can be carried out with no additional costs or personnel. We do anticipate that the program will advertise its existence nationally by

developing and distributing a brochure and by working with major programs to help attract qualified students. We estimate that telephone, mailing, advertising and recruitment activities will cost \$1500. per year.

Extra-University Resources. No significant sources of external support are required for implementation and continuation of the program. Still, many students in this program can be expected to receive support from either research grants or training grants available to their major advisor and program.

ATTACHMENT A

Proposed Initial Faculty

Faculty who have an interest in participating in the proposed Studies in Africa and the African Diaspora Graduate Minor program.

Allen Isaacman - Professor, History and Afro-American & African Studies

Joanne Eicher - Professor, Design, Housing and Apparel

Caesar Farah - Professor, History

Phil Porter - Professor, History and Afro-American & African Studies

Earl Scott - Professor, Geography and Afro-American & African Studies

Rose Brewer - Associate Professor, Afro-American & African Studies

Susan Geiger - Associate Professor, Women's Studies

Ronald McCurdy - Associate Professor, Music and Afro-American & African Studies

August Nimitz - Associate Professor, Political Science and Afro-American & African Studies

Angelita Reyes - Associate Professor, Women's Studies

John Taborn - Associate Professor, Afro-American & African Studies

✓ Patricia Turner - Associate Professor, Library Collection Division

John Wright - Associate Professor, English and Afro-American & African Studies

Teirab AshShareef - Assistant Professor, Afro-American & African Studies

Victoria Coifman - Assistant Professor, Afro-American & African Studies

Charles Ben Pike - Assistant Professor, Afro-American & African Studies

✓ Nassif Youssif - Head, Middle Eastern Library

**ATTACHMENT B
SAMPLE PLANS**

Following are five sample minor programs from a variety of graduate majors. Each is hypothetical, and does not consider an individual student's academic background or his/her specific graduate concentration.

Sample Plan 1: Major in Public Policy (Masters)

Minor: Studies in Africa and the African Diaspor

Afro 8xxx	Seminar: Africa and the African Diaspora: History, Theory and Methods (3 cr)
Afro 5072	Racism: Social-Psychological Consequences for Black Americans (4 cr)
Afro 5352	Black Families in Comparative Perspectives (4 cr)

TOTAL 11 credits

Sample Plan 2: Major in Political Science (Comparative Politics)

Minor: Studies in Africa and the African Diaspora

Afro 8xxx	Seminar: Africa and the African Diaspora: History, Theory and Methods (3 cr)
Afro 5800	Interdisciplinary Seminar on Africa (4 cr)
Hist 5931	History of Africa: Social Grouping and Context (4 cr)
Geog 5142	Geography of East Africa (4 cr)
Geog 5143	Geography of West Africa (4 cr)
Geog 8140	Seminar: Africa (3 cr)

TOTAL: 22 credits

Sample Plan 3: Major in Agriculture and Applied Economics

Minor: Studies in Africa and the African Diaspora

Afro 8xxx	Seminar: Africa and the African Diaspora: History, Theory and Methods (3 cr)
Afro 5800	Interdisciplinary Seminar on Africa (4 cr)
Afro 5145	Development in Africa (4 cr)
Hist 5436	Social History of African Women, 1850 to present (4 cr)

Hist 5931	History of Africa: Social Grouping and Context (4 cr)
Pol 8603	Government and Politics in Africa (3 cr)

TOTAL: 22 credits

Sample Plan 4: Major in English (focus on "emerging" literatures)
Minor: Studies in Africa and the African Diaspora

Afro 8xxx	Seminar: Africa and the African Diaspora: History, Theory and Methods (3 cr)
Afro 5800	Interdisciplinary Seminar on Africa (4 cr)
Afro 5598	Black Renaissance II (4 cr)
Afro 5678	Africa-Arabic Fiction in Translation (4 cr)
Afro 5352	Black Families in Comparative Perspective (4 cr)
Hist 8430	Topics in History of African Peoples (3 cr)

TOTAL: 22 credits

Sample Plan 5: Major in American History
Minor: Studies in Africa and the African Diaspora

Afro 8xxx	Seminar: Africa and the African Diaspora: History, Theory and Methods (3 cr)
Afro 5900	Seminar: Afro-American Studies (4 cr)
Afro 5593	The Afro-American Novel (4 cr)
Afro 5597	The Harlem Renaissance (4 cr)
Afro 5072	Racism: Social-Psychological Consequences for Black Americans (4 cr)
Eng 8590	Studies in Afro-American Literature (3 cr)

TOTAL: 22 credits

ATTACHMENT C

Summary of the characteristics of five major Afro-American Studies or African Studies programs elsewhere.

Wisconsin: Wisconsin has a large, federally-funded African Studies Program drawing from a diverse faculty in departments throughout the university. It does not offer a graduate degree, but does offer both a Certificate in African Studies to students who have completed 15 hours of course work on Africa in 2 different disciplines. It also offers a PhD minor program.

Departmental affiliations -- The core faculty (16) are drawn primarily from African Languages & Literature, History, Anthropology and Agricultural Economics.

Program structure -- The PhD minor requires a minimum of 4 courses from the African Studies core curriculum, all of which must be outside a student's own department. Courses chosen must form a coherent pattern of study, and include courses from at least 2 different disciplines.

Indiana: Indiana offers PhD minors in both Afro-American Studies and in African Studies. Each program is administered separately. Both programs, however, draw heavily on Indiana's strong tradition in African art and comparative literature.

Departmental affiliations -- African Studies has some 17 faculty members, drawn mainly from the art history, comparative literature, history, anthropology and political science. Afro-American Studies (12 faculty members) draws from history, comparative literature, art, political science and sociology.

Program structures -- The PhD minor in African Studies requires all students to take a core graduate seminar on Bibliography in sub-Saharan Africa and 4 additional 3 or 4 credit graduate-level courses. Each course must be outside a student's major field, and in at least 2 different disciplines. For the PhD minor in Afro-American Studies, students must complete 15 credits of graduate course work from the department's 3 concentration areas: 1) arts, 2) literature, 3) history, culture and social sciences. Three courses must be from 1 concentration area.

Illinois: Illinois offers a PhD minor in African Studies through its African Studies Program. It has no graduate degree-granting programs in either African Studies or Afro-American Studies.

Departmental affiliations -- African Studies (12 faculty members) draws heavily on courses in the fields of anthropology, history, agricultural economics and art history.

Program structure -- The PhD minor in African Studies requires all students to take a minimum of 4 courses of graduate credit from at least 2 different disciplines, including art history, anthropology and agricultural economics.

Cornell: Cornell has a program closest to our proposed graduate minor. Growing out of its Africana Studies and Research Center it offers a Masters of Professional Studies degree in Afro-American & African Studies, as well as graduate minor programs. Its goal is to develop students with professional expertise in the rapidly-expanding area of Black studies.

Department affiliations -- The Africana Studies and Research Center, which controls the graduate program, has 14 active faculty members drawn heavily from literature, political science, psychology and history.

Program structure -- All students admitted to the program are expected to have some background in one or more areas of Black studies. A special committee helps each student work out individual programs. Study for completion of a PhD minor must include at least 5 courses from at least 2 different disciplinary areas.

SUNY - Albany: The Department of Afro-American and African Studies at SUNY-Albany offers a Masters degree in either African Studies or Afro-American Studies, as well as a graduate minor in each area.

Department affiliations -- There are 10 regular faculty members in the Department. Focused disciplines are history, literature, economics and political science.

Program structure -- Students must specialize in either African Studies or Afro-American Studies. In each case they must complete at least 5 courses from 2 separate areas. African Studies areas of study include history, economics, political science and literature; Afro-American areas include history and culture, urban economics, and central city political science and development.

UNIVERSITY OF MINNESOTA

Twin Cities Campus

School of Social Work

*400 Ford Hall
224 Church Street S.E.
Minneapolis, MN 55455
612-624-5888
Fax: 612-626-0395*

April 13, 1994

Anne Petersen, Dean
Graduate School
321 Johnston Hall
Campus

APR 15 1994

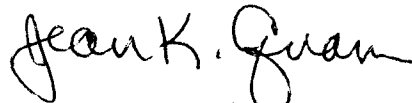
RE: Afro and Afro-American Studies

Dear Dean Petersen:

I am writing in strong support of the proposed Graduate Minor in Studies in Africa and the African Diaspora. It is an exciting option for our graduate students who may be interested in taking a minor as a part of their graduate program. We have a large number of students who are expecting to work with African American clients and would be interested in the concentration in the social and behavioral sciences area within this minor.

I believe that we have faculty and offer some courses that might be of interest to the Afro and Afro-American Studies department in further development of their minor. I will send this information on to Professor Brewer. I hope that the Graduate School will act favorably on this proposal. Thank you.

Sincerely,



Jean K. Quam, PhD
Professor and Director

7:jq1-ap9

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Political Science
College of Liberal Arts*

*1414 Social Sciences Building
267-19th Avenue South
Minneapolis, MN 55455-0410*

*612-624-4144
Fax: 612-626-7599
E-mail: polisci@polisci.umn.edu*

April 20, 1994

APR 21 1994

Dean Anne Petersen
Graduate School
321 Johnston Hall

Dear Dean Petersen:

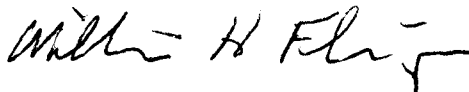
Rose Brewer has asked me to write you regarding the proposed minor in Africa and the African Diaspora. This impresses me as an appropriate minor parallel to several others with an area focus. The curriculum and faculty for this program are in place as this represents structural coordination rather than a reallocation of resources.

I do not want to exaggerate the number of political science graduate students who would become involved with this new minor. We are a small program and at most a couple of students per year would consider this option. We would make use of the minor in recruiting students to Minnesota and it is our experience that more structured curricular arrangements have an appeal when competing for students.

The proposal for a minor in African studies fits well with a Department of Political Science proposal to NSF which seeks fellowship funding for students of democratization. We would attempt to implement a combination of comparative analysis and political theory that depends on strong area studies programs outside our department.

I am pleased to support this proposal enthusiastically.

Sincerely yours,



William H. Flanigan
Director of Graduate Studies

WHF:sc

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of French and Italian
College of Liberal Arts*

*260 Folwell Hall
9 Pleasant Street S.E.
Minneapolis, MN 55455-0122
612-624-4308
Fax: 612-624-6021*

ADD 25

April 21, 1994

Dr. Anne Petersen
Dean, Graduate School
321 Johnston Hall

Dear Dean Petersen:

I am writing to support the proposed graduate minor program in Studies in African and the African Diaspora.

This is a program long in coming; it will be welcomed by those of our students (in the French program) who have a special interest in Francophone literature and its counterparts in the anglophone world touched by the African diaspora. Two of our students now completing Masters degrees have focussed their "related fields coursework" on African History and literature; they were disappointed that no African studies minor existed when they began their studies. One of these students will possibly enter a Ph.D. program in African Studies at another university; the other intends to continue in the Ph.D. program in French, with a minor emphasis in African Studies. I am sure that, if the program is approved, she will immediately make application for it.

A number of our incoming M.A. students (Fall 1994) have expressed a strong interest in Francophone studies, and I am sure that they will give serious consideration to doing a minor in African or African-American Studies. Indeed, I foresee that, like the minor in CAFS (Center for Advanced Feminist Studies), this proposed minor could serve as an important recruiting tool in future years.

I have examined the proposal and find it sound and well-formulated and look forward to its eventual implementation.

Sincerely,



Judith E. Preckshot
Director of Graduate Studies

cc: Rose Brewer, Chair, Afro-American and African Studies

UNIVERSITY OF MINNESOTA


Twin Cities Campus

Family Social Science
College of Human Ecology

290 McNeal Hall
1985 Buford Avenue
St. Paul, MN 55108
612-625-1900
Fax: 612-625-4227

Date: April 13, 1994

To: Anne C. Petersen
Vice President for Research and Dean of the Graduate School

From: 
Harold D. Grotevant
Professor and Head

Re: Proposal for Interdisciplinary Minor in Studies in Africa and the African
Diaspora

Professor Rose M. Brewer, Chair of the Afro-American and African Studies Department, has written to me about the proposed interdisciplinary minor for the masters and doctoral levels in Studies in Africa and the African Diaspora. I am very supportive of this creative proposal. It will give students from all graduate programs at the university the opportunity to participate in a coherent minor concentration that crosses traditional disciplinary boundaries. I anticipate that some students from Family Social Science might be interested in such a program, as we have (with Professor Brewer's assistance) been involved in a major curriculum transformation project in order to enhance sensitivity to issues of race, class, and gender in our courses.

In my view, the interdisciplinary minor mechanism is a very positive, creative, and inexpensive approach to supporting interdisciplinary study. The proposal referenced above should provide good opportunities for graduate students who are already here, and I hope would also be a positive force for increasing the recruitment, retention, and graduation of students of color in our social science fields. If you have any questions, do not hesitate to contact me at 624-3756.

cc: Rose Brewer
Julia Davis

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Radiology
Medical School*

*Box 292 UMHC
420 Delaware Street S.E.
Minneapolis, MN 55455*

May 11, 1994

Kenneth Zimmerman
Associate Dean
322 Johnston Hall

Dear Dean Zimmerman:

I am writing to inform you that the faculty of the Biophysical Sciences Graduate Program have voted to change the name of the program to Biophysical Sciences and Medical Physics.

On April 20, 1994 a meeting of the Biophysical Sciences Graduate Faculty was held to discuss the pros and cons of changing the name of our graduate program. A number of options were considered, including of course, no change. The consensus of the faculty present was that the name of our program should:

- reflect our interdisciplinary nature
- maintain the identity of the field of Biophysical Sciences
- acknowledge the significant components of Radiobiology, and the Radiological Sciences in general.
- provide some identification in areas in which training grants and student travel awards are becoming available.

Therefore it was decided that the most appropriate course of action was to change the name of our program to: Biophysical Sciences and Medical Physics.

All faculty were then asked to vote on this issue via memo. Of the 36 ballots sent on April 26th, 22 have been returned marked in favor of the name change. None were marked in favor of keeping the current name.

Sincerely,



E. Russell Ritenour, Ph.D.
Associate Professor, Director of Radiology Physics
Director of Graduate Studies, Biophysical Sciences Program

ERR:pjh

Academic Program Proposal Summary
Educational Planning and Policy Committee

Program Title (include degree, if applicable): Master of Computer and Information Sciences
Campus: Twin Cities (CIP Code Number: _____) (MCIS)
College: Institute of Technology
Proposed Implementation Date: September 1995
Program Length (credits): 44credits. Minimum of 28 credits in major & 9 credits in
Number of Graduates at Full Operation: 30 minor.

Program Description:

Summary Description of Program:

This is a coursework only masters program covering the areas of computer science and designed for the working professionals.

Admission Requirements:

B.S. or B.A. in Computer Science or related field with a GPA of 3.0 or better . A minimum of six months equivalent of full-time computer or software industrial experience in the United States. Three letters of recommendation and at least one of them must come from the candidate's employer.

Curriculum:

A minimum of 28 course credits come from the areas of theory, numerical analysis, software systems, artificial intelligence, computer engineering and a minimum of 9 quarter credits come from supporting areas.

Internal Review and Support (Has the proposal been reviewed by relevant parties? If there has been internal opposition to the proposal, describe the basis for this opposition.)

The faculty of Computer Science Department has unanimously recommended and approved this program.

Rationale for Offering Program (In what ways is the program consistent with the University's mission? Why should the University offer the program?)

This program is in the same spirit as the Master of Engineering program designed for the working professional. The University is committed to providing these professional programs. The State of Minnesota has large computer and software industries, and many of these companies have working professionals that desire graduate studies at the master level for professional development.

Collegiate/Campus Priorities (How does the program relate to the unit's most recent planning statement?)

This program is in accordance with the mission statement of the Institute of Technology. The Institute of Technology fully supports professional masters degree programs.

Budgetary Implications of Program Implementation (Is the program within the capability of the institution's resources?)

Redirection of Resources: None

Number of New Courses to be Developed: None

New FTE Faculty: None

Physical Facilities: None

Information Services:¹ None. The existing facilities will serve the need.

¹ Include a written statement from the University Libraries. Please refer to page 7 of

Academic Program Proposal Summary
Educational Planning and Policy Committee

Page 2

Program Demand (Is the program necessary?)

Many working professionals have enrolled in a similar program offered by Electrical Engineering and are eager for a similar one in Computer Science. We have been contacted by many industrial leaders (particularly from Rochester, MN) to set up a Masters program in computer science specifically designed for working professionals. Currently we have a temporary program, M.S. in Computer Science Coursework only option in place, and many working professionals have stated their appreciation and willingness to apply for admission. So far, we have received many requests to join the temporary program.

Program Duplication (Are there comparable programs in Minnesota and, if applicable, elsewhere?)

The new Master of Computer and Information Sciences is a terminal degree and is designed specifically for working professionals. We are not aware of any similar in Minnesota. However, many other universities such as University of Massachusetts, University of Colorado, Northeastern University, Purdue University, Columbia University and Arizona State University offers similar programs.

Diversity (In what ways will the program address the University's diversity goals, e.g., student and faculty recruitment, curriculum, etc.?)

This program is in the existing structure of the Computer Science Department and the department follows the diversity goals.

Program Quality (In what ways has the program development process insured that the resulting program will be of high quality? What steps were taken to address issues of program quality from both learner and disciplinary perspectives?)

The coursework required is exactly the same as that in the already established Master of Science degree program and it will be taught by the same faculty members in the existing M.S. and Ph.D. programs. All of the faculty members have earned their Ph.D. from respected universities and most of them are actively engaged in their research activities.

Timetable for Program Evaluation (When is the expected first date for program evaluation and by whom?)

The new program will be subject to the same evaluation for the existing M.S. in Computer and Information Sciences program. This includes regular course evaluation by students, external evaluation by recognized experts, evaluation by the Graduate School, and internal evaluation by our own faculty members and students. Currently, every course offered is subject to independent student evaluation and often peer evaluation by faculty members. The first date for program evaluation by the Graduate School appointed committee will be five years after the program is initiated.

(Please limit your response to two pages.)

Higher Education Coordinating Board
Application Form for New Academic Program
 (See Attached Instructions)

COVER SHEET

1) Institution(s) Name 1) Univ of Minnesota Private Institution Applicant Only:

2) _____

Does this institution have Private
 Institutions Registration (PIR)
 approval to offer this degree?

If more than one institution, this is a
 joint _____ cooperative _____
 program (see instructions)?

Yes _____ No _____
 In process _____

2) Program Title (include degree, if applicable)

Master of Computer and Information Sciences (MCIS)

Classification of Instructional Program (CIP) code number: _____ (Academic
 Affairs provides)

3) Program Location: to be offered at main campus only Yes
 to be offered at other locations (specify locations) _____

4) Implementation date: September 1995

5) Program length: (credits) 44 credits. Minimum of 28 crs in major & 9 crs in minor.

6) Number of graduates at full operation: 30

7) Governing Board approval date: _____ (Academic Affairs provides)

8) Brief Program Description:

This is a coursework only masters program covering the areas of computer science and designed for the working professionals. Each applicant must have a B.S. or B.A. in Computer Science or related field with a GPA of 3.0 or better. The candidate must also have a minimum of six months equivalent of full-time computer or software industrial experience in the United States. The candidate must supply three letters of recommendation and at least one of them must come from the candidate's employer. The program requires a minimum of 28 course credits from the areas of theory, numerical analysis, software systems, artificial intelligence, computer engineering and a minimum of 9 credits come from supporting areas.

University Response to the Four Criteria Considered
by the Minnesota Higher Education Coordinating Board

*(In completing this section, please refer to the detailed
instructions in Appendix D. of the attached memorandum from Dr. Infante.
Use as much space as you feel necessary to provide complete answers.)*

- 1) Is the program necessary?

There is a great need for working professionals in Minnesota to access to a coursework only masters degree. Such programs have been approved for engineering and are in operation. This proposed program compliments the engineering one and fills an urgent need for working professionals. Many computer or computer-related companies such as Control Data, Honeywell, Cray Research, 3M, IBM, Unisys, and Mayo are located in Minnesota and thousands of working professionals work for them. Computer Science is a fast growing field, and there is a great need for working professionals to pursue graduate studies so that they will be able to learn the latest technology urgently needed by many computer-related companies in Minnesota. The University is also committed to provide advance graduate training for those working professionals in these companies.

- 2) Is the program a needless duplication?

The new Master of Computer and Information Sciences is a terminal degree and is designed specifically for working professionals. We are not aware of any similar in Minnesota. However, many other universities such as University of Massachusetts, University of Colorado, Northeastern University, Purdue University, Columbia University and Arizona State University offers similar programs.

- 3) Is the program within the capability of the institution's resources?

The new program will use the exactly the same faculty and equipment as our regular M.S. and Ph.D. programs in Computer Science and Information Sciences. The additional enrollment due to the new program may be partially offset by the reduced enrollment in the regular M.S. program. Currently, we do not expect any additional University resources needed to implement this new program.

- 4) Is the program within the mission of the institution?

The University is committed to provide training and research needed by the State's large computer and software industries. The program is in accordance with the mission statement of the Institute of Technology, and the University fully supports professional masters degree programs.

Appendix Describing Admission Requirements and Curriculum

1. *Admission requirements:* Describe any that are specific to this program (e.g., admission test, prerequisite courses, licensure, previous degree). If admission to the college qualifies the student to pursue the program, so state.

All admission recommendations made by the department are subject to review by the Graduate School. The departmental recommendation follows the operational guidelines given below:

- Each applicant must have a B.S. or B.A. in computer science or a related field. He/she must have an undergraduate GPA of 3.0 or better. Those who have taken courses after their bachelor degree must maintain a GPA of 3.0 or better.
- Each applicant must have six months equivalent of full-time computer-related industrial experience in the United States before application.
- Three letters of recommendation are needed and at least one must come from the candidate's employer.
- Applicants need not take GRE tests (general or subject).

2. *Curriculum:* Describe the curriculum required to complete the program. For associate degree programs, indicate which courses fulfill the general education requirements for the degree.

Candidates for this degree must complete a minimum of 44 quarter credits in graduate courses with a minimum of 28 credits in the major. All credits must be 5000 level or above, and at least 8 of the total credits must be 8000-level courses. These 8000-level credits must be Department of Computer Science course credits. Two credits of the Computer Science Colloquium are mandatory and should be taken before filing a degree program. These credits, however, may not be used on the program.

MAJOR FIELD: A minimum of 28 quarter credits which must include 20 credits from at least 4 different areas from the following list.

Theory:	5122	8401	8403			
Numerical Analysis:	5001	5302	5304	5305		
Software Systems:	5107	5180	5502	5504	5505	5703
Artificial Intelligence:	5512	5521	5531	5571		
Computer Engineering:	5104	5205	5211	5280	5281	

MINOR FIELD: A minimum of 9 quarter credits of coursework outside CS in a single department of the Institute of Technology (e.g., Electrical Engineering, Mathematics, Statistics, etc.) for a designated minor

or

SUPPORTING PROGRAM: A minimum of 8 quarter credits of coherent coursework outside CS in a field within the Institute of Technology, Management, Cognitive Science and other related fields.

All degree candidates must maintain a GPA above 3.0 after completion of 12 credits.

Each student needs to satisfy the departmental breadth requirement. However, students need not do a research project.

Proposal for Master of Computer and Information Sciences

Proposed by the Department of Computer Science

1. Introduction

To meet the needs of the state's computer industries, the Department of Computer Science intends to propose a new Master of Computer and Information Sciences program specifically tailored to working professionals. Many industries and working professionals in the state have indicated the need and importance of a coursework only Master's program in Computer Science. We are proposing this new Master of Computer and Information Sciences to address these concerns.

This program is identical to our regular M.S. in Computer Science program except that students in this new program do not need either to write an M.S. thesis or to carry out a research project as part of their degree program. The new Master of Computer and Information Sciences is a terminal degree, in other words, students in this program are not expected to continue to the Ph.D. program.

Since the approval of such a program requires several years of preparation and review by various organizations, last year the Department of Computer Science proposed a temporary program, the M.S. in Computer and Information Sciences Coursework only program, as a means to satisfy the urgent needs of local industry. This temporary program has been approved by the Graduate School Physical Science P & R Council and the Graduate School Executive Council in 1993. This temporary program is in its first year of operation and will be closed to new students in 1997.

2. The Proposed Program

Program Objective

This program is designed for working professionals in the State of Minnesota who desire further education in Computer and Information Sciences.

Admission Requirements

The departmental admission recommendation follows the guidelines given below:

- Each applicant must have a B.S. or B.A. in computer science or a related field, with an undergraduate GPA of 3.0 or higher. Those who have taken courses after their bachelor's degree must maintain at least a GPA of 3.0.
- Each applicant must have six months equivalent of full-time computer-related industrial experience in the United States before application.
- Three letters of recommendation are required with at least one letter of reference from the candidate's employer.
- Applicants need not take the GRE's (general or subject).

All admission recommendations made by the department are subject to review by the Graduate School.

Curriculum

Candidates for this degree must complete a minimum of 44 quarter credits in graduate courses with a minimum of 28 credits in the major field in Computer Science. All credits must be 5000 level or above, and at least 8 of the total credits must be 8000-level courses in Computer Science. Two credits of the Computer Science Colloquium are mandatory and should be taken before filing a degree program. These credits, however, may not be used for the degree program.

MAJOR FIELD: A minimum of 28 quarter credits which must include 20 credits from at least 4 different areas from the following list.

Theory:

- 5122 Advanced Data Structures
- 8401 Algorithms: Techniques and Theory
- 8403 Theory of Computation

Numerical Analysis:

- 5001 Theory and Application of Linear Programming Algorithms
- 5302 Numerical Analysis
- 5304 Computational Aspects of Matrix Theory
- 5305 Numerical Methods of Ordinary Differential Equations

Software Systems:

- 5107 Computer Graphics I
- 5180 Software Engineering I
- 5502 Introduction to Operating Systems
- 5504 Introduction to Compilers
- 5505 Introduction to Compilers
- 5703 Database System Design

Artificial Intelligence:

- 5512 Artificial Intelligence II
- 5521 Pattern Recognition
- 5531 Artificial Intelligence Programming Techniques
- 5571 Expert Systems

Computer Engineering:

- 5104 System Simulation: Languages and Techniques
- 5205 Parallel Computer Architecture
- 5211 Data Communications and Computer Networks
- 5280 Computer-Aided Design I
- 5281 Computer-Aided Design of VLSI

Other credits can be taken from the following courses:

- 5002 Computational Methods for Non-Linear Programming
- 5117 Computer Graphics II
- 5151 Introduction to Parallel Computing I
- 5152 Introduction to Parallel Computing II
- 5181 Software Engineering II
- 5199 Problems in Languages and Systems
- 5279 Computer-Aided Design of Computers
- 5299 Problems in Machine Design
- 5306 Numerical Methods for Partial Differential Equations
- 5307 Numerical Algorithms for Parallel Computers
- 5314 Introduction to Sparse Matrix Techniques
- 5399 Problems in Numerical Analysis
- 5499 Problems in Computational Theory of Logic
- 5511 Artificial Intelligence I
- 5561 Computer Vision
- 5599 Problems: Artificial Intelligence
- 5702 The Principles of Database Systems
- 5799 Problems in Information Science
- 8101 Advanced Operating Systems
- 8102 Operating Systems Theory
- 8103 Distributed and Parallel Programming
- 8199 Seminar: Languages and Systems
- 8299 Seminar: Machine Design
- 8303 Computational Methods for Initial Value Problems
- 8304 Computational Methods and Boundary Value Problems
- 8307 Advanced Parallel Numerical Methods

- 8314 Iterative Methods for Linear Systems
- 8320 Numerical Solution of Linear Least Squares Problems
- 8330 Parallel Methods for Numerical Optimization
- 8399 Seminar: Numerical Analysis
- 8402 Algorithms: Techniques and Theory
- 8404 Theory of Computation
- 8505 Optimization in Compilers
- 8551 Artificial Intelligence Techniques in Robotics
- 8561 Readings in Computational Vision
- 8571 Readings in Expert Systems
- 8581 Readings in Parallel Symbolic Computing
- 8599 Seminar: Artificial Intelligence
- 8699 Seminar: Control Science
- 8701 Advanced Topics in Database Systems
- 8799 Seminar: Information Science

MINOR FIELD: A minimum of 9 quarter credits of coursework outside Computer Science in a single department of the Institute of Technology (e.g., Electrical Engineering, Mathematics, or Chemical Engineering.) for a designated minor

or

SUPPORTING PROGRAM: A minimum of 8 quarter credits of coherent coursework outside CS in a field within the Institute of Technology, Management, Cognitive Science and other related fields.

All degree candidates must maintain a GPA above 3.0 after completion of 12 credits.

Each student needs to satisfy the departmental breadth requirement. However, students need not carry out a research project.

3. Educational and Social Need for the Program

Prospective Students

We have received many phone calls, electronic mail messages and visits by working professionals expressing their interest in our temporary program (M.S. in Computer and Information Sciences coursework only option) which is identical to the proposed program. The University of Minnesota Rochester Center has also received many inquiries concerning this program, and the staff at the Rochester Center frequently called us to clarify issues raised by the prospective students who called or visited at the Center. To the best of our knowledge, we have received at least one hundred such inquiries from prospective students in our temporary program. Many of these students have actually applied to, and enrolled in, the temporary program.

Employment Prospects for Program Graduates

One of the requirements for students admitted to this program is that they must have six months equivalent of full-time computer or software-related industrial experience. Thus, most of the applicants will already be full-time employees in some computer- or computing-related industry in the State of Minnesota. Our temporary program confirms this, as most of the applicants are already employees of IBM, Unisys, Honeywell or other software development companies in the State. These students do not need to be concerned with securing a job after graduation. In fact, most of them have their tuition and fees, and released time provided by their organizations in order to participate in our program.

There are, however, some applicants who have had industrial experience but who are currently unemployed. Most of them return to school for further education in the latest computer and software technology, such as object-oriented software development, in order to enhance their chances of securing a new job in the field of Computer Science. Our experience, in the usual M.S. program, is that most of these students find suitable jobs soon after graduating.

Educational, Research, Cultural and Social Benefits

The new Masters program will have a great impact on many working professionals in the State of Minnesota. Computer technology is advancing so rapidly that many computer science practitioners find that techniques learned during their undergraduate years are completely obsolete. For example, many working professionals were trained to program in Fortran or Cobol in their previous education, but are now required to develop large-scale real-time systems using latest Computer-aided Software Engineering (CASE) tools and object-oriented programming languages such as C++. These working professionals will find it increasingly difficult to get promoted or even remain useful and productive members of their organizations due to their limited exposure to the changing computer and software technology. The new program will enable these working professionals to

continue their education and increase their skills, with direct positive impact on their productivity, career prospects, and indirectly on their cultural and social life.

Many of these working professionals have years of industrial experience and are either actively involved in, or supervising, important research and development projects at their organizations. Some of them even hold senior positions such as General Managers, Corporate Fellows or Chief Scientists. With positive experience in our program, they, as well as their organizations, would be willing to contribute to our program by sharing with other students and faculty the technical challenges they face in their development projects that could have direct impact on the economy and quality of life in the State. Moreover, after a positive experience, local industry would more willing to sponsor research projects in which their scientists and our faculty can have meaningful interaction. Such interaction can lead to support of our graduate students and greatly enhance the University's visibility in the State's industrial community.

4. Comparison with Similar Programs

The new Master of Computer and Information Sciences is a terminal degree and is designed specifically for working professionals. We are not aware of any similar program in the State of Minnesota. However, many universities such as University of Massachusetts, University of Colorado, Arizona State University, Northeastern University, Purdue University, and Columbia University, offer similar programs. Some of these universities require coursework only even for their regular M.S. programs.

5. Quality Control

Qualification of the Faculty Members

The new Master of Computer and Information Sciences program will be taught by the same faculty members in the existing M.S. and Ph.D. programs. All of our faculty members have earned their Ph.D. from respected universities and most of them are actively engaged in research activities. Following is a list of the Computer Science Faculty, their education, research interests, and membership to the CS Graduate Faculty.

Professors

David Hung-Chuang Du, Ph.D., Washington (Seattle). Computer-aided design for VLSI, computer networking, database design, parallel and distributed architectures and processing. Full Member.

David W. Fox, Ph.D., Maryland. Applied mathematics, eigenvalue problems. Full Member.

Linda Petzold, Ph.D., Illinois at Urbana-Champaign. Numerical methods, differential algebraic equations, dynamical systems. Full Member.

J. Ben Rosen, Professor Emeritus; Ph.D., Columbia. Numerical optimization, parallel computing. Full Member.

Youcef Saad, Doctorat, Grenoble (France). Sparse matrix computations, parallel computation, nonlinear equations, control theory, partial differential equations. Full Member.

Ahmed Sameh, Department Head; Ph.D., Illinois at Urbana-Champaign. Parallel computations, numerical linear algebra. Full Member.

Eugene Shragowitz, Ph.D., Moscow. Combinatorial optimization, CAD of VLSI and computers, parallel and learning algorithms, learning automata, nonlinear networks. Full Member.

James R. Slagle, Ph.D., MIT. Artificial intelligence. Full Member.

Marvin L. Stein; Ph.D., California at Los Angeles. Machine arithmetic, organization of programming systems. Full Member.

Associate Professors

Daniel Boley, Ph.D., Stanford. Numerical analysis, linear algebra, control theory. Full Member.

John Carlis, Ph.D., Minnesota. Database systems, management information systems, systems analysis and design. Full Member.

Ding-Zhu Du, Ph.D., California at Santa Barbara. Complexity theory, theory of computation, combinatorial optimization. Full Member.

Krzysztof Frankowski, Ph.D., Hebrew (Jerusalem). Compilers and assemblers, algebraic manipulations, mathematics of computations. Full Member.

Maria Gini, Doctor of Physics, Milan. Artificial intelligence, robotics. Full Member.

Ravi Janardan, Ph.D., Purdue. Computational geometry, graph algorithms, data structures, distributed computation. Full Member.

Vipin Kumar, Ph.D., Maryland. Parallel processing, artificial intelligence. Full Member.

Arthur Norberg, Ph.D., Wisconsin. History of science and technology. Associate Member.

Haesun Park, Ph.D., Cornell. Numerical analysis, parallel computing, signal processing algorithms. Full Member.

Ting-Chuen Pong, Ph.D., Virginia. Artificial intelligence, vision. Full Member.

Anand Tripathi, Ph.D., Texas at Austin. Architecture, operating systems, distributed systems, parallel computing. Full Member.
Wei-Tek Tsai, Ph.D., California at Berkeley. Software engineering, computer systems. Full Member.

Assistant Professors

Phillip Barry, Ph.D., Utah. Computer-aided geometric design, computer graphics. Full Member.
Anthony Chronopoulos, Ph.D., Illinois at Urbana-Champaign. Numerical analysis, parallel processing. Full Member.
Joseph Konstan, Ph.D., California at Berkeley. User interfaces, parallel programming, computer-assisted instruction. Associate Member.
Zhiyuan Li, Ph.D., Illinois at Urbana-Champaign. Compilers, parallel programming for high performance computation. Full Member.
Nikolaos Papanikolopoulos, Ph.D., Carnegie Mellon. Computer vision, robotics, computer engineering, computer integrated manufacturing. Full Member.
John Riedl, Ph.D., Purdue. Collaborative systems, database systems, fault tolerance, computer networks, object-oriented systems. Full Member.
Shashi Shekhar, Ph.D., California at Berkeley. Neural networks, software engineering databases and distributed artificial intelligence. Full Member.
Jaideep Srivastava, Ph.D., California at Berkeley. Databases, distributed and parallel processing. Full Member.

Members of the Computer Science Grad Faculty from Other Departments

Fredric N. Bailey, Professor of Electrical Engineering. Full Member.
Vladimir S. Cherkassky, Assoc. Professor of Electrical Engineering. Associate Member.
Gordon Davis, Professor, Information and Decision Sciences. Full Member.
Shantanu Dutt, Assistant Professor of Electrical Engineering. Associate Member.
Lael C. Gatewood, Professor of Lab Medicine & Pathology. Associate Member.
Larry Hutchinson, Associate Professor of Linguistics. Associate Member.
Paul Johnson, Professor of Management Sciences. Associate Member.
Michael Kac, Professor of Philosophy. Associate Member.
Richard Y. Kain, Professor Electrical Engineering. Full Member.
Daniel J. Kersten, Associate Professor of Psychology. Associate Member.
Larry L. Kinney, Professor of Electrical Engineering. Full Member.
K. S. P. Kumar, Professor of Electrical Engineering. Full Member.
E. Bruce Lee, Professor of Electrical Engineering. Full Member.
David Lilja, Assistant Professor of Electrical Engineering. Associate Member.
David Naumann, Associate Professor of Management Sciences. Associate Member.
Marian B. Pour-El, Professor of Mathematics. Full Member.
Gerald Sobelman, Associate Professor of Electrical Engineering. Associate Member.
Clark Thomborson, Professor of Computer Science at Duluth. Full Member.
Hans F. Weinberger, Professor of Mathematics. Full Member.

Governing Procedures

The new program will be administered by the Director of Graduate Studies (DGS) of the Computer and Information Sciences program. This includes admission, degree programs, petitions, breadth requirements, advising, office and desk assignments, and progress monitoring. The DGS will be assisted by the Graduate Affairs Committee which is composed of faculty members in the Department of Computer Science.

Program Evaluation

The new program will be subject to the same evaluation procedures as the existing the M.S. in Computer and Information Sciences program. This includes regular course evaluation by students, external evaluation by recognized experts, evaluation by the Graduate School, and internal evaluation by our own faculty members and students. Currently, every course offered is subject to independent student evaluation and often peer evaluation by faculty members. New courses are frequently added to cover new technology, and we consult often with our industrial partners concerning our curriculum.

6. Implementation

Program Initiation Timetable

We plan to start this new program in Fall 1995. Currently, we have the temporary program, M.S. in Computer and Information Science Coursework Only Option, and this temporary program is identical to the new program. We have not encountered significant difficulties in the temporary program. Thus, we do not foresee any difficulties in implementing this new program.

University Resources

The new program will use exactly the same faculty and equipment as our regular M.S. and Ph.D. programs. The additional enrollment due to the new program may be partially offset by the reduced enrollment in our regular M.S. program. However, due to the greater than expected interest shown by prospective students, we expect that we will have at least twenty more graduate students in the Department of Computer Science.

We also expect that the students in this new program will not require financial support in the form of teaching or research assistantships, or tuition and fee waivers. Thus, the Department of Computer Science will not need additional resources from the University at this time. Moreover, no additional office space is needed to support this new program.

Extra-University Resources

We do not expect any new University resources will be needed to support this new program.

Twin Cities Campus

*Department of Computer Science
Institute of Technology*

*4-192 EE/CS Building
200 Union Street S.E.
Minneapolis, MN 55455-0159
612-625-4002
Fax: 612-625-0572*

April 25, 1994

Dean Kenneth Zimmerman
Graduate School
321 Johnston Hall

Dear Dean Zimmerman:

To meet the needs of the state's computer industries, the Department of Computer Science intends to propose a new Master of Computer and Information Sciences program specifically tailored to working professionals. Many industries and working professionals in the state have indicated the need and importance of a coursework only Master's program in Computer Science. We are proposing this new Master of Computer and Information Sciences to address these concerns.

This program has been unanimously approved by the Department of Computer Science Faculty last year and we request the Graduate School P & R Council to examine and approve this. After that, we intend to submit this proposal to the Higher Education Coordination Board for approval.

During the last few years we have received numerous requests for the Department of Computer Science to establish a coursework only Masters program for working professionals. The State of Minnesota has a large computer and software industry. These companies have thousands of working professionals such as engineers, programmers and even managers eager to learn the latest computer technology via a professional masters program. This is especially true for working professionals at remote sites such as Rochester.

Sincerely,



Wei-Tek Tsai
Associate Professor and
Director of Graduate Studies

WTT/cjo

Enclosure

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Computer Science
Institute of Technology*

*4-192 EE/CS Building
200 Union Street S.E.
Minneapolis, MN 55455-0159
612-625-4002
Fax: 612-625-0572*

April 26, 1994

Dean Kenneth Zimmerman
Graduate School
321 Johnston Hall

Dear Dean Zimmerman:

This is a letter in support of the new Master of Computer and Information Sciences program that the faculty of the Department of Computer Science approved last year.

This program is specifically designed for the working professionals in the State's Computer and Software industry, and was introduced after repeated requests from our local industry. The new program is identical to our regular M.S. in Computer Science program except that: (i) it does not require a thesis or a detailed research project, and (ii) it is a terminal degree, i.e. students enrolled in this program are not expected to pursue the Ph.D. degree in Computer Science.

I strongly urge the approval of this new program.

Sincerely yours,



Ahmed Sameh
Professor and Head
Department of Computer Science

*Twin Cities Campus**Institute of International Studies
MacArthur Interdisciplinary Program
on Peace & International Cooperation
College of Liberal Arts**214 Social Sciences Building
267 19th Avenue South
Minneapolis, MN 55455
612-624-0832
Fax: 612-626-2242
Bitnet: IIS@UMNACVX*

Dr. Anne C. Petersen
Vice President for Research
and Dean of the Graduate School
The Graduate School
321 Johnston Hall
University of Minnesota

Dear Dean Petersen,

We are submitting a proposal for a free-standing Ph.D. Graduate Minor in Development Studies and Social Change. The proposed minor offers to graduate students in the social sciences, humanities, and biological sciences the opportunity to complete a structured interdisciplinary program of study on the relationships between macroscopic processes of political, economic, and social change, and the microscopic conditions of lived experience in the developing world.

The social bases and social consequences of change in the developing world are areas of increasing interest and scholarly importance across a wide range of academic disciplines, from agricultural economics to political science to comparative literature. At the University of Minnesota, this multi-disciplinary (or trans-disciplinary) field of study is partially institutionalized in the MacArthur Program on Peace and International Cooperation, in which several dozen Ph.D. students participate outside of their formal coursework.

The MacArthur Program, which was established in 1989-90 under a grant from the John D. and Catherine T. MacArthur Foundation, provides funding for students pursuing doctoral studies at the University. There are currently 67 graduate students, from 33 different countries, in the Program. Together with the 24 faculty members who comprise the MacArthur Steering Committee, these students participate in quarterly workshops organized around major themes of the Program, as well as informal seminars in which they share their own research with one another.

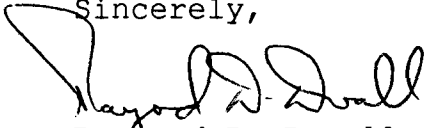
Though they represent some twenty different departments within the University, the students and faculty of the MacArthur Program share a common interest in making connections between aggregate-level social and historical processes in the developing world on the one hand, and the lived experiences of individuals and communities on the other. The proposed minor in Development Studies and Social Change would share this approach to the study of the developing world, thereby distinguishing itself from other related fields of inquiry, such as developmental economics and

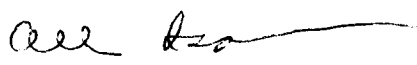
cultural anthropology. While the proposed minor would include attention to these important, established fields, its overarching concern would be the integrated, bi-level approach to which the MacArthur Program is committed.

It should be emphasized that graduate students in the MacArthur Program, who would make up the majority of students in the proposed minor, are already engaged in work organized around this general focus through their participation in the MacArthur Program. These graduate students would benefit greatly from the formal, structural recognition which the proposed minor would provide. Indeed, the impetus for this proposal came from the MacArthur graduate students themselves, who saw a need for their work in the Program to be included formally in their individual graduate programs.

This proposal is the product of extensive planning that took place beginning in early 1993. This planning has taken the form of discussions between the administration of the MacArthur Program and a team of faculty members representing a wide range of academic disciplines as well as numerous units within the University. An initial committee was formed, consisting of the following faculty members: Norbert Hirschhorn (School of Public Health), Jeffrey Broadbent (Sociology), Helga Leitner (Geography), Vernon Ruttan (Agricultural and Applied Economics), John Mowitt (Cultural Studies and Comparative Literature), William Cunningham (Genetics and Cell Biology), and Raymond Duvall (Political Science). This committee provided the general shape of the proposal, which was then discussed with MacArthur graduate students and other MacArthur faculty. On March 10, 1994, the full MacArthur Steering Committee met and indicated its unanimous support for this general conception of the proposed minor. Following this meeting, Raymond Duvall (Associate Director of the MacArthur Program) and John Collins (a MacArthur graduate student) took responsibility for composing the full text of the actual proposal.

Sincerely,


Raymond D. Duvall
Professor of Political
Science, and
Associate Director,
MacArthur Program on
International Peace and
Cooperation


Allen F. Isaacman
Professor of History, and
Director,
MacArthur Program on
International Peace and
Cooperation

Part E: The Proposal to Establish a Graduate Minor in Development Studies and Social Change

1. Introduction

The proposed Ph.D. minor in Development Studies and Social Change is located within a burgeoning realm of academic inquiry. The social basis of change in the developing world is an area of interest across a wide range of academic disciplines, from agricultural economics to political science to comparative literature. At the University of Minnesota, this multi-disciplinary (or trans-disciplinary) field of study is partially institutionalized in the MacArthur Program on Peace and International Cooperation, in which several dozen Ph.D. students participate outside of their formal coursework.

The MacArthur Program, which was established in 1989-90 under a grant from the John D. and Catherine T. MacArthur Foundation, provides funding for students pursuing doctoral studies at the University. There are currently 67 graduate students, from 33 different countries, in the Program. Together with the 24 faculty members who comprise the MacArthur Steering Committee, these students participate in quarterly workshops organized around major themes of the Program, as well as informal seminars in which they share their own research with one another.

Though they represent some twenty different departments within the University, the students and faculty of the MacArthur Program share a common interest in making connections between aggregate-level social and historical processes in the developing world on the one hand, and the lived experiences of individuals and communities on the other. This general commitment is reflected in the three major themes of the Minnesota-Stanford-Wisconsin Consortium on International Peace and Cooperation, of which the MacArthur Program is a founding member. The first theme, "Ethnicity, the State, and International Security," attempts to connect the study of ethnic conflicts with the study of individual and collective ethnic identity-formation. The second theme, "Democracy and Popular Empowerment," examines the ways in which processes of democratization in the developing world are linked with the day-to-day ideas and practices of individuals seeking to exercise their voices as citizens. The third theme, "Sustainable Development," focuses on the relationship between national and international development strategies and policies, and the demands for "sustainability" voiced by the local communities which are the objects of development projects.

The proposed minor in Development Studies and Social Change would share this approach to the study of the developing world, thereby distinguishing itself from other related fields of inquiry, such as developmental economics and cultural anthropology. While the proposed minor would include attention to these important, established fields, its overarching concern would be the

integrated, bi-level approach to which the MacArthur Program is committed.

It should be emphasized that graduate students in the MacArthur Program, who would make up the majority of students in the proposed minor, are already engaged in work organized around this general focus through their participation in the MacArthur Program. These graduate students would benefit greatly from the formal, structural recognition which the proposed minor would provide.

This proposal is the product of extensive planning that took place beginning in early 1993. This planning has taken the form of discussions between the administration of the MacArthur Program and a team of faculty members representing a wide range of academic disciplines as well as numerous units within the University.

2. The Proposed Program

A doctoral minor in Development Studies and Social Change is proposed both to integrate and focus the diverse resources and to enhance the visibility of the University of Minnesota as a center for graduate education in, and advancement of, research in Development Studies and Social Change.

Program Objectives: Establishing a formal degree-related program will accomplish the following objectives:

1. Permit the appointment of a Director of Graduate Studies and selection of a Steering Committee. This group would be responsible for the operation of the program.
2. Provide a set of high-quality core courses that emphasize theory, methods, and key issues in Development Studies and Social Change and that provide an interdisciplinary background in the field. In addition to three core courses, students will select remaining courses from a list of elective courses from disciplines in the social sciences, humanities, and biological sciences which represent coherent areas of inquiry in Development Studies and Social Change.
3. Provide a central listing in the Graduate School Bulletin of graduate-level courses in Development Studies and Social Change. Relevant courses are now widely scattered in diverse graduate programs. Such a listing would provide general publicity and facilitate more specialized advertising for recruitment of graduate students into existing graduate programs.
4. Facilitate and enhance the current level of interdisciplinary research among graduate students and faculty in Development Studies and Social Change.

5. Enhance the training of students in graduate programs for which specialized knowledge of theory and research in Development Studies and Social Change would supplement major program requirements.

6. Improve the ability to attract and coordinate outside speakers.

7. Provide official university recognition of the minor on student transcripts. This recognition will be helpful for students seeking jobs. It is expected that most students who choose the Minor will pursue careers in the academy. Those who do not will likely pursue employment in policy-making institutions or in public-interest and advocacy work.

Admission Requirements: Admission to the minor program will be contingent upon enrollment in good standing within a recognized doctoral degree-granting program of the University of Minnesota, and will be granted only by permission of the Director of Graduate Studies in Development Studies and Social Change. Eligibility for admission to the minor program will be limited initially to graduate students in the MacArthur Program, which is open to incoming Ph.D. students in all graduate programs in the College of Liberal Arts, the College of Biological Sciences, the College of Natural Resources, and the College of Agriculture. Two additional points should be made, however, concerning future admissions policy. First, the refunding grant recently received by the MacArthur Program from the MacArthur Foundation allows for the admission to the MacArthur Program of graduate students already enrolled in the Graduate School. These students (five per year) would have the option of declaring a minor in Development Studies and Social Change. Second, if in the future there is space available in the core courses, the minor program will consider admitting other qualified graduate students.

The Curriculum: The minor program requires a minimum of 18 graduate level quarter credits. The following core courses are required:

DSSC 8xxx: "Approaches to Knowledge and Truth: Defining Ways of Knowing in Development Studies and Social Change" (3 credits)

This course is intended to serve as a cross-disciplinary overview of the various approaches to studying the connections between the macroscopic processes of political, economic, and social change, and the microscopic conditions of lived experience in the developing world. The content of the seminar may be divided into two related concerns. First is an examination of how various disciplinary approaches are applied to the kinds of research problems which are important to scholars who study development and social change. An example of such a research problem is the

question of food security in the developing world: how would a biologist, a social scientist, and a humanities scholar approach this problem? What kinds of connections can be made between these diverse approaches in order to develop richer, more effective research strategies? Other examples might include the impact of agricultural or communications technology on the developing world, or the relationship between Western and non-Western concepts of medicine and health. Second, the course will examine the tensions between academic knowledge and the local knowledges possessed by the people whose lived experiences are a central concern of the minor program. Through an integration of these two conceptual areas, the course will address the complex epistemological concerns facing graduate students doing research on development and social change. The course will be team-taught by faculty from the social sciences, humanities, and biological sciences, and will be offered in the spring quarter each year.

DSSC 8xxx: "Field Research Methodology in Development Studies and Social Change" (3 quarters, 1 credit per quarter)

Students will participate in this course during the year before undertaking their field research. The fall quarter will be devoted to the identification of potential funding sources for field research and the writing of grant proposals. The winter quarter will be devoted to discussion of key issues related to preparing for and conducting field research. The spring quarter will be devoted to hearing from advanced graduate students who have already completed field research.

DSSC 8xxx: "Topics in Development Studies and Social Change" (2 quarters, 4 credits total)

Topics courses, offered in conjunction with the MacArthur Program's quarterly workshop series, will normally be taken during fall and winter quarters. Recent topics have included: The Ordinary Experience of Social and Political Change; Reconceptualizing Nationalism for the 21st Century; The Social Content of Contemporary Third World Fiction; Food Security/Insecurity in the Developing World; and Democracy and Development. Topics planned for future years include: Transnational Social Networks/Movements: Human Rights, the Environment, Women's Movements and Indigenous Movements; Development, Environment and Sustainability; Biology and Politics of Food, Fiber, and the Environment; The Role of the State in Development; and Gendered Discourses of Tradition and Change.

Each student must fulfill the remaining course requirements by taking at least two elective courses from outside their own department or program. These courses will be chosen from a list of courses, from across the Graduate School curriculum, which are relevant to the field of Development Studies and Social Change. Students will be encouraged to do elective coursework outside of the broad area (social sciences, humanities, or biological sciences) in which they do their major work. The program for an individual student will be developed in consultation among the student, the major adviser, and the Director of Graduate Studies in Development Studies and Social Change.

Students in the minor program will also be encouraged to take advantage of the \$2000 pre-dissertation fieldwork grants or (if this is more applicable) international internship grants offered by the MacArthur Program. Interested students who are in good standing in the minor program, and who have a clear project for which to use this funding, will be awarded one of these grants.

Completion Requirements and Standards: Students must maintain academic standards in accordance with Graduate School standards, and must complete all required courses for the minor before taking their preliminary Ph.D. examinations.

3. Educational and Social Need for the Program

Student Interest in the Program: Based on the response of current MacArthur Scholars to inquiries about the proposed minor, it is estimated that approximately 10 students per year will be admitted to the doctoral minor program. Thus, roughly 30 students will be continuously affiliated with the program by its third year of existence. If by this time there is space available in the minor program, students from outside the MacArthur Program will be admitted in order to reach the target of 10 new students per year.

Employment Prospects: While this minor program is not established principally to enhance the employment prospects of its graduate students, it will nonetheless help serve this purpose in three major ways. First, graduate students who choose the minor will receive formal recognition for a coherent course of study which goes beyond the bounds of their major programs; this work is not currently being recognized in any official way. Second, the core courses of the minor program will provide students with methodological training specifically oriented toward field research in the developing world. This training will significantly enhance graduate student research, which will help make students more attractive candidates for employment. Third, the major intellectual concern of the minor program--making connections between aggregate-level social and historical process in the developing world on the one hand, and the lived experiences of individuals and communities on the other--is of increasing interest in public-interest and advocacy work, in policy-making institutions, and in numerous academic disciplines.

It is expected that most students who choose the Minor will pursue careers in these areas, with the greatest number working within the academy.

Educational, Research, Cultural and Social Benefits: There is now a critical mass of faculty and students at the University of Minnesota who share an active interest in Development Studies and Social Change. The interdisciplinary links among these individuals, however, are currently informal in nature. The proposed minor program would formalize these links, facilitating the introduction of graduate students to the numerous professional associations, conferences, and scholarly journals concerned with Development Studies and Social Change. A key component of this process will be the MacArthur Consortium on International Peace and Cooperation, recently established among the University of Minnesota, the University of Wisconsin, and Stanford University.

In addition, the University presently lacks an institutionalized organizational and programmatic focus around which to consolidate its considerable instructional and research strengths in the area of Development Studies and Social Change. The proposed minor would provide that focus, thereby alleviating several existing problems: (a) There is no central listing of available faculty and courses in Development Studies and Social Change and no single source from which prospective graduate students can obtain information about resources. These circumstances make it more difficult to advertise for and recruit quality graduate students. (b) The education of graduate students in this area may be uneven, in the absence of a formal curriculum. (c) There is no way for graduate students to obtain formal recognition on their records of their expertise in Development Studies and Social Change.

4. Comparison with Similar Programs

There exists no similar program among the institutions of higher education in Minnesota, including the University of Minnesota. The Minor will complement and strengthen the present system of traditional department-oriented Ph.D. programs in a number of disciplines, providing students in those programs with a broadly-based foundation in contemporary research in Development Studies and Social Change.

5. Quality Control

The Steering Committee of the MacArthur Program, made up of faculty from across the Graduate School in all three major academic areas (social sciences, humanities, biological sciences), will comprise the teaching faculty of the proposed minor. Members of this faculty range from Assistant Professors to Regents' Professors; they are highly-respected, productive, intellectually active, committed teachers who are central to the intellectual life of the University. The following is a list of

the current members of this Steering Committee, all of whom currently hold Graduate School faculty appointments:

Ron Aminzade (Sociology)
Ragui Assaad (Public Affairs)
Betsy Baker (Law School)
Vernon Cardwell (Agronomy and Plant Genetics)
William Cunningham (Genetics and Cell Biology)
Raymond Duvall (Political Science)
Susan Geiger (Women's Studies)
Allen Isaacman (History)
Amy Kaminsky (Women's Studies)
Lisette Josephides (Anthropology)
Anne Kapuscinski (Fisheries)
Daniel Kelliher (Political Science)
Robert Kudrle (Public Affairs)
Deborah Levison (Public Affairs)
John Mowitt (Cultural Studies and Comparative Literature)
August Nimtze (Political Science)
Vernon Ruttan (Agricultural and Applied Economics)
Abdi Samatar (Geography)
Eric Sheppard (Geography)
Kathryn Sikkink (Political Science)
Janet Spector (Anthropology)
Ann Waltner (History)
John Wright (Afro-American and African Studies)

This group currently meets once a month in its capacity as Steering Committee for the MacArthur Program. As the faculty for the Minor, the group will elect a Director of Graduate Studies, and will make decisions concerning the addition of new faculty. Other University faculty members are invited to indicate their desire to join the Minor.

6. Implementation

Schedule: It is proposed that the minor in Development Studies and Social Change be initiated in Fall, 1994 and will be in full operation within three years.

University Resources: The proposed minor would require a minimum of resources from the University: part-time clerical and administrative staff support; a minimum amount of photocopying and printing supplies and support; and support for visiting scholars to speak to Topics seminars. No additional resources are needed for the teaching of the core courses, since the above-mentioned faculty have already expressed their commitment to staffing these courses. The teaching schedule for these core courses is in place for the coming three years.

Extra-University Resources: The MacArthur Foundation is currently providing resources to enable faculty participation and the offering of pre-dissertation research grants to graduate students. These resources are guaranteed until the year 2002,

Minor in International Development and Social Change

Proposed Budget

I. Staff:

A.	Secretarial ⁽¹⁾	3,972
	fringe benefits @ 27.5%	1,092
B.	Administrative fellow ⁽²⁾	2,171
	fringe benefits @ 36.2%	<u>786</u>
	Total, staff	\$8,021

II. Supplies and program expenses:

A.	Photocopying and printing ⁽³⁾	1,200
B.	Travel ⁽⁴⁾	<u>4,000</u>
	Total, supplies and expenses	\$5,200

Total budget request.....\$13,221

Notes:

- (1) Senior secretary, base salary, 12 month appointment at 25%-time (10 hours/week). Salary estimated at 5% increase over 1993-94 rates.
- (2) Graduate student on 9 month appointment at 12.5%-time (5 hours/week) to perform administrative tasks associated with organizing and offering the three core seminars of the minor. Salary estimated at 5% increase over 1993-94 rates.
- (3) Printing of advertising brochures (\$400), plus photocopying of papers and other materials for three core seminars (\$800).
- (4) Eight invited guest speakers for the year-long topics seminar, each at \$500. The MacArthur Program will double-match, providing \$1,000 per visitor. Total transportation, lodging, boarding, and honorarium expenses are estimated at \$1,500 per guest speaker.

ATTACHMENT A

Acceptable Elective Courses for Minor in Development Studies and Social Change

- Afro 5876 Seminar: Approaches to African Development
- AgEc 5580 Human Capital and Household Economics
AgEc 5630 Regional Development Systems
AgEc 5650 Economics of National Resource Policy
AgEc 5720 Economics of World Agriculture
AgEc 5790 World Food Problems
AgEc 8200 Advanced Topics in Agricultural and Applied Economics
AgEc 8264 Resource Economics
AgEc 8278 Agricultural and Economic Development
AgEc 8378 Seminar: Agricultural Development
- AgEd 5023 Extension Methods for Agricultural Production in
Developing Countries
- AmIn 5411 Urban Indian Communities
AmIn 5431 Contemporary Indian Movements
- Anth 5102 Principles of Cultural Anthropology
Anth 5151 Cultural Change and Development
Anth 5152 Anthropology of Social Movements
Anth 5154 Anthropology of Colonialism
Anth 5157 The Political Discourse of Social Change
Anth 5331 Culture Theory: An Introduction
Anth 8202 Research Methods in Social and Cultural Anthropology
Anth 8320 Seminar: Social Anthropology
Anth 8420 Seminar: Cultural Change
Anth 8450 Seminar: Development Theories and Policies
Anth 8460 Seminar: Anthropology of Gender
- Chn 5165 History of Chinese Literature
Chn 5460 Topics in Chinese Literature
Chn 8660 Seminar: Vernacular Chinese Literature
Chn 8960 Seminar: Chinese Literature
- CLit 5910 Topics, including:
Post-Colonial Women's Literature: Theory and Practice
Testimonial Literature and Political Intervention
The Novel in India
- CLit 8910 Topics, including:
Colonialism and Culture
Nation and Narration
- CLit 8920 Emergent Literatures
- CSDS 5711 Interpretation of Myth
CSDS 5712 Interpretation of Ritual
CSDS 5910 Topics, including:
Cultural Implications of Human Rights
Sacred Dances and Cultural Resistance

Dependency Theory & the Analysis of Cultural Production
Analyzing Popular Narratives
Interpreting the Structures of Urban Form
Theology of Liberation
CSDS 8910 Topics, including:
Theories of Popular Culture
Popular and Mass Culture
Cultural Politics and Revolutionary Struggles
Cultural Constructions of Gender
Social Dramas and Performances in Everyday Life
Migration, Transnationalism and Hispanic Literature

EALL 5460 Topics in East Asian Literature

EAS 8061 Scope and Methods of East Asian Studies

Econ 5041 The Prospective World Economy
Econ 5307 Comparative Economic Systems
Econ 5312 Technology and Development
Econ 5331 Economic Development
Econ 5401 International Economics
Econ 8401-3 International Trade and Payments Theory
Econ 8481-3 Advanced Topics in International Trade Theory
Econ 8491-3 Workshop in Trade and Development
Econ 8801-3 Public Finance

EdPA 5603 International Development and Education
EdPA 5605 Research Topics: International Development Education
EdPA 5607 Applied International Development Education

ENGL 5920 Topics in Anglophone Literature: South African and
Zimbabwean Literature
ENGL 5950 Figures in Anglophone Literature: Indo-Anglian
Literature and the Politics of Translation
ENGL 8050 Studies in Special Subjects: Theories of Colonial
Discourse
ENGL 8590 Studies in Afro-American Literature: Postcolonial Women
Writers

Ent 5320 Ecology of Agriculture

FR 5130 Geographical Information Systems in Natural Resources
Analysis
FR 5142 Tropical Forest Ecology
FR 5146 Dynamics of Global Change: Plant Ecology
FR 5250 Role of Renewable Natural Resources in Developing
Countries
FR 5460 Water Quality: The International Dimension

FSoS 5210 The Family in World Perspective
FSoS 5256 Family Policy: An International Perspective
FSoS 5500 Racial and Ethnic Diversity in Families

Geog 5132 South America

Geog 5142 Geography of East Africa
Geog 5145 Development in Africa
Geog 5211 East Asia
Geog 5212 South Asia
Geog 5215 China
Geog 5411 Medical Geography
Geog 5444 Geography of Water Resources
Geog 5605 Geographical Perspectives on Urban Planning I
Geog 5606 Geographical Perspectives on Urban Planning II
Geog 5900 Topics, including:
Agrarian Change in the Third World
The Political Economy of Development
International Migration and the Politics of Immigration
and Xenophobia
Geog 8001 Proseminar: Geography and Cultural Ecology
Geog 8002 Proseminar: The Economy, the State, and Spatial
Development
Geog 8005 Proseminar: Population Geography
Geog 8007 Proseminar: Theories of Development and Change
Geog 8020 Seminar in Economic Geography
Geog 8140 Seminar: Africa
Geog 8210 Seminar: South Asia
Geog 8350 Seminar: World Population Problems

Hist 5420 Topics in Latin American History
Hist 5436 Social History of African Women: 1850 to Present
Hist 5447 Problems in East Africa
Hist 5901 Latin American History
Hist 5920 Topics in Comparative Women's History
Hist 5925 Caribbean History Proseminar
Hist 5930 Topics in Comparative Third World History
Hist 5931 History of Africa: Social Groupings, Conflicts
Hist 5939 Methodology for the Study of African History
Hist 5890 Topics in American Indian Social History
Hist 8401-3 Latin American History
Hist 8430 Topics in the History of African Peoples
Hist 8464-6 Research in Late Imperial China: Yuan, Ming, and
Qing
Hist 8944-5 African History
Hist 8960 Topics in Chinese History

ID 5525 Garbage, Government and the Globe

Intr 5701 Theories of International Development
Intr 5930 Topics in International Development

Jour 5801 International Communication
Jour 5825 World Communications Systems
Jour 8580 Seminar: Problems in International Communication
Research
Jour 8651 Mass Media and Social Change
Jour 8681 Seminar: International Mass Communication
Jour 8683 Mass Communication Problems of Developing Countries

Jpn 5166 Literature by 20th-Century Japanese Women
Jpn 5460 Topics in Japanese Literature
Jpn 8960 Seminar in Japanese Literature (Classical)

LAS 5865 Housing in World Perspective

MELC 5505 Survey: The Middle East
MELC 5508 Islam: Iran to India
MELC 5523 The Middle East in World Affairs: The 19th Century
MELC 5525 The Middle East in World Affairs: The Arab World,
Turkey and Iran, 1915 to the Present
MELC 5730 Proseminar in Middle East History: 16th to 19th
Centuries

NRES 5060 Water Quality in Natural Resource Management
NRES 5100 Problem Solving in Natural Resources and Environmental
Studies

PA 5291-9 Topics in Planning
PA 5391-9 Topics in Policy Analysis
PA 5432 Poverty and Policy
PA 5491-9 Topics in Social Policy
PA 5511 Community-Based Community and Economic Development
PA 5591-9 Topics in Economic and Community Development
PA 5691-9 Topics in Land Use and Human Settlements
PA 5791-9 Topics in Technology, Energy, and Environmental Policy
PA 8291-9 Workshop/Seminar: Advanced Topics in Planning
PA 8391-9 Workshop/Seminar: Advanced Topics in Policy Analysis
PA 8491-9 Workshop/Seminar: Advanced Topics in Social Policy
PA 8591-9 Workshop/Seminar: Advanced Topics in Economic and
Community Development
PA 8691-9 Workshop/Seminar: Advanced Topics in Land Use and Human
Settlements
PA 8791-9 Workshop/Seminar: Advanced Topics in Technology,
Energy, and Environmental Policy

POL 5477 Middle Eastern Government and Politics
POL 5883 International Organizations
POL 5889 The Politics of Global Economic Relations
POL 8400 International Relations
POL 8404 International Hierarchy
POL 8405 International Political Economy
POL 8460 Topics in International Politics
POL 8600 Introduction to Comparative Politics
POL 8605 Government and Politics of Africa
POL 8611 Government and Politics of China
POL 8619 Government and Politics of Latin America
POL 8633 Comparative Sociopolitical Change
POL 8637 Comparative Political Economy
POL 8650 Research Seminar: Comparative Politics
POL 8660 Ordinary Experience of Sociopolitical Change

Port 5210 Topics in Brazilian Literature

Port 5523 Nationalism in Brazilian Literature
Port 5524 Brazilian Literature and Modernization
Port 5910 Topics in Luso-Brazilian Cultures
Port 8920 Seminar: Luso-Brazilian Literature

SALC 5036 The Religion of Islam
SALC 5202 Modern Indian Literature in Translation
SALC 5411 Introduction to Indian Philosophy
SALC 5412 Hinduism
SALC 5413 Buddhism
SALC 5520 Studies in the Religions of India
SALC 5535 Tribal Peoples and Cultures of South Asia
SALC 5710 Seminar in South Asian Languages and Literatures
SALC 8710 Seminar: South Asian Languages and Literature

SOC 5301 Social Movements in a Changing Society
SOC 5481 Comparative Asian Development
SOC 5755 Social Structure and Political Behavior
SOC 8090 Research Seminar in Social Movements
SOC 8477 Historical Sociology

Span 5527 National Literary Consciousness and Free Trade
Span 5529 National Affirmation and Transnationalization
Span 5532 Literature and National Disintegration
Span 5533 Latin-American Cultural Discourse
Span 5534 National Literatures of Spanish America
Span 8940 Advanced Research in Spanish-American Literary
 Historiography
Span 8950 Seminar: Spanish-American Literature
Span 8960 Advanced Research in Social Approaches to Spanish-
 American Literary Texts
Span 8990 Advanced Comparative Research of Caribbean Genres

Spch 5232 International Broadcasting
Spch 5233 Broadcasting and National Development
Spch 5404 Language, Culture, and Education
Spch 5451 Processes of Intercultural Communication
Spch 5452 Workshop in Intercultural Communications
Spch 8451 Seminar: Face to Face Intercultural Communications
Spch 8452 Seminar: Facilitating Intercultural Communication

SpPt 5930 Selected Topics in the Hispanic Cultural Discourses
SpPt 8911 Seminar: Feminist Perspectives on Hispanic and Luso-
 Brazilian Cultural Discourses
SpPt 8920 Cross-Cultural Issues in Hispanic and Luso-Brazilian
 Literatures

SW 5025 International Social Welfare
SW 5601 Ethnocultural Concepts in Social Work Practice

WoSt 5106 The Cultural Construction of Sex, Gender, and Sexuality
WoSt 5301 Women's Autobiographical Narratives
WoSt 5401 Women, Colonialism, and Underdevelopment

ATTACHMENT B

SAMPLE PLAN I

Major: Comparative Studies in Discourse and Society

Basic Research Seminar Sequence

CSDS 8001 4 cr
CSDS 8002 4 cr
CSDS 8003 4 cr
TOTAL 12 credits

Minimum of 16 credits at the 8xxx level

CSDS 8910 Theories of Popular Culture, 4 cr
CSDS 8910 The Emergence of Everyday Life, 4 cr
CSDS 8910 International Hierarchy, 4 cr
CSDS 8970 Directed Readings in Critical Social/Cultural Theory, 4
cr
TOTAL 16 credits

Minimum of 16 credits appropriate to declared concentration

CSDS 8910 Cultural Politics and Revolutionary Struggle, 4 cr
CSDS 5711 Interpretation of Myth, 4 cr
CLit 8910 Cultural Politics of Partition, 4 cr
Clit 5711 Sociocriticism, 4 cr
Engl 5920 South African and Zimbabwean Literature, 4 cr
TOTAL 20 credits

Minor: Development Studies and Social Change

DSSC 8xxx Approaches to Knowledge and Truth: Defining Ways of
Knowing in Development Studies and Social Change, 3 cr
DSSC 8xxx Field Research Methodology in Development Studies and
Social Change, 3 cr
DSSC 8xxx Topics in Development Studies and Social Change, 4 cr
SOC 8090 Research Seminar in Social Movements, 4 cr
POL 5477 Middle East Politics
TOTAL 18 credits

SAMPLE PLAN II

Major: History

General Area--African History

HIST 5931 Rural Differentiation in Precolonial Africa, 4 cr
HIST 8015 Scope and Methods of Historical Studies, 4 cr
HIST 5447 Problems in East Africa, 4 cr
HIST 5932 African Historiography, 4 cr
HIST 5436 Social History of African Women, 4 cr
HIST 8011 Social History as Social Science, 4 cr
HIST 8970 Mozambique: Historiography and Sources, 4 cr
HIST 8944 African History: Research Seminar, 3 cr

HIST 8945 African History: Research Seminar II, 3 cr
HIST 5920 Matriliney and Patriliney in Comparative Perspective, 4
cr
HIST 8970 Gender and Agrarian Change in Southern Mozambique, 4 cr
TOTAL 42 credits

Outside Area--Native American History

HIST 8970 Native American History: Historiography, 4 cr
HIST 8970 Native American History: Fur Trade Social History, 4 cr
HIST 8970 Topics in American Indian Social History, 4 cr
TOTAL 12 credits

Minor: Development Studies and Social Change

DSSC 8xxx Approaches to Knowledge and Truth: Defining Ways of
Knowing in Development Studies and Social Change, 3 cr
DSSC 8xxx Field Research Methodology in Development Studies and
Social Change, 3 cr
DSSC 8xxx Topics in Development Studies and Social Change, 4 cr
CSDS 8910 Cultural Constructions of Gender, 4 cr
Anth 8460 Seminar: Anthropology of Gender, 4 cr
TOTAL 18 credits

SAMPLE PLAN III

Major: Agricultural and Applied Economics

Required courses for Major

AgEc 5580 Human Capital and Household Economics, 3 cr
AgEc 5750 Agricultural Trade and Commercial Policies, 3 cr
AgEc 8210 Applied Econometrics, 3 cr
AgEc 8270 Applied Welfare Economics and Public Policy, 3 cr
AgEc 8278 Agricultural and Economic Development, 3 cr
AgEc 8288 Dynamic Production Economics, 3 cr
AgEc 8370 Agricultural and Trade Policy in Developed Countries, 3
cr
AgEc 8590 Economics of Food and Consumer Policy, 3 cr
AgEc 8591 Consumption Economics, 3 cr
Econ 8101 Microeconomic Theory, 4 cr
Econ 8102 Microeconomic Theory, 4 cr
Econ 8103 Microeconomic Theory, 4 cr
Econ 8104 Macroeconomic Theory, 4 cr
Econ 8105 Macroeconomic Theory, 4 cr
Econ 8106 Macroeconomic Theory, 4 cr
Econ 8181 Advanced Topics in Microeconomics, 3 cr
Econ 8201 Applied Econometrics, 4 cr
Econ 8202 Applied Econometrics, 4 cr
TOTAL 62 credits

Minor: Development Studies and Social Change

DSSC 8xxx Approaches to Knowledge and Truth: Defining Ways of
Knowing in Development Studies and Social Change, 3 cr

DSSC 8xxx Field Research Methodology in Development Studies and Social Change, 3 cr
DSSC 8xxx Topics in Development Studies and Social Change, 4 cr
Ent 5320 Ecology of Agriculture, 4 cr
Hist 5436 Social History of African Women: 1850 to Present, 4 cr
TOTAL 18 credits

SAMPLE PLAN IV

Major: Conservation Biology

Required Courses

FW 8452 Conservation Biology, 3 cr
Stat 5021 Stastical Analysis, 5 cr
EEB 5970 Decision Analysis and Modeling in Conservation Biology, 4 cr
AgEc 5650 Economics of Natural Resource Policy, 4 cr
CBio 8001 Conservation Biology Seminar, 1 cr
FR 5703 Colloquium in Forest Biology: Forestry for Sustainable Development, 1 cr
FR 5130 Geographic Information Systems in Natural Resource PLanning, 5 cr
TOTAL 23 credits

Elective Courses

PA 5021 Quantitative Methods in Public Affairs and Planning I, 4 cr
PA 5022 Quantitative Methods in Public Affairs and Planning II, 4 cr
EEB 5613 Assessing the Ecological Effects of Pollution, 4 cr
Ent 5320 Ecology of Agriculture, 4 cr
FR 5104 Forest Ecology, 3 cr
FR 5458 Water Quality Management: Ecosystem Approaches, 4 cr
AgEc 8278 Agricultural and Economic Development, 3 cr
TOTAL 26 credits

Minor: Development Studies and Social Change

DSSC 8xxx Approaches to Knowledge and Truth: Defining Ways of Knowing in Development Studies and Social Change, 3 cr
DSSC 8xxx Field Research Methodology in Development Studies and Social Change, 3 cr
DSSC 8xxx Topics in Development Studies and Social Change, 4 cr
Anth 8450 Seminar: Development Theories and Policies, 4 cr
Geog 8350 Seminar: World Population Problems, 4 cr
TOTAL 18 credits

PROFILES OF ASSOCIATED FACULTY

RON AMINZADE

Ron Aminzade is a Professor of Sociology and is interested in social movements, political parties, and the dynamics of political change. His earlier research, published in a variety of sociology and history journals, concerns the relationship between social mobility and collective political protest, the process of working-class formation, the determinants of strikes and collective industrial protest, and the origins of political parties. He is author of Class, Politics, and Early Industrial Capitalism, recently finished Visions of the Republic (Princeton University Press), about the changing relationship between the theory and practice of liberalism, socialism, and democracy in nineteenth century France and the transformation of French republicanism from a revolutionary to a reformist ideology. His research and teaching interests concern the relationships among social movements, political parties, and the state in different historical and geographical settings. He is currently chair of the Comparative/Historical Sociology section of the American Sociological Association and co-editor of the journal *Social Science History*.

RAGUI ASSAAD

Assistant Professor of Planning and Public Affairs, Humphrey Institute of Public Affairs. B.A. in Physics, M.A. in Mechanical Engineering, Stanford University. Ph.D. in City and Regional Planning, Cornell University. Professor Assaad has held fellowships from the Social Science Research Council and the American Research Center in Egypt for doctoral research on the Egyptian construction labor market from 1987 to 1989. He served as consultant to the Central Agency for Public Mobilization and Statistics in Egypt, the Economic Development Institute of the World Bank and the International Labor Office on issues relating to labor markets and employment. His teaching interests are in economic development, development planning, urbanization and urban planning in developing countries, and quantitative methods. His research interests are in structural adjustment, urban poverty, and labor markets; the role of institutions in development, with a focus on labor market institutions; and the informal economy in developing countries. He is currently working on a Ford Foundation-funded project which examines the links between poverty and access to the labor market in Cairo, Egypt.

BETSY BAKER

Associate Dean for Administration, Director of International Programs, Law School. In her teaching and research, Professor Baker seeks to distinguish legal from political questions by exploring the legal framework which establishes and controls the actions of international organizations as diverse as the United Nations, the General Agreement on Tariffs and Trade, the International Civil Aeronautics Organization and the Council of Europe. Which charter provisions and conventions make for effective regional and/or international cooperation? How are those provisions interpreted by member states, committees within the organization, or relevant judicial bodies? Are there legal impediments to more effective international cooperation? How do the laws of different nations affect their ability to carry out obligations imposed by international organizations to which they belong? Do the apparently more flexible legal structures and constraints on NGOs (non-governmental organizations) allow them a more effective role in promoting international cooperation? These and other questions inform her inquiries into the role of public international organizations in promoting international peace and cooperation.

JEFFREY P. BROADBENT

Assistant Professor of Sociology since 1986. Ph.D. and M.A. Harvard University. B.A. (Religious Studies), University of California, Berkeley. Professor Broadbent has held academic appointments at the State University of New York, the University of Michigan, the University of Tsukuba (Japan), and Hiroshima Shudo University (Japan). His research focuses on social movements and policy networks in Japan, particularly with respect to environmental change, economic growth, and labor policy. He is currently completing two book manuscripts: Comparing Policy Networks: Politics of Labor Policy Formation in the U. S., Germany, and Japan (with David Knoke, Franz Pappi, and Yutaha Tsujinaka), and Butterflies in the Belly of the Beast: Environmental Movements and Growth Politics in Japan.

VERNON B. CARDWELL

Professor of Agronomy. B.S. in Agricultural Education, M.S. in Plant Breeding from Colorado State University, following five years as a branch experiment station agronomist, Professor Cardwell earned a Ph.D. at Iowa State University in Crop Physiology in 1967. His current areas of research include seed physiology and farming systems. He has had international experience in Jamaica, Honduras, Uruguay, Pakistan, Indonesia and Australia, including as mentor in the Minnesota Studies in International Development (MSID) program for Minnesota students in Jamaica (1991). He chairs the Minnesota-Uruguay Farmer-to-Farmer Program which is scheduling up to 10 farmers and professional visits per year to Uruguay through September 1995. Professor Cardwell has been named Fellow by the American Society of Agronomy, the National Association of Colleges and Teachers of Agriculture, and The American Association for The Advancement of Science.

WILLIAM P. CUNNINGHAM

Ph.D. in Botany, University of Texas, Austin, 1963. Professor of Genetics and Cell Biology at the University of Minnesota since 1978. Visiting Professor at University of Trondheim, Norway (1980), Gadjah Mada University, Jogjakarta, Indonesia (1987), Agricultural Institute, Bogor, Indonesia (1991). Professor Cunningham's research and teaching focus on issues of the environment. His current research projects include the effect of air pollutants and acid rain on cellular membrane structure and function. Several of his students are working on mechanisms of secretory vesicle formation and fusion and formation of blebs and other surface structures on animal tissue culture cells. His teaching on the environment takes a systemic approach, including social and political issues as well as technical scientific considerations. Cunningham has co-authored Environmental Science: A Global Concern with B.W. Saigo and Environmental Issues and Analysis Workbook with B.W. Saigo and G.S. Phillips.

RAYMOND DUVALL

Ph.D. in Political Science, Northwestern University, 1975. Professor, Political Science since 1985; Visiting Professor at Boğaziçi University, Istanbul, Turkey (1989), at The Graduate Institute of International Studies, Geneva, Switzerland (1990), and University of Graz, Austria (1990). Other professional experience: Consultant, The World Bank, Industry Department (regarding the political economy of state-owned enterprises and privatization programs); co-editor, International Studies Quarterly (1981-85). Professor Duvall is completing a manuscript on the political economy of liberalization and social welfare in modern Turkey. His other current projects are on the political economy of uneven development in the 20th century, and the globalization of capital and the internationalization of political authority. His previously published research was on dependency theory; the capitalist state; political conflict in the Third World. His more than thirty articles have been published in International Organization, American Political Science Review, International Studies Quarterly, Comparative Political Studies, Economic Development and Cultural Change, Journal of Conflict Resolution, and several anthologies.

SUSAN GEIGER

Associate Professor, Women's Studies Department, Associate in the History Department, and Adjunct in the Department of African-American and African Studies.

Research Interests: 1) Political and social history of African women, with primary focus on development and expression of political consciousness among Tanzanian women, using oral and life history documentation. 2) Analytical importance of gender in all aspects of historical analysis, including studies of "the state," nationalism, economic policy, etc. 3) Methodological and theoretical issues around the collection and use of life histories as data in historical research. 4) International feminist theory; race/gender in international perspective.

University Interests: Women's Studies and the Center for Advanced Feminist Studies (Graduate Program). MSID (Minnesota Studies in International Development) and university exchanges with University of Dar es Salaam in Tanzania.

ALLEN F. ISAACHAN

Professor of African History; received his B.S. from City College, New York, and his M.A. and Ph.D. from the University of Wisconsin. He held a Foreign Area Fellowship to do research in Africa from 1967-69 and was also awarded a Gulbenkian Foundation Fellowship in 1966. His publications include Mozambique: the Africanization of a European Institution: the Zambezi Prazos, 1750-1902, which won the 1973 Melville Herskovits Award for the most distinguished publication in African studies, as well as several

articles examining aspects of the social history of Mozambique. He has also written The Tradition of Resistance in Mozambique, A Luta Continua, and Mozambique: From Colonialism to Revolution, 1900-1982, plus three articles in the UNESCO History of Africa. He is particularly interested in pre-colonial southern and central Africa, with an emphasis on the collection of oral data and questions of political economy, peasants, agrarian change and social protest. He is currently co-editing Cotton in Colonial Africa with Richard Roberts and completing a study entitled Cotton is the Mother of Poverty, Peasants, Work and the Rural Experience in Colonial Mozambique. He was awarded grants from ACLS, SSRC, the National Endowment for the Humanities and the Gulbenkian Foundation. He was Professor of Mozambican History at the Universidade Eduardo Mondlane in Mozambique from 1977-79, and was chair of the American Council of Learned Societies/Social Science Research Council Joint Africa Committee from 1981 to 1987.

LISETTE JOSEPHIDES

B.A. in Philosophy, Diploma and Ph.D. in Anthropology, University of London. Assistant Professor, Anthropology Department, member of Women's Studies and CAFS. Professor Josephides spent many years doing anthropological fieldwork in Papua New Guinea, where she also taught in the University's History Department. Her research interests were originally in political and economic anthropology, and especially how relations of inequality developed in so-called egalitarian societies. The Production of Inequality (Tavistock, 1985) tackled this question in terms of the centrality of gender relations. Subsequently she expanded her analysis to include the areas of myth, song, and metaphoric meaning, as well as social change and a redefinition of the concept of tradition. She is particularly interested in questions of knowledge, cross-cultural understanding and ethnic/cultural identity in situations of increasing diffusion of ideas, beliefs, material objects, and lifestyles. Her current project is entitled: "Gendered discourses of tradition and change." Recent publications include a chapter (co-authored with Marc Schiltz) in Like People You See in a Dream: first contact with six Papual societies (ed., E.L. Schieffelin and R. Crittenden, Stanford 1991), and "Metaphors, Metathemes and the Construction of Sociality: a critique of the new Melanesian ethnography" (Man 26(1), 1991).

AMY KAMINSKY

Associate Professor and Chair, Women's Studies. Ph.D., in Spanish, Pennsylvania State University. M.A., Spanish, Rutgers. Professor Kaminsky has held academic appointments at the State University of New York at Oswego, Bechnell University, and the University of Umea (Sweden). She recently published Reading the Body Politic: Latin American Women Writers and Feminist Criticism (*University of Minnesota Press, 1993) and is currently completing for publication by the same press Waterlilies: An anthology of Spanish Women Writers from the Fifteenth to the Nineteenth Century. Her recent articles include: "Gender, Race Raza" (Feminist Studies, 1994), and "Issues for an International Feminist Literary Criticism," (Signs, 1993).

ANNE R. D. KAPUSCINSKI

Ph.D. (1984) and M.S. (1980) in Fisheries, Oregon State University. B.A., Swarthmore College. Professor, Fisheries and Conservation Biology (effective 1994-95). Professor Kapuscinski has been an Assistant and Associate Professor at the University of Minnesota since 1984. She has received more than 20 major research grants in recent years to support her research in the renewability of fish resources. Her recent coauthored publications include: "Benefits, Risks, and Policy Implications: Biotechnology in Aquaculture", "Reweaving Pacific Salmon and their Ecosystems" "What threads can artificial propagation contribute?", and "Geological Implications of Using Transgenic Fishes in Aquaculture".

DANIEL KELLIHER

B.A., Oberlin College, 1975, in Chinese Language and Literature. Ph.D., Yale University, 1985, in Political Science. Associate Professor of Political Science at the University of Minnesota since 1993. Assistant Professor of Political Science, Northwestern University (1986-1989); English Teacher at Tunghai University, Taichung, Taiwan (1975-1977). Kelliher's research interests include peasant politics and the state, agrarian change, political reform, and China. His publications include Peasant Power in China: The era of rural reform 1979-1989 (Yale University Press, 1992); "Privatization and Politics in Rural China," in Gordon White, ed., The Road to Crisis, (MacMillan, 1991); "The Political Consequences of China's Reforms," in Comparative Politics (Vol. 18, Number 4, 1986).

ROBERT T. KUDRLE

Professor of Public Affairs, Associate Dean for Research, Hubert Humphrey Institute of Public Affairs, and planning Director of the Orville and Jane Freeman Center in International Economic Policy. He is interested in industrial organization, public policy toward business, international economic policy, and the political economy of social services. Much of his recent research has examined economic relations among the industrial countries. He has served as a consultant and expert witness for the Antitrust Division of the U.S. Department of Justice and as a consultant to the Canadian Department of Consumer and Corporate Affairs, the U.N. Centre of Transnational Corporations, the Overseas Private Investment Corporation, and the Urban Institute. Kudrle is past coeditor of International Studies Quarterly and currently serves on the editorial board. He is also a member of the editorial board of International Political Economy Yearbook, International Interactions, and the Journal of Health Politics, Policy and Law. His recent work has appeared in World Politics and International Organization. He is author of Agricultural Tractors: A World Industry Study and coeditor of Reducing the Cost of Dental Care and The Industrial Future of the Pacific Basin. A Rhodes Scholar, Kudrle holds a master of philosophy degree in economics from Oxford University and a Ph.D. in economics from Harvard University.

DEBORAH LEVISON

Assistant Professor of Population Affairs and Policy, Humphrey Institute of Public Affairs, since 1992. B.A. in Economics from Smith College, including one year at the University of Geneva and the International Development Institute (IUED) in Switzerland. Graduate training in the Economics Department and at the Population Studies Center of the University of Michigan, Ann Arbor, beginning in 1983. Interruptions to graduate school included a population workshop at the East-West Center (Hawaii) and in China, an internship at the International Labour Office in Geneva, Switzerland, various research-related trips to Brazil, and consulting for the World Bank. Affiliated with the Population Research Center, University of Texas at Austin, 1988-1990. Ph.D. in economics in 1991. Postdoctoral fellow at the Economic Growth Center, Yale University, 1990-1992. Her research lies at the intersection of economic demography, development, and labor economics. All of her work thus far is in the context of Brazil; new projects also involve Bolivia, Colombia, and Peru in Latin America, Cote d'Ivoire and Ghana in Africa, and India. Topics--all of which are policy-relevant to some degree--include allocation of children's time, child labor, and schooling; women's employment and child care; living arrangements of the elderly; and the relationship between education and inequality.

JOHN W. MOWITT

Professor Mowitt earned his Ph.D. in Comparative Literature from the University of Wisconsin in 1982. He is currently Associate Professor of Humanities and English, and of Cultural Studies and Comparative Literature. He has also taught at the University of Amsterdam. Mowitt's recent publications include Text: The Genealogy of an Antidisciplinary Object (Duke University Press, 1992), "Algerian Nation: Fanon's Fetish", Cultural Critique 9(1992), and "What is Called Critical Thinking" Critique 1992).

AUGUST NIMTZ, JR.

Ph.D. Indiana University, 1973. Associate professor, Political Science. Areas of specialization include: Comparative politics (African political systems, African-American politics, comparative methodology); Political Development (Theories of political development, Rural political development); Marxist political economy. Publications include Islam and Politics in East Africa, and essays on the politics of socialist transformation and African politics. His most recent work is on destabilization and political change in Nicaragua and Cuba.

PHILIP W. PORTER

A.B., Middlebury College, 1950; M.A., Syracuse University, 1955; Ph.D., University of London, 1957. The enduring core of Professor Porter's research and teaching interests is the way people fashion livelihoods and the patterns of human settlement and systems of resource use that result. He concentrates on the geography of Africa. His systematic interests are varied - cultural ecology, development, agricultural geography, agrometeorology, cartography, population geography, air photo interpretation. For the most part they are pressed into service to help him understand human use and understanding (perception) of environment. Recent publications include: "Community among geographers," Professional Geographer 41:3:362-365, August 1989. "Wholes and fragments: Reflections on the economy of affection, capitalism, and the human cost of development," Geografiska Annaler, 69B:1:1-14, 1987. Thomas J. Bassett and Philip W. Porter, "'From the best authorities': The mountains of Kong in the cartography of West Africa," Journal of African History, 32:3:367-413.

VERNON W. RUTTAN

Regents Professor of Agricultural and Applied Economics, and Economics. B.A., Yale University, 1948; M.A. and Ph.D., University of Chicago, 1952 and 1954. Academic appointments at Purdue University (1954-63) and at the University of Minnesota, where he served as Professor and as Head of the Department of Agricultural and Applied Economics from 1965 to 1970 and as Director of the Economic Development Center from 1970 to 1973. Visiting Professor, University of California, Berkeley, 1958-59, and the University of the Philippines, 1963-65. Professor Ruttan has had substantial non-academic experience. His first professional position was on the Government Relations and Economics staff at the Tennessee Valley Authority (1951-1954). In 1961 and 1962 he served on the staff of the President's Council of Economic Advisors. Between 1963 and 1965 he was Agricultural Economist with the Rockefeller Foundation at the International Rice Research Institute in the Philippines. From 1973 to 1978 he was President of the Agricultural Development Council. He has also served on a number of advisory committees and boards including the Research Advisory Committee of the U.S. Agency for International Development (1968-73 and 1980-86), the Board of Directors of the International Service for National Agricultural Research (1980-86), and the Board on Agriculture and the Board on Global Change (1991-present) of the National Academy of Sciences/National Research Council (1982-1989). He was President of the American Agricultural Economics Association in 1971-1972. Ruttan's research has been on the economies of technical change and agricultural development. His book (with Yujiro Hayami), Agricultural Development: An International Perspective (Johns Hopkins University Press, 1971 and 1985) has become a basic reference in the field of agricultural development. His book, Agricultural Research Policy (University of Minnesota Press, 1982), is the leading work in its field. His most recent book (with Anne O. Krueger and Constantine Michalopoulos), Aid and Development, was published by Johns Hopkins University Press in 1989. He has published more than 75 refereed journal articles as well as numerous book chapters and shorter articles and editorials. The quality of Ruttan's research has been recognized by the American Agricultural Economics Association by six awards for published research. He has been honored by election as a Fellow of the American Agricultural Economics Association (1974), the American Academy of Arts and Sciences (1976), the American Association for the Advancement of Science (1986), and to membership in the National Academy of Sciences (1990). He holds honorary degrees from Rutgers University (1978), Christian Albrechts University of Kiel (1986) and Purdue University (1981). He has received the Alexander von Humboldt Award for outstanding contribution to agriculture (1984) and the U.S. Department of Agriculture Distinguished Service Award (1986).

ABDI SAMATAR

M.A., 1981, Iowa State University, Ames, in Community and Regional Planning; Ph.D., 1985, University of California, Berkeley, in Rural Development. Assistant Professor of Geography at the University of Minnesota since 1991. Assistant Professor, Department of Geography and Urban Planning, University of Iowa, Iowa City (1988-1991). Samatar's research interests include rural development and agrarian change in Eastern Africa, the political economy of resources in pastoral societies, the state and peasant/pastoral societies. His areas of teaching are rural development, rural poverty, and peasant economy and society; theories and practices of development; natural resources and development; economic development and cultural change; the state and development; urbanization and comparative economic development. Samatar is the author of The State and Rural Transformation in Northern Somalia, 1884-1985 (Madison: University of Wisconsin Press, 1989). He is co-author (with Lidwein Kapteijns) of The Somali Crucible: Articulation of Gender, Class and Clan (forthcoming), and is doing field research in Botswana in 1993-94.

ERIC SHEPPARD

For the last ten years Professor Sheppard has been attempting to make sense of the principles underlying the spatial organization of economic activities in capitalist societies. His approach to explaining this was to start with some basic properties of capitalism (economic competition, a free labor market and social classes), and to examine theoretically how the operation of a capitalist economy is affected by the distance that must be overcome in the process of producing and marketing commodities. Underlying all of this is an overriding concern with human welfare and inequality, and with how social position, site and situation affect the prospects for individuals in a place. He has spent considerable effort promoting the research agenda of radical geography where this theme is of central importance, spending several years as editor of Antipode. Recently, he has also examined underdevelopment in the "Third World", stimulated by a lengthy stay in Indonesia, leading to joint work with Philip Porter on a text on global development. Recent Publication: Sheppard, E. and T.J. Barnes. The Capitalist Space Economy: Analytical Foundations. Unwin & Hyman: London, 1990.

KATHRYN SIKKINK

Associate Professor, Political Science (effective 1994-95). Ph.D. Columbia University, 1988. Professor Sikkink received her B.A. from the University of Minnesota. As an undergraduate she spent time in both Latin America and East Africa. She went on to doctoral work in comparative politics and international relations with an emphasis on Latin America. Her research interests included issues of political economy, Third World development, foreign policy, international human rights, and transnational social movements. With support from the Social Science Research Council Foreign Policy Fellowship, she is currently carrying out a research project on the origins of human rights policies in the U.S. and in Europe, and on the international human rights movement. She has done fieldwork in Argentina, Brazil, Chile, and Uruguay. Publications: Ideas and Institutions: Developmentalism in Brazil and Argentina (Ithaca: Cornell University Press, 1991), articles in International Organization and Latin American Research Review on economic policy in Argentina and codes of conduct for transnational corporations, and book chapters on U.S. human rights policy toward Latin America, and on the origins of human rights policies in the U.S. and in Europe.

JANET SPECTOR

Assistant Provost for Academic Affairs and Chair of the University's Commission on Women (for a 3 year term, 1992-95), and Associate Professor of Anthropology and Women's Studies. Professor Spector was chair of Women's Studies from 1981-84 and was a founding member of the Center for Advanced Feminist Studies. Her research interests are feminist archaeology and anthropology with a regional focus on the archaeology of colonization in the Upper Great Lakes Region. She is also interested in feminist approaches to change in higher education. Recent publication include: What This Awl Means: Glimpses of 19th Century Dakota Life at Inyan Ceyaka Atonwan (Village at the Rapids), forthcoming from the Minnesota Historical Society Press; "Incorporating Gender into Archaeology Courses" (with M. Whelan) in Gender and Anthropology: edited by S. Morgen; "What This Awl Means: Toward a Feminist Archaeology," in Engendering Archaeology, edited by J. Gero and M. Conkey; "The Minnesota Plan II: A Project to Improve the Environment for Women..." in Women's Studies Quarterly, Special Issue on Curricular and Institutional Change.

ANN WALTNER

Associate Professor of History. Professor Waltner joined the department in the fall of 1987. She received her Ph.D. from the University of California, Berkeley, and her M.A. from Yale University. She is a social historian of traditional China and has strong interests in traditional Chinese fiction, kinship, religion and law. Recent publications include "From Casebook to Fiction: Varieties of Kung-an in late Imperial China" (Journal of the American Oriental Society 110:2, 1990); "On Not Becoming a Heroine: Lin Dai-yu and Cui Ying-ying" (Signs 15:1, 1989); "Tan-yang-tzu and Wang Sih-chen: Visionary and Bureaucrat in the Late Ming" (Late Imperial China 8:1, 1987), "The Moral Status of the Child in Late Imperial China: Childhood in Ritual and Law" (Social Research 58:4, 1986) and "Learning from a Woman: Ming Literati Responses to Tan-yang-zi" (The International Journal of Social Education 6:1, 1991). Her book, Getting an Heir: Adoption and the Construction of Kinship in Late Imperial China, was published by the University of Hawaii Press in 1990. She is currently writing a monograph on Tan-yang-tzu, a young woman visionary and teacher who lived in the late sixteenth century.

JOHN WRIGHT

Ph.D., 1977, American Studies, University of Minnesota; M.A., 1971, English and American Literature, University of Minnesota. Associate Professor of Afro-American and African Studies since 1984. Associate Professor of African and Afro-American Studies, Associate Professor of English, Carleton College (1973-1984). Wright chaired the Department of Afro-American and African Studies, University of Minnesota from 1984-1989 and the African and Afro-American Studies Program at Carleton College from 1974-1982. His research focuses on literature of African Americans in North America and the Caribbean and of the African diaspora. He has co-edited (with Michael Harper) A Ralph Ellison Festival, Special Issue of The Carleton Miscellany, (18:3, 1980). He has taught courses on Afro-American Art and Culture from the Harlem Renaissance, Afrocentricity: an introduction to Afro-American studies, the literature of American minorities, introduction to Afro-American literature, introduction to black women writers, Afro-American autobiography, classic texts and comparative methods in Afro-American Studies.

From: Field, Vicki L (VLF)
To: Everyone
Date: Monday, April 1, 1996 10:17 am
Subject: M.F.A. in Creative Writing

Please note the following clarification with respect to the M.F.A. degree in Creative Writing: This degree may be pursued either through the day school or CEE, as was the case with the M.A. degree in English with a writing emphasis. If you have any questions about this aspect of the new program, please let me know.

Thanks.

Twin Cities Campus

*Department of English
College of Liberal Arts*

*207 Lind Hall
207 Church Street S.E.
Minneapolis, MN 55455-0134
612-625-3363
Fax: 612-624-8228*

July 13, 1994

Anne Petersen
Vice President for Research and
Dean of the Graduate School
322 Johnston Hall
101 Pleasant St. S.E.
Minneapolis, Minnesota 55455-0421


Dear Dean Petersen,

Thank you for your letter of June 6 regarding the process of transmission of the proposal for a Master of Fine Arts in Creative Writing. Please find enclosed the final version of this proposal. I would appreciate your forwarding it to the Board of Regents for consideration at their October and November meetings.

I am grateful for the many levels of advice and assistance the Office of the Graduate School has provided in the process of bringing this proposal forward. This has been a very positive experience for me personally and for the Creative Writing Program as a whole.

If you have any questions, please do not hesitate to contact me.

With best wishes,


Madelon Sprengnether
Professor and Director,
Creative Writing Program

University of Minnesota
Board of Regents
Academic Program Proposal Summary
Educational Planning and Policy Committee

Part A

Program Title: Creative Writing Program (Department of English, University of Minnesota),
Master of Fine Arts degree
Campus: Twin Cities (CIP Code Number: _____)
College: Graduate School
Proposed Implementation Date: September 15, 1995
Program Length (credits): 68 credits (60 major field, 8 related fields)
Number of Graduates at Full Operation: 10-12 per year

Program Description

Summary Description: The Master of Fine Arts (M.F.A.), degree at the University of Minnesota offers thorough study and practice in the writing of fiction, poetry, and creative non-fiction through a course of study which culminates in the construction of a book-length creative project.

Admission requirements: Admission to the M.F.A. program is limited to students with the bachelor's degree or its equivalent from an accredited college or university who demonstrate exceptional promise as creative writers. Additional screening criteria must be met.

Curriculum: The M.F.A. degree program requires a minimum of 68 credits (69 if a minor is included), comprised of workshop and literature courses, related field credits, and creative project credits to prepare a book-length manuscript. The program also includes an exam specifically designed for writing students.

Internal Review and Support

The M.F.A. degree proposal has been reviewed (and passed by unanimous vote) by each of the following bodies: the Department of English; the Language, Literature, and Arts Policy and Review Council of the Graduate School; the Graduate School Executive Committee. Specific approval has been obtained from Phil Furia, Chair of the Department of English, Peter Reed, Associate Dean for Undergraduate Education, and Julia Davis, Dean of the College of Liberal Arts.

Rationale for Offering Program

The M.F.A. degree is now the preferred degree for students of creative writing. In order to be fully competitive on a national as well as a regional basis, the Creative Writing Program at the University of Minnesota needs to offer this degree.

Collegiate/Campus Priorities

The M.F.A. degree responds to the English Department's five-year plan, which designates the Creative Writing Program as an area for development. It also responds to the

College's plan to implement writing intensive courses across the curriculum. Finally, it is consistent with the goals of U2000.

Budgetary Implications of Program Implementation

Redirection of Resources: None
Number of New Courses to be Developed: One
New FTE Faculty: None
Physical Facilities: None
Information Services: None

Program Demand

The M.F.A. program is intended as a "general education" or "enrichment" degree, which will also provide students with the necessary credential for teaching creative writing or for working in arts organizations or arts administration. Candidates who do not possess the M.F.A. are severely disadvantaged in seeking teaching positions at the college and university levels. Similarly, arts organizations recognize the specific education and training provided by this type of degree program.

Program Duplication

The M.F.A. in Creative Writing at the University of Minnesota, because of its distinguished tenured faculty, its Edelstein-Keller endowment, and its extended and diverse course options, is a stronger program than the ones soon to be offered by Hamline University and Moorhead University. In addition, the University of Minnesota M.F.A. is designed to compete successfully with other programs of national distinction.

Diversity

The current curriculum of the Creative Writing Program addresses issues of diversity in relation to race, class, gender, ethnicity, and place of national origin. We routinely sponsor residencies by visiting writers of color, employ writers of color in our adjunct faculty program, and seek fellowship support on behalf of incoming students of color.

Program Quality

Our distinguished program faculty insure that the degree we offer will be of high quality. We have chosen to retain a strong emphasis on literary study in our program in order to attract students of the highest ability and to insure that the writing produced in the program responds to the strong literary tradition for which the Department of English at the University of Minnesota is known.

Timetable for Program Evaluation

The English Department as a whole is scheduled for an external review in 1995-96, the first year in which the M.F.A. will be offered. The Creative Writing Program will participate in this process. A further review of the M.F.A. degree will be conducted by the Program after the first three years of its operation.

Subject Bibliography Unit
Room 5, Wilson Library

April 8, 1994

Professor Madelon Sprengnether
Chair, Creative Writing
209 Lind Hall

Dear Professor Sprengnether:

Thank you for discussing with me the plans for the MFA degree. I want to assure you and your colleagues that the library can support your proposed new graduate degree program.

Creative Writing does not make great demands on the Library, and the materials you use also serve other readers. We have broad and deep holdings in all genres of English and American writing, and so our Library has most of the materials you need. We don't have everything, of course, but with advice from your current and past faculty, I have built a selective but strong collection.

Our collections in English and American Literature include about 175,000 books and nearly 600 periodicals. These numbers convey nothing of the quality of the collection, but close examinations of parts of the whole give evidence of its good quality.

- In 1986 100 writers identified the 32 best of an estimated 2000 literary reviews. We owned 26.81 percent.
- Library Journal in 1991 identified the top twelve literary reviews. Our collection held all twelve.
- We had 68% of the relevant new periodicals in literary studies identified in annual articles in the Dictionary of Literary Biography Yearbooks 1987, 1988, 1989, 1990.
- We found in 1989, by checking two new bibliographies, that we were particularly strong in plays by 30 contemporary British and American playwrights, owning almost everything they had published.
- Of 74 contemporary British poets I checked in 1988, we had works by 72. For two thirds of these 72 poets we owned 30-70% of their books.
- We have 71% of the anthologies in the Poetry Index Annual 1989-90. The remaining titles, books for children or popular anthologies, are not central to our collection.

Students and teachers in Creative Writing need not limit their library resources to those at the University of Minnesota. I work with the head of the literature collection at the Minneapolis Public Library, which supplements ours. Their collection, the second largest in the state, is strong in contemporary and Minnesota literature. They also regard their holdings in the short story as one of their strengths. On my recommendation, they often buy periodicals which we do not buy. Similarly, I work with librarians at the University of St. Thomas and at the Minnesota Historical Society. We also have

Page 2

April 8, 1994

Professor Madelon Sprengnether

very strong bibliographic resources to identify and locate materials at other libraries, and our Interlibrary Loans services are second to none.

I expect to continue to work with your faculty and students to provide them with library collections and services that will enrich their work. I hope the new degree will be approved. Please let me know if you have questions or if I may provide other information.

Yours truly,

Marcia Pankake

Marcia Pankake

Professor and Bibliographer

English and American Literature

**Higher Education Coordinating Board
Application Form for New Academic Program**

COVER SHEET

1) Institution Name 1) University of Minnesota

2) Program Title: Master of Fine Arts in Creative Writing (M.F.A.)

Classification of Instructional Program (CIP) code number:
_____ (Academic Affairs provides)

3) Program Location: to be offered at main campus only, Twin Cities

4) Implementation date: September 15, 1995

5) Program length: 68 credits (60 major field, 8 related fields)

6) Number of graduates at full operation: 10-12 students per year

7) Governing Board approval date: _____ (Academic Affairs provides)

8) Brief Program Description:

The Master of Fine Arts degree in Creative Writing at the University of Minnesota is designed to offer thorough study and practice in the writing of fiction, poetry, and creative non-fiction. The proposed three-year degree will integrate graduate study in literature with writing workshops. In their third program year students will concentrate on their creative project, a book-length manuscript, in a form suitable for submission to a publisher.

The M.F.A. degree program requires a minimum of 68 credits (69 if a minor is included): 4 credits for Introductory Multi-Genre course; 20 workshop course credits; 20 literature course credits; 8 credits in related fields (9 for a minor); 16 credits for creative project. The program also includes an exam specifically designed for writing students.

**University Response to the Four Criteria Considered
by the Minnesota Higher Education Coordinating Board**

1) Is the Program Necessary?

The M.F.A. program is intended as a "general education," or "enrichment" degree, which will also provide students with the necessary credential for teaching creative writing or for working in arts organizations or arts administration. In the past ten years, more than twenty-five new M.F.A. programs have been established throughout the country. This trend recognizes the need for programs which are specifically tailored to the academic and artistic development of writers. As a result, the M.F.A. degree is now the preferred degree for students of creative writing. The Associated Writing Programs (AWP), a national consortium of over 300 writing programs and the primary source of information on creative writing programs, recommends that "the Master of Fine Arts be considered the appropriate credential for the teacher of creative writing." Most of our graduates aspire to teach creative writing in a college or university setting. Candidates who do not possess the M.F.A. are severely disadvantaged in seeking these positions. Similarly, arts organizations look for the specific education and training provided by this type of degree program. In order to remain fully competitive on a national as well as a regional basis, the Creative Writing Program at the University of Minnesota needs to offer this degree.

2) Is the Program a Needless Duplication?

The M.F.A. in Creative Writing at the University of Minnesota is a stronger program than the ones soon to be offered by Hamline University and Moorhead University. In addition, the University of Minnesota M.F.A. is designed to compete successfully with other programs of national distinction.

Local Programs

Hamline University has just initiated an M.F.A. degree which will begin in the Fall of 1994. Hamline's program, which shares a Director with the Master of Liberal Studies Program, focuses on interdisciplinary study and is designed primarily for part-time students, who may take up to seven years to complete their degrees. The program, moreover, will rely heavily on adjunct faculty. As their proposal states, "most of the core faculty would work for Hamline on a long-term, but untenured part-time basis." With no endowment (such as the University of Minnesota's Edelstein-Keller fund), the Hamline program is unable to offer fellowships to incoming students and provides only matching funds for visiting writers sponsored by local bookstores and the Loft. Given these fiscal constraints, Hamline plans to move cautiously toward its long-term goal of regional and national marketing.

State Programs

Moorhead University has proposed a two to three year M.F.A. degree in Creative Writing, which is awaiting final approval from the Minnesota Higher Education Coordinating Board.

Their proposed curriculum offers less extensive and diverse writing course options and fewer literature credits than the proposed M.F.A. degree at the University of Minnesota. Two of the writing faculty at Moorhead have significant administrative tasks outside of the Creative Writing Program, which does not anticipate expanding its course offerings by hiring adjunct faculty. Support for writing students (one graduate assistantship) is minimal at this time. The University of Minnesota, in contrast, offers two Edelstein-Keller fellowships and two teaching assistantships in English annually to incoming students. Most students at the U. of M., moreover, have the opportunity to teach at least one course (at the introductory level) while they are in the Program. Because of its location, the Moorhead program will primarily attract and serve students from the surrounding area. The program at the University, located more advantageously in the Twin Cities, will serve students from this area, while continuing to draw from the five-state region and the nation at large.

Regional and National Programs

There are no Master of Fine Arts Programs in Creative Writing in North Dakota, South Dakota, Nebraska, or Wisconsin. The University of Michigan at Ann Arbor offers a two-year M.F.A. degree. The emphasis at the University of Michigan is on workshop courses (twice as many as literature and related field credits) and the final project. There is no M.F.A. exam. The Writer's Workshop at the University of Iowa, one of the longest established and most distinguished programs in the country, offers a two-year M.F.A., with roughly equal credits in workshop and literature courses, a required exam, and a creative thesis. The University of Minnesota program is comparable in many respects, with the difference that it offers credit for the final creative project, with the requisite faculty supervision. The University of Minnesota M.F.A. will also encompass the field of creative non-fiction, which the Writers' Workshop does not offer at this time. The Stanford Writing Program, the other most notable one in the country, is designed for relatively mature writers and does not offer a degree of any kind. Its sole requirement, during a two year residency, is attendance at a weekly writing workshop.

3) Is the Program Within the Capability of the Institution's Resources?

The Creative Writing Program requires no additional budgetary resources to begin offering the M.F.A. degree.

Faculty

Current faculty (4 "core" and 2 "contributing" members) and support staff of the Creative Writing Program (a 75% Assistant to the Director and a 50% office assistant) provide the necessary teaching and administrative strength to put the M.F.A. Program into operation. Current space and equipment needs (separate offices and computers for the Director and the Assistant Director, plus general office and filing space) have also been met.

Curriculum

The necessary curriculum for the M.F.A. degree (with the exception of one new course to be developed and taught in rotation by existing program faculty) is already in place.

Edelstein-Keller Endowment

The Edelstein-Keller endowment income provides support in the following ways: honoraria for visiting writers, fellowships and teaching appointments for incoming students, graduate instructor salaries, adjunct faculty salaries, and other essential Program costs such as publicity and advertising. In addition, provision has been made for a very substantial second Edelstein-Keller endowment, which will support any new initiatives undertaken by the Program.

Department of Continuing Education and Extension

The Department of Continuing Education and Extension contributes to the Creative Writing Program by providing salaries for adjunct faculty, graduate instructors, and teaching assistants in courses with joint day school and CEE enrollments.

English Department

The English Department normally offers partial salary support for the position of the Assistant to the Director, for the work-study office assistant, for some graduate instructors and teaching assistants, and for general office expenses, such as telephones, xerox, and mailing.

Library

Library resources are more than adequate to support the needs of Creative Writing students at this time. Wilson library subscribes to 75 literary journals (ones which regularly publish poetry, fiction, and creative non-fiction) and has strong holdings in contemporary Anglophone literature.

Accreditation

There is no existing accreditation agency for Creative Writing Programs. The AWP (Associated Writing Programs) provides guidelines for M.F.A. programs (including curriculum and governance structures), with which we are in compliance.

Program Evaluation

The English Department as a whole is scheduled for an external review in 1995-96, the first year in which the M.F.A. will be offered. The Creative Writing Program will participate in this process. A further review of the M.F.A. degree will be conducted after its first three years of operation--the time necessary for the initial M.F.A. degrees to be conferred.

4) Is the Program Within the Mission of the Institution?

On March 15, 1994 the faculty of the Department of English voted unanimously to approve the M.F.A. in Creative Writing degree proposal. On May 6, 1994, the Language, Literature, and Arts Policy and Review Council of the Graduate School met and voted unanimously to approve the M.F.A. in Creative Writing degree. On May 25, the Executive

Committee of the Graduate School met and voted their unanimous approval of the new M.F.A. degree.

In 1989 the English Department created a five-year plan, which includes a commitment to the development of four specific areas of study. In recognition of the "genuine momentum toward national visibility" and the "pivotal stage of development" of the Creative Writing Program, the plan calls for focusing Department energy in this, as well as the other three, areas. The plan states:

We are singling out these areas for development partly because of their emerging or continuing importance in English studies nationally and internationally, and partly because, in different ways, our programs in these areas are all at critical phases now and our immediate attention to them holds out the promise that they can all become nationally prominent (or more prominent) in the next five years.

The proposal for a Master of Fine Arts degree in Creative is a logical step in response to the Department's call for excellence and national prominence.

Recently, the College of Liberal Arts has articulated a goal of requiring undergraduates to take several writing intensive courses across the College curriculum. The Creative Writing Program, which offers a full undergraduate curriculum of writing intensive courses, is uniquely situated to support this initiative. Finally, the M.F.A. degree, by strengthening the Creative Writing Program, in both its undergraduate and graduate missions, will also serve the goals of U2000.

Appendix Describing Admission Requirements and Curriculum

1. ADMISSION REQUIREMENTS

Admission to the M.F.A. program is limited to students with the bachelor's degree or its equivalent from an accredited college or university who demonstrate exceptional promise as creative writers. Students must show a minimum of 16 credits in English, American, or Anglophone literature or language, 12 of which must be at the upper division level. In addition to Graduate School operational standards, at least one of the following conditions must be met: 1) an undergraduate g.p.a. of 3.5 (or above) for the last two years; 2) a postbaccalaureate g.p.a. of 3.8 (or above) for a minimum of three courses; 3) a verbal score in the 85th percentile (or above) of the GRE; 4) a significant record of publication.

Students must submit for application: 1) a substantial sample of creative work (poetry, fiction, or creative non-fiction) and a description of the student's writing background; 2) three letters of recommendation from people who can judge the student's academic performance and promise as a graduate student; 3) an official score from the general test of the Graduate Record Exam; 4) a calculation of the overall grade point average and the g.p.a. for English courses only; 5) a short statement explaining the applicant's choice to pursue graduate study in Creative Writing at Minnesota in terms of his or her academic and general experience, including professional and personal goals.

2. CURRICULUM

The M.F.A. degree program requires a minimum of 68 credits (69 if a minor is included), comprised of workshop and literature courses, related field credits, and creative project credits, to prepare a book-length manuscript. The program also requires an exam specifically designed for writing students.

Required Courses

Introductory Multi-Genre Course (4 credits)

All students entering the program will be required to take this course in the fall quarter of their first year. This will be an 8000 level course taught in rotation by program faculty, in which students will read, discuss, and produce writing in the genres of poetry, fiction, and creative non-fiction.

Workshop Courses (20 credits)

Students will take three workshops (12 credits) in their main genre, one 8000 level seminar in their genre (4 credits) and one workshop (4 credits) in another genre. Within the workshop structure, students concentrate on writing by their peers with a substantial amount of time devoted to the reading and critique of manuscripts of class participants. Workshop courses also included selected readings.

Literature Courses (20 credits)

Students will take five courses in literature, which may be drawn from the graduate

English curriculum (including courses in theory and linguistics), as well as from the Reading as Writers curriculum offered by the Creative Writing faculty. Reading as Writers courses, which are considered literature credits, are intended to give student writers the opportunity to discuss a number of literary texts, often (but not exclusively) contemporary or modern. Some Reading as Writers courses also involve the critique of student manuscripts by participants. Final projects are generally creative rather than analytic.

Related Field Courses (8 or 9 credits)

Students will take two courses in related fields outside the department which support their intellectual and creative interests. One of these courses (which may be either studio or academic) must deal with an art form other than creative writing.

(Students wishing to add a minor to their concentration will fulfill the requirements of the minor program.)

M.F.A. Exam

Students will take the M.F.A. exam in the spring of their second year. This will be a take-home, comprehensive exam based on approximately twenty texts: creative, analytical, and theoretical. The texts will be determined by faculty and announced spring quarter of the first year. The length of the exam essay will be 15-20 pages.

Creative Project (16 credits)

Students will register for credit (the equivalent of four Independent Study courses at the 8000 level) to work on their projects. Two faculty members, at least one of whom must be a member of the Creative Writing Program, will supervise this project, which will consist of a book-length manuscript in a form suitable for submission to a publisher. Once the project has been approved, students will present an informal reading of their work, open to members of the faculty and to their fellow students.

Twin Cities Campus

*Department of English
College of Liberal Arts*

*207 Lind Hall
207 Church Street S.E.
Minneapolis, MN 55455-0134
612-625-3363
Fax: 612-624-8228*

April 22, 1994

Kenneth Zimmerman
Associate Dean, Graduate School
321 Johnston Hall
University of Minnesota

Dear Dean Zimmerman,

I am writing on behalf of the Creative Writing Program in the Department of English to request that you forward the enclosed proposal for an M.F.A. degree in Creative Writing to the Language, Literature and Arts Policy and Review Council and to the Graduate School Executive Committee for their approval.

The Creative Writing Program has anticipated offering such a degree since 1989 when we first reviewed the status of the M.F.A. in programs across the country. Since then we have increased faculty participation in Creative Writing and refined our administrative structure and course offerings in ways that are appropriate to the new degree. In May 1993, we initiated a series of planning and discussion meetings among the Program staff, culminating in a formal proposal. On March 15, 1994, the faculty of the Department of English met and voted unanimously to approve the new degree.

I appreciate the assistance you have provided as the Creative Writing Program has worked toward our goal of offering the M.F.A. in Creative Writing. The staff joins with me in thanking you for your advice and encouragement.

If you need any additional information, please let me know.

With best wishes,



Madelon Sprengnether
Professor and Director
Creative Writing Program

**MASTER OF FINE ARTS DEGREE IN
CREATIVE WRITING**

A PROPOSAL FOR THE UNIVERSITY OF MINNESOTA

Submitted April 22, 1994

PROPOSAL

The Master of Fine Arts degree at the University of Minnesota is designed to offer thorough study and practice in the writing of fiction, poetry, and creative non-fiction. The proposed three-year degree will integrate graduate study in literature with writing workshops. In their third program year students will concentrate on their creative project, a book-length manuscript, in a form suitable for submission to a publisher.

1. INTELLECTUAL, SOCIAL, AND EDUCATIONAL CONTEXT

The M.F.A. degree, currently the preferred degree for students of Creative Writing, will replace the M.A. in English with an Emphasis in Writing degree. This transition in degree programs is necessary to the future success of the Creative Writing Program in addition to the academic and professional needs of prospective students.

In the past ten years, more than twenty-five new M.F.A. programs have been established throughout the country. This trend recognizes the need for programs which are specifically tailored to the academic and artistic development of writers. Because the M.F.A. degree supports such a "writerly" course of study, it is considered the "appropriate terminal degree for the practicing writer" by the Associated Writing Programs. The AWP, to which we belong, is a national consortium of over 300 writing programs and the primary source of information on creative writing programs. Our proposed curriculum changes and revised exam are consistent with the AWP guidelines, which state:

The primary aim of writing programs, through work in writing, form and theory, contemporary writers and/or traditional literature, is to help students become better writers. Writing programs are also characterized by the presence of active and experienced writers on their faculties, and the student's own creative work is seen as the primary evidence for decisions about admission and graduation.

Further, the AWP recommends that "the Master of Fine Arts be considered the appropriate credential for the teacher of creative writing." Since the M.F.A. degree is the preferred final degree for writers, academic search committees around the country are requiring M.F.A. degrees for teaching jobs in poetry and fiction as they are listed in the Associated Writing Programs Job List and the Modern Language Association Job Information List. (See p. 9 for data.) In addition, the M.F.A. degree is the one most useful to graduates seeking work in arts organizations or arts administration.

In contrast, the M.A. degree is increasingly seen as either an intermediate degree for students pursuing a Ph.D. or as the appropriate professional qualification for those intending to teach creative writing in community colleges and high schools. Therefore, if our students are to compete nationally for academic and arts administration jobs in their field, they must have the required M.F.A. degree.

Instituting the M.F.A. degree will attract students of the highest caliber to our program. Presently, the number of applications to the M.A. program is low in comparison to M.F.A. writing programs around the country. Historically, other universities which have made the transition from M.A. to M.F.A. programs have found that the number and quality of applicants have increased significantly. The following statements are representative of the experience of M.F.A. programs generally.

We started with a M.A. in writing and did reasonably well at recruiting good students. We began the M.F.A. in 1980 and have done much better. I have no doubt the M.F.A. is more attractive. Professor Ed Ochester, University of Pittsburgh.

This is the degree that students were demanding. Our program has been strengthened - we are getting better and better students. Professor Heather McHugh, University of Washington.

In addition to attracting the highest level of students, the M.F.A. degree will assist us in recruiting excellent faculty. As other English departments around the country have found, the presence of an M.F.A. degree not only brings increased national visibility to the creative writing program involved, but also serves to strengthen the reputation of the department within which the program is situated.

PROGRAM HISTORY

The University of Minnesota has a distinguished history of attracting writers of national stature to its faculty. Saul Bellow, John Berryman, Allen Tate, Robert Penn Warren, and James Wright have all taught here. Between 1971 and 1985 the English Department hired three "core" faculty in Creative Writing, Michael Dennis Browne, Alan Burns, and Patricia Hampl--all of whom have outstanding records of publications and awards. In 1978, the English Department proposed the addition of a concentration in writing to the existing program for the M.A. degree in English, designated as the M.A. in English with an Emphasis in Writing.

With the arrival of the generous Edelstein-Keller endowment in 1986, the Department was able to expand and improve the M.A. in

Writing program. Endowment funds provided for visits or residencies by distinguished writers (such as Chinua Achebe, Carolyn Forché, Nuruddin Farah, Grace Paley, Mona Simpson, and Isaac Bashevis Singer) in addition to expanded course offerings through the hiring of accomplished adjunct faculty. The Program also acquired office space, part-time staff support, and a faculty Director. Permanent faculty designed new courses and began national recruiting. The Edelstein-Keller endowment, which funds two graduate fellowships per year, greatly assisted this process.

In 1989 the English Department created a five-year plan, which includes a commitment to the development of four specific areas of study. In recognition of the "genuine momentum toward national visibility" and the "pivotal stage of development" of the Creative Writing Program, the plan calls for focusing Department energy in this, as well as the other three, areas. The plan states:

We are singling out these areas for development partly because of their emerging or continuing importance in English studies nationally and internationally, and partly because, in different ways, our programs in these areas are all at critical phases now and our immediate attention to them holds out the promise that they can all become nationally prominent (or more prominent) in the next five years.

In accordance with this plan, the Department gave high priority to the hiring of two new faculty members in Creative Writing, fulfilling this objective in the fall of 1992 with the appointments of Maria Fitzgerald and Valerie Miner. While the Program is still one member short of its goal of five "core" faculty (due to the early retirement of Alan Burns) its additional support from the literature faculty (especially Madelon Sprengnether and Charles Sugnet) gives it the critical strength necessary for the new degree program.

The proposal for a Master of Fine Arts degree in Creative Writing (to replace the current M.A. in English with an Emphasis in Writing) is a logical step in response to the Department's call for excellence and national prominence.

2. ACADEMIC PROGRAM DESCRIPTION

PROGRAM OBJECTIVES

- To provide students of exceptional promise as creative writers with a program of study appropriate to their development as professionals.

- To provide opportunities for students to work under the direction of faculty who are distinguished practicing writers.
- To improve the analytic and creative skills of the writer through faculty instruction and peer interaction.
- To enable students to earn the appropriate terminal degree for college or university teaching or for employment in the world of the literary arts.
- To create a community of writers, including students and faculty, with a shared interest in and knowledge of the craft of writing.
- To assume an appropriate leadership role in the local and regional literary arts community through interactions with other literary arts organizations.

ADMISSIONS: SCREENING CRITERIA

Admission to the M.F.A. program is limited to students with the bachelor's degree or its equivalent from an accredited college or university who demonstrate exceptional promise as creative writers. In addition to Graduate School operational standards, at least one of the following conditions must be met: 1) an undergraduate g.p.a. of 3.5 (or above) for the last two years; 2) a postbaccalaureate g.p.a. of 3.8 (or above) for a minimum of three courses; 3) a verbal score in the 85th percentile (or above) of the GRE; 4) a significant record of publication.

APPLICATION REQUIREMENTS

- A minimum of 16 credits in English, American, or Anglophone literature or language. Twelve of the credits must be at the upper division level.
- Three letters of recommendation from people who can judge the student's academic performance and promise as a graduate student.
- Official score from the general test of the Graduate Record Exam (GRE).
- A substantial sample of creative work (poetry, fiction, or non-fiction) and a description of the student's writing background.
- A short statement explaining the applicant's choice to pursue graduate study in Creative Writing at Minnesota in terms of his or her academic and general experience, including professional and personal goals.

- A calculation of the overall grade point average (GPA) and the GPA for English courses only.

CURRICULUM

According to categories established and defined by the Associated Writing Programs (AWP), this program will be classified studio/academic, a classification which requires course work in the study of literature as well as writing.

The M.F.A. degree program requires a minimum of 68 credits (69 if a minor is included), comprised of workshop and literature courses as well as creative project credits, to prepare a book-length manuscript. The program also requires an exam specifically designed for writing students.

The requirements for the proposed M.F.A. degree differ from those of the M.A. in Writing as follows.

M.A. in Writing (44 credits)

20 workshop credits

16 credits in language and literature

8 credits in related fields

Reading knowledge of one modern or classical language

M.A. "Two book" exam

2 Plan B projects or 1 creative project

M.F.A. (68 or 69 credits)

4 credits Multi-Genre course

20 workshop credits

20 credits in literature

8 credits in related fields (9 credits for a minor)

M.F.A exam (based on 20 assigned texts)

16 creative project credits

REQUIRED COURSES

First Quarter Mixed Genre Course (4 credits)

All students entering the program will be required to take this course in the fall quarter of their first year. This will be an

8000 level course taught in rotation by program faculty, in which students will read, discuss, and produce writing in the genres of poetry, fiction, and creative non-fiction.

Workshops (20 credits)

Students will take three workshops (12 credits) in their main genre, one 8000 level seminar in their genre (4 credits) and one workshop (4 credits) in another genre. Within the workshop structure, students concentrate on writing by their peers with a substantial amount of time devoted to the reading and critique of manuscripts of class participants. Workshop courses also include selected readings.

Students may choose workshop courses from the sequence of Advanced Poetry, Fiction, and Non-Fiction classes or from the Special Topics courses. Topics courses, which are considered workshop credits, are designed by individual faculty members to explore specific issues in the areas of poetry, fiction, or non-fiction. Topics courses, like other workshop courses, include the critique of student manuscripts by workshop participants as well as the reading of selected literary texts.

Literature (20 credits)

Students will take five courses in literature, which may be drawn from the graduate English curriculum (including courses in theory and linguistics), as well as from the Reading as Writers curriculum offered by the Creative Writing faculty. Reading as Writers courses, which are considered literature credits, are intended to give student writers the opportunity to discuss a number of literary texts, often (but not exclusively) contemporary or modern. Some Reading as Writers courses also involve the critique of student manuscripts by participants. Final projects are generally creative rather than analytic.

Related Fields (8 or 9 credits)

Students will take two courses in related fields outside the department which support their intellectual and creative interests. One of these courses (which may be either studio or academic) must deal with an art form other than creative writing. (Students wishing to add a minor to their concentration will fulfill the requirements of the minor program.)

Exam

Students will take the M.F.A. exam (which will replace the current M.A. in Writing exam) in the spring of their second year. This will be a take-home, comprehensive exam based on approximately twenty texts: creative, analytical, and theoretical. The texts will be determined by faculty and announced spring quarter of the first year. The length of the exam essay will be 15-20 pages.

Creative Project (16 credits)

Students will register for credit (the equivalent of four Independent Study courses at the 8000 level) to work on their projects. Two faculty members, at least one of whom must be a member of the Creative Writing Program, will supervise this project, which will consist of a book-length manuscript in a form suitable for submission to a publisher. Once the project has been approved, students will present an informal reading of their work, open to members of the faculty and their fellow students.

CREDIT DISTRIBUTION

Mixed Genre Course	4
Workshop	20
Literature	20
Related Fields	8 or 9
<u>Creative Project</u>	<u>16</u>
 TOTAL	 68 or 69

3. EDUCATIONAL AND SOCIAL NEED FOR THE PROGRAM

CREATIVE WRITING STUDENTS SERVED

Current M.A. in Writing Students

Forty-five students, at various stages of their degree progress, are currently enrolled in the Creative Writing Program. These students will be offered the opportunity to change to the M.F.A. degree by fulfilling the new degree requirements. Students who entered the Program prior to September 1993 and who have yet to complete the M.A. in Writing must formally apply for admission to the M.F.A. program in order to change their status.

Relationship to Continuing Education and Extension

The process of admission and application is the same for all students regardless of whether they pursue their degrees through Day school or Extension. Since virtually all 5000 and 8000 level courses are open to registration through Extension (in the 1615-1845 time period), students may progress toward their degrees at the same rate through either route. At present four students are enrolled in the M.A. in Writing program through Extension.

M.F.A. Admissions

The Program plans to admit ten to twelve new students annually for the M.F.A. degree. This represents a slight decrease in the number of admissions from previous years--in recognition of the additional faculty effort involved in curriculum planning, advising, administration of the exam, and thesis supervision for the new degree.

OTHER STUDENTS SERVED

The Creative Writing Program serves a substantial number of students (both graduate and undergraduate) outside of its specific degree program. This part of the Program's mission will continue and be enhanced by the M.F.A. degree.

Many non-degree students enroll in Creative Writing courses through the Program in Continuing Education and Extension. Class lists for the 1992-93 academic year (excluding summer session) indicate that 167 students enrolled in 5000 and 8000 level Creative Writing courses.

Undergraduate interest in Creative Writing is strong at the University of Minnesota. In the spring of 1993, the Department revised its major to offer several cluster models of concentration, including one in Creative Writing. The Program's very successful Introduction to Creative Writing (combining a large lecture format with individual discussion sections) regularly fills to its enrollment capacity of 170 students each Fall and Spring. The Introduction to Creative Writing course also fulfills the Diversified Core Curriculum requirement in the Humanities and Arts Category, as defined by the Council on Liberal Education. Other undergraduate offerings typically include several Introductory and Intermediate fiction, poetry, and memoir writing courses per year (a total of 13 courses at the 1000 and 3000 levels for 1994-95). In addition, the Program offers at least two sections per year of a Writing Workshop for Majors (3960) for students who elect the Creative Writing concentration.

The presence of a Creative Writing Program in a Department of English is also attractive to students seeking a Ph.D. There is a vital flow between the two programs, as evidenced by the number of Ph.D. enrollments in Creative Writing classes and Creative Writing students who go on to earn a Ph.D. From the Fall of 1991 through the Winter of 1994, a total of 17 Ph.D. students have taken a total of 29 writing courses. In addition, between 1988 and the present, 14 students (a few of whom contribute to the crossover enrollments) have been admitted into the Ph.D. Program from the Creative Writing Program. One student during this period of time earned an M.A. in Writing degree after having entered the Ph.D. Program. Another student was admitted simultaneously into both programs, and currently there are three change of status applications pending.

EVIDENCE OF STUDENT INTEREST

In 1989, at the request of the Creative Writing Program, Teresa Whitman (herself a candidate for the M.A. in Writing) prepared a report on ways to improve the program at Minnesota, focusing on the advisability of changing to the M.F.A. degree. She gathered

information about writing programs across the country, interviewed Directors of nationally prominent M.F.A. programs, and spoke with writing students at Minnesota. Her report, which concludes that the M.F.A. is the logical next step for Minnesota, states: "The M.F.A. is now the degree of choice for the majority of writing programs across the country. In fact many expressed surprise that I was asking the question." Student letters addressed to the Creative Writing Program faculty, and even to the Dean of CLA, in the following year, confirm this view. One such letter, from the Graduate Student Advisory Committee, recommends the M.F.A. "to enhance the stature of the Program and the 'marketability' of graduate students." Another urges "the adoption of a MFA-degree program, now the nationally recognized terminal degree for writers," while a third simply states "MFA: do it."

This year, in preparing to draft an M.F.A. proposal, the Creative Writing Program sent questionnaires to current students and alumni soliciting their opinions about the possible structure and ultimate significance of the new degree program.

With the exception of one student who works in a corporate environment, graduates of the M.A. in Writing program expressed a preference for the M.F.A. degree. One student was moved to elaborate, recommending the M.F.A. for the following reasons: 1) "an M.A. is not a competitive degree in the college setting. Most colleges will not consider people with an M.A. for tenure track positions," 2) "the University needs an M.F.A. to attract top students," 3) "an M.F.A. program would allow students to complete a booklength manuscript while working with one or more instructors. The Plan B project is a meager requirement for completed work." Many students, incidentally, praised the M.A. in Writing for its emphasis on literary study, an emphasis which is preserved in the requirements for the proposed M.F.A. degree.

Students currently enrolled in the Program responded enthusiastically, and in detail, to questions about the shape of an M.F.A. degree. They stress the importance of: 1) a curriculum and an exam suited to their needs as writers, 2) adequate provision for writing time, 3) diversity in the student body, faculty, and content of their courses, 4) close supervision of their projects, 5) an emphasis on the professionalism appropriate to a "terminal" degree such as the M.F.A. The proposed degree program addresses all of these concerns.

EMPLOYMENT OPPORTUNITIES

Most state and private universities recognize only the M.F.A., not the M.A., as the required degree, even for part-time teaching positions in creative writing. The M.F.A. is certainly the preferred degree for tenure-track teaching jobs in poetry and fiction, as they are listed in the Associated Writing Programs

Job List and the Modern Language Association Job Information List. None of the 50 Creative Writing positions advertised in the 1993 MLA or AWP job lists, for instance, asks for the M.A. degree. Specified degrees are either the M.F.A., or (in special circumstances requiring the teaching of literature and composition) the Ph.D.

In addition to teaching positions, graduates from an M.F.A. program are qualified to seek employment in publishing, editing, journalism, technical writing, consulting, advertising, public relations, and arts administration. The M.F.A. signals the student's professional orientation towards writing and writing-related activities.

RELATIONSHIP TO THE REGION

The unusually dynamic literary life of the Twin Cities presents a compelling motivation for establishing the M.F.A. degree at the University of Minnesota.

Over the past ten years, the Twin Cities has become the home of some of the best independent literary presses in the nation, including: Coffee House Press, Graywolf Press, Milkweed Editions, New Rivers Press, and Spinsters' Ink. The Minnesota Center for Book Arts, which produces fine press editions, in addition to offering classes in printing and other aspects of book production, is also located here. The Hungry Mind Review, a superb national book review, is published and edited locally, as is the Utne Reader, another major national publication. Bookstores, both independent (e.g. Hungry Mind) and major chains (e.g. Barnes and Noble) support the literary endeavors of established as well as emerging writers through their regular reading series.

The literary life of the community is sustained well, moreover, by The Loft, the nation's most lively and well established literary center. The Loft, whose founders include three members of the Creative Writing faculty, Michael Dennis Browne, Patricia Hampl, and Charles Sugnet, offers readings, classes, grants, and a range of seminars and other events. Like the literary events at the Walker Art Center and local bookstores, its programs typically draw large audiences. The Creative Writing Program currently co-sponsors the Loft's Mentor Series, which brings four distinguished writers annually to work with local writers and to participate in public readings and workshops.

The base of financial support for writers in the form of fellowships and grants presents attractive opportunities for local writers. The Bush Fellowship, for instance, which makes annual awards to regional writers, provides a more generous stipend than the Guggenheim Fellowship. The Jerome Foundation, the Minnesota State Arts Board, and the Loft all offer financial

support for emerging and established writers.

Writers and editors, even literary agents with handsome client lists composed of local as well as distant writers, make their home here. No longer a literary outpost, this community has become a destination for serious writers. Outside of New York, there is no single community that offers as much support to literary workers as the Twin Cities.

The diversity and dynamism of the Twin Cities arts community will allow us to offer a degree which draws on its rich resources. Internships at local publishing houses, literary publications, The Loft, the Minnesota Center for Book Arts, and other literary organizations will be available to students in our program. The Minnesota M.F.A. will offer students opportunities in and out of the classroom which few programs in the nation can deliver.

Connections between University faculty and these literary organizations are already in place. The M.F.A. degree will put the University more firmly in the picture of the current cultural life of the state where, by rights, it belongs. The Loft membership, in addition to our own students and graduates from the local liberal arts colleges, currently provide a strong population for the program. With the M.F.A. degree in place, the number of out-of-state applicants will grow, thus creating an even more competitive field in which to encourage excellence.

The vitality of the literary community provides an ideal environment for the M.F.A., which will foster a lively relation among local writers, editors, publishers, and the University community, thus allowing the Creative Writing Program to assume a leadership role and to move to the center of the world of the literary arts.

4. COMPARISON WITH OTHER PROGRAMS

LOCAL PROGRAMS

Hamline University has proposed an M.F.A. program, to begin Fall 1994, which is under consideration by the Higher Education Coordinating Board. Hamline's program, which shares a Director with the Master of Liberal Studies Program, focuses on interdisciplinary study and is designed primarily for part-time students, who may take up to seven years to complete their degrees. The Program, moreover, will rely heavily on adjunct faculty. As their proposal states, "most of the core faculty would work for Hamline on a long-term, but untenured part-time basis." With no endowment (such as the University of Minnesota's Edelstein-Keller fund), the Hamline program is unable to offer fellowships to incoming students and provides only matching funds for visiting writers sponsored by local bookstores and the Loft. Given these fiscal constraints, Hamline plans to move cautiously

toward its long-term goal of regional and national marketing.

STATE PROGRAMS

Moorhead University has proposed a two to three year M.F.A. degree in Creative Writing which is awaiting final approval from the Higher Education Coordinating Board. Their proposed curriculum offers less extensive and diverse writing course options and fewer literature credits than the proposed M.F.A. degree at the University of Minnesota. Two of the writing faculty at Moorhead have significant administrative tasks outside of the Creative Writing Program, which does not anticipate expanding its course offerings by hiring adjunct faculty. Support for writing students (one graduate assistantship) is minimal at this time. The University of Minnesota, in contrast, offers two Edelstein-Keller fellowships and two teaching assistantships in English annually to incoming students. Most students at the U. of M., moreover, have the opportunity to teach at least one course (at the introductory level) while they are in the Program. Because of its location, the Moorhead program will primarily attract and serve students from the surrounding area. The program at the University, located more advantageously in the Twin Cities, will serve students from this area, while continuing to draw from the five-state region and the nation at large.

REGIONAL AND NATIONAL PROGRAMS

There are no Master of Fine Arts Programs in Creative Writing in North Dakota, South Dakota, Nebraska, or Wisconsin. The University of Michigan at Ann Arbor offers a two-year M.F.A. degree. The emphasis at the University of Michigan is on workshop courses (twice as many as literature and related field credits) and the final project. There is no M.F.A. exam. The Writers' Workshop at the University of Iowa, one of the longest established and most distinguished programs in the country, offers a two-year M.F.A., with roughly equal credits in workshop and literature courses, a required exam, and a creative thesis. The University of Minnesota program is comparable in many respects, with the difference that it offers credit for the final creative project, with the requisite faculty supervision. The University of Minnesota M.F.A. will also encompass the field of creative non-fiction, which the Writers' Workshop does not offer at this time. The Stanford Writing Program, the other most notable one in the country, is designed for relatively mature writers and does not offer a degree of any kind. Its sole requirement, during a two year residency, is attendance at a weekly writing workshop.

OTHER DISTINCTIVE FEATURES OF THE M.F.A. AT THE UNIVERSITY OF MINNESOTA

The University of Minnesota M.F.A. is distinguished from most

other programs by the following features:

1. Entering students will be required in the fall quarter to take a multi-genre course. This course, and the proposed curriculum, encourages study of diverse genres, thus providing a practical understanding of the demands of different genres and the relationships among them.
2. Among our faculty there are several writers who have gained national recognition for their work in creative non-fiction. Thus, in addition to poetry and fiction, students will have faculty and program support to study this major emerging genre.
3. The Program has been promised a second Edelstein-Keller endowment, which will include a Chair in Playwriting (to be shared with the Theater Arts and Dance Department). This appointment will enable students to explore the genre of playwriting and to engage in dialogue with distinguished visiting playwrights.
4. Present faculty are specially qualified to offer courses that tie creative writing to contemporary social and philosophical issues. Many of our faculty and students are interested in "engaged writing," the scrutiny of public issues through literature.
5. Among our faculty there is serious involvement with international literature. A number of our faculty have worked abroad as writers and teachers. Both the personal background of the faculty and their creative work reflect a strong interest in exploring the role of literature in the world.
6. The Center for Advanced Feminist Studies at the University of Minnesota acts as an attraction for students who are interested in exploring gender issues through creative writing.
7. Students will have the opportunity to participate in internship programs at writing related organizations such as: the Loft, Coffee House Press, Graywolf Press, Milkweed Editions, New Rivers Press, Spinsters' Ink, The Hungry Mind Review, and the Minnesota Center for Book Arts.

5. QUALITY CONTROL

FACULTY

The current "core" faculty of the Creative Writing Program consists of four tenured faculty: Michael Dennis Browne, Maria Fitzgerald, Patricia Hampl, and Valerie Miner--all widely published, nationally and internationally recognized writers, whose shared professional accomplishments include fellowships

from the MacArthur Foundation, the Guggenheim Foundation, the National Endowment for the Arts, the Bush Foundation, and the Loft, as well as Distinguished Teaching Awards from the University of Minnesota.

Two additional tenured faculty in English, Madelon Sprengnether, and Charles Sugnet, each of whom contributes to the curriculum of the Program and has served as its Director, have distinguished reputations in their respective fields. Together they have won awards from The Loft, the Bush Foundation, and the National Endowment for the Arts.

The Program regularly employs a number of adjunct faculty (approximately fifteen annually) to teach courses in their areas of speciality. All adjunct faculty have significant teaching and publication records. Many have won awards and are nationally recognized in their fields.

Additional courses and workshops will be taught by distinguished authors brought to campus as Edelstein-Keller Visiting Writers for periods ranging from three days to a complete quarter. Visitors to the Program have included Chinua Achebe, Nuruddin Farah, Eva Figes, Carolyn Forché, Nikki Giovanni, Sue Halpern, Joy Harjo, Bill McKibben, Victoria Nelson, Grace Paley, Wendy Rose, and Mona Simpson.

PROGRAM GOVERNANCE

Program governance is already in place. Since 1986, the Program has been directed by a member of the English Department faculty. The Director's duties include general Program planning, supervision of the curriculum, scheduling of workshops and events for visiting writers, organization of staff meetings, coordination of activities with the Director of Graduate Studies in English and with the Division of Continuing Education and Extension, recruitment of promising graduate students, representation of the Program to the AWP (the national consortium of Creative Writing Programs), and outreach to the Twin Cities' arts community. The Program also employs an Assistant to the Director on a 75% appointment, who participates in Program governance and provides other essential services in the form of Program publicity and scheduling, assistance in the hiring of T.A.s and adjuncts, advising, and general office organization. In addition, the Program shares a work-study appointment with the Graduate Program in English for office duties, such as directing telephone calls, scheduling appointments, xeroxing, filing, and fielding questions of a general nature about the Program.

The six regular faculty of the Program (including the Director), who meet as a staff on a bi-weekly basis, are responsible for the following: staffing the core graduate curriculum, evaluating applications for admission, student advising, supervision of

students' creative projects, and general advice concerning course scheduling, visiting writers, and other aspects of Program planning. Under the new degree Program, they will also be responsible for staffing the new Multi-Genre course (in rotation) and for administering the M.F.A. exam.

Beginning in 1994-95, the Creative Writing Program will initiate a "crossover" course with the English faculty, inviting a member of the literature faculty to offer a Reading as Writers course in his or her speciality in exchange for a course offered in English by a Creative Writing staff member. The literature faculty member will also serve for a two-year period on the Creative Writing Program staff, participating in its program governance.

Other members of the English Department will participate in the Program by teaching courses which may be taken as electives in the literature component of the M.F.A. course requirements. Faculty members from the English Department, as well as other departments, may also serve on M.F.A. students' creative project committees.

ACCREDITATION AND REVIEW

The proposed M.F.A. degree is in compliance with the "AWP Guidelines for Creative Writing Programs and Teachers of Creative Writing," the most comprehensive document on this subject. (See the attached statement of criteria.) There is no formal accrediting agency for the M.F.A. degree. The Program in Creative Writing will undertake a review of the M.F.A. at the end of its first three years of operation and thereafter as needed.

6. IMPLEMENTATION

TIME SCHEDULE

Subject to approval by the University Board of Regents and the Minnesota Higher Education Coordinating Board, the Creative Writing Program will admit its first M.F.A. students in the Fall of 1995. The M.F.A. Program will be in full operation at this time.

DEPARTMENT AND UNIVERSITY RESOURCES

The Creative Writing Program requires no additional resources to begin offering the M.F.A. degree. Its current faculty (4 "core" and 2 "contributing" members) and support staff (a 75% assistant to the director and a 50% office assistant) provide the necessary teaching and administrative strength to put the M.F.A. Program into operation. Current space and equipment needs (separate offices and computers for the Director and the Assistant Director, plus general office and filing space) have also been

met.

The Edelstein-Keller endowment income provides support in the following ways: honoraria for visiting writers, fellowships and teaching appointments for incoming students, graduate instructor salaries, adjunct faculty salaries, and other essential Program costs such as publicity and advertising.

The Department of Continuing Education and Extension contributes to the Creative Writing Program by providing salaries for adjunct faculty, graduate instructors, and teaching assistants in courses with joint day school and CEE enrollments.

The English Department normally offers partial salary support for the position of the Assistant to the Director, for the work-study office assistant, for some graduate instructors and teaching assistants, and for general office expenses, such as telephones, xerox, and mailing.

Library resources are adequate to support the needs of Creative Writing students at this time. Wilson library subscribes to 75 literary journals (ones which regularly publish poetry, fiction, and creative non-fiction) and has strong holdings in contemporary Anglophone literature. (For additional information, see the attached letter from Marcia Pankake.)

SAMPLE BUDGET

There are three major sources of support for the Creative Writing Program: the Edelstein Keller endowment, the English Department, and the Department of Continuing Education and Extension. The EK endowment provides income in the range of \$68,000-\$72,000 per year. English Department support (from its soft money budget) averages about \$58,000, and CEE generally provides an additional \$60,000. Although variations in these amounts may occur from year to year, the Creative Writing Program is flexible enough to adjust for them.

The College of Liberal Arts contributes to the program by providing 1/3 salary support (from its hard line budget) for the position of the Assistant to the Director. Theater Arts contributes a course in playwriting (taught by one of its own faculty) and pays 1/2 of the cost of an adjunct faculty member's salary for a second playwriting course. Tenured faculty lines are based in the English Department, which also provides space, equipment, and other office supplies.

The following represents a typical budget year.

Edelstein-Keller Endowment Support

2 graduate instructors (intro courses)	\$5,600
2 adjunct instructors	7,000
1/2 adjunct instructor (playwriting)	1,750
2 EK graduate fellowships	10,000
4 tuition support awards	8,000
1/3 salary for Assistant to Director (includes fringe)	13,200
Program brochure printing	1,200
Program Ads	1,000
1 quarter-long distinguished writer	15,000
2 short-term distinguished writers	6,000
Loft Mentor Series co-sponsorship	1,000

Total EK support	\$69,750

English Department Support

6 TA instructors for 1101	\$15,372
2 adjunct coordinators for 1101	8,000
1 adjunct instructor for 3960	3,500
2 year-long 50% TAs	16,542
1/3 salary for Assistant to Director (includes fringe benefits)	13,200

1 student office worker	1,000

Total instructional and office support	\$57,614
<u>Continuing Education and Extension Support</u>	
10 adjunct faculty instructors	\$35,000
6 TA instructors for 1101	15,372
4 graduate instructors (intro courses)	10,000

Total instructional support	\$60,372
<u>CLA support</u>	
1/3 salary for Assistant to Director (includes fringe benefits)	\$13,200

Total office support	\$13,200
<u>Theater Arts and Dance Support</u>	
1/2 adjunct faculty instructor	\$ 1,750

Total (not including TA and D faculty taught playwriting course)	\$ 1,750
 TOTAL ANNUAL BUDGET	 \$202,686

MFA in Creative Writing Emphasis in Nonfiction

Course number	Title	Credits
REQUIRED COURSE		
EngW 8xxx	Creative Writing Seminar: Mixed Genre Readings	4
WORKSHOP COURSES		
EngW 5210	Topics in Advanced Nonfiction Writing: Writing from Life—Finding a Subject, Creating a Voice	4
EngW 5210	Topics in Advanced Nonfiction Writing: Literary Nonfiction	4
EngW 5201	Memoir Writing	4
EngW 8130	Creative Writing Seminar: The Nonfiction Manuscript	4
EngW 5102	Advanced Fiction Writing	4
LITERATURE COURSES		
EngW 5310	Reading as Writers: Writing from Life—Varieties of Nonfiction Prose	4
Engl 5620	British and American Women Writers	4
Afro 5595	Afro-American Poetry	4
Afro 5596	Afro-American Autobiography	4
Engl 8480	Studies in Folklore	4
RELATED FIELDS		
Mus 5801	Folk & Traditional Music: Cross-cultural Survey	4
WoSt 5301	Women's Autobiographical Narratives	4
CREATIVE PORTFOLIO		
EngW 8xxx	Creative Portfolio	<u>16</u>
	<i>The World Through My Own Eyes: Memories and Reflections</i>	68

MFA in Creative Writing Emphasis in Poetry

Course number	Title	Credits
REQUIRED COURSE		
EngW 8130	Creative Writing Seminar: Mixed Genre Readings	4
WORKSHOP COURSES		
EngW 5105	Advanced Poetry Writing	4
EngW 5107	Advanced Poetry Writing	4
EngW 5120	Topics in Advanced Poetry Writing: The Poet in the World	4
EngW 8120	Writing of Poetry Seminar	4
EngW 5204	Advanced Playwriting	4
LITERATURE COURSES		
Engl 5651	Techniques of Poetry	4
Engl 5831	American English	4
Engl 5433	American Poetry since 1940	4
Engl 5597	The Harlem Renaissance	4
Engl 8530	Studies in 19th Century American Literature	4
RELATED FIELDS		
Arab 5501	Modern Arabic Poetry	4
ArtS 5130	Watercolor	4
CREATIVE PORTFOLIO		
EngW 8xxx	Creative Portfolio	16
	<i>Crossing Borders: Poems and Translations</i>	68

MFA in Creative Writing Emphasis in Fiction

Course number	Title	Credits
REQUIRED COURSE		
EngW 8xxx	Creative Writing Seminar: Mixed Genre Readings	4
WORKSHOP COURSES		
EngW 5101	Advanced Fiction Writing	4
EngW 5102	Advanced Fiction Writing	4
EngW 5103	Advanced Fiction Writing	4
EngW 8110	Writing of Fiction Seminar	4
EngW 5120	Topics in Advanced Nonfiction Writing: The Literary Essay	4
LITERATURE COURSES		
Engl 5671	Theory of the Novel	4
Engl 5151	18th Century English Novel	4
Engl 5152	19th Century English Novel	4
Engl 8240	Seminar: Shakespeare	4
Engl 5131	Renaissance Poetry	4
RELATED FIELDS		
Th 5132	Shakespeare: Histories	4
Th 5823	Interpreting Shakespeare	4
CREATIVE PORTFOLIO		
EngW 8xxx	Creative Portfolio	16
	<i>Out of Measure Sad: A Novel</i>	68

Twin Cities Campus

*Department of English
College of Liberal Arts*

*207 Lind Hall
207 Church Street S.E.
Minneapolis, MN 55455-0134
612-625-3363
Fax: 612-624-8228*

19 April 1994

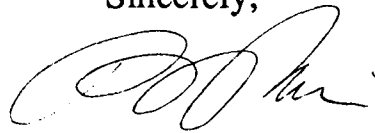
Kenneth Zimmerman
Associate Dean, Graduate School
University of Minnesota
321 Johnston Hall

Dear Ken,

On behalf of the English Department, I am happy to support the proposal to establish a Master of Fine Arts degree in Creative Writing. The Creative Writing Program is one of the finest gems of the department, and the creation of this degree will strengthen the program and make it more attractive to the best students. The proposal was discussed carefully and with great enthusiasm by the entire department, and the faculty gave it their unanimous support.

Please let me know if I can be of help in the furtherance of this proposal.

Sincerely,



Philip Furia
Professor and Chair

APR 18 1994

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Office of the Dean
College of Liberal Arts*

*215 Johnston Hall
101 Pleasant Street S.E.
Minneapolis, MN 55455
Fax: 612-624-6839*

April 15, 1994

Kenneth Zimmerman
Associate Dean, Graduate School
University of Minnesota
321 Johnston Hall

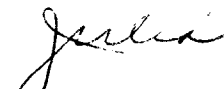
Dear Ken:

I write to express my enthusiasm for the proposal put forward by the Department of English to establish a Master of Fine Arts degree in Creative Writing.

Over the last few years the College of Liberal Arts has provided scarce resources to enhance the creative writing program here at Minnesota. We have been fortunate enough to attract and retain some outstanding writers and scholars to the faculty. We are well-positioned to establish the proposed degree, which we all believe to be in the best interests of our students of writing.

Please let me know if I can furnish further information to you as you and your committees deliberate about this matter.

Sincerely yours,



Julia M. Davis
Professor and Dean

cc M. Sprengnether

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Office of the Dean
College of Liberal Arts

215 Johnston Hall
101 Pleasant Street S.E.
Minneapolis, MN 55455
Fax: 612-624-6839

March 11, 1994

Professor Madelon Sprengnether
Acting Director
Program in Creative & Professional Writing
Department of English
207 Lind Hall

Dear Madelon:

I read the proposal for an M.F.A. in creative writing with interest. The proposal seems to me to be thorough and complete, laying out the history and context for the proposal, requirements, staffing, admissions standards and all the other necessary information for consideration of the new degree.

I was glad to see that you addressed the issue of the number of candidates for the degree to be admitted, since that seems to me one point where questions may be raised in the review process. Because the faculty is small, and because the nature of its creative activities requires some members to take fairly frequent leaves, it will be to everyone's advantage not to overload with too many graduate students. The fact that the MFA is a three year degree, as opposed to the two year MA degree, will increase the number of students enrolled, so a decrease in annual admissions will be necessary. It appears that issue has been considered, and my guess would be that the reduced number you propose will be manageable with existing faculty.

For many years the faculty of the program patiently resisted the notion of offering an MFA, even when others suggested it, because they felt their resources were inadequate. Now the program is ready, and as one of the selected areas of emphasis of the Department of English seems reasonably assured of continued support. I wish you success in this natural next step in the evolution of the program.

Sincerely,



Peter J. Reed
Professor and Associate Dean

cc Julia M. Davis
Kenneth Zimmerman

Twin Cities Campus

Department of Art
College of Liberal Arts

208 Art Building
216-21st Avenue South
Minneapolis, MN 55455
612-625-8096
Fax: 612-625-7881

May 4, 1994

Kenneth Zimmerman
Associate Dean, Graduate School
321 Johnston Hall
East Bank

Dear Dean Zimmerman

I write on behalf of the Department of Art to strongly support the application to establish the MFA degree in Creative Writing from the Department of English. The proposal is well written and thoroughly thought out. Our department especially is pleased to see the creative project component of the degree, as it parallels the creative and visual thesis required in our own MFA program. The requirement for credits in a related field is also an excellent part of this plan, since it seeks to expand the vision and interests of creative writers. The MFA in Creative Writing has become the terminal degree in creative writing. The University of Minnesota cannot remain competitive in this field without this degree.

If approved, the MFA in Creative Writing would join the other MFA degrees in Art and Theatre Arts and I would urge the Graduate School to reconsider the way in which these terminal degrees are handled by the Graduate School. That is, the MFA degrees cannot and must not be categorized with other Masters degrees which are shorter, carry less credits, and are not the terminal degree in the field. MFA students have been disenfranchised in regard to fellowship and thesis support because of this erroneous perception and categorization.

I strongly urge the Graduate School to approve the Department of English proposal for the MFA in Creative Writing.

Sincerely



Wayne E. Potratz
Professor and Chair



cc: Madelon Sprengnether
Curtis Hoard

Subject Bibliography Unit
Room 5, Wilson Library

April 8, 1994

Professor Madelon Sprengnether
Chair, Creative Writing
209 Lind Hall

Dear Professor Sprengnether:

Thank you for discussing with me the plans for the MFA degree. I want to assure you and your colleagues that the library can support your proposed new graduate degree program.

Creative Writing does not make great demands on the Library, and the materials you use also serve other readers. We have broad and deep holdings in all genres of English and American writing, and so our Library has most of the materials you need. We don't have everything, of course, but with advice from your current and past faculty, I have built a selective but strong collection.

Our collections in English and American Literature include about 175,000 books and nearly 600 periodicals. These numbers convey nothing of the quality of the collection, but close examinations of parts of the whole give evidence of its good quality.

- In 1986 100 writers identified the 32 best of an estimated 2000 literary reviews. We owned 26, 81 percent.
- Library Journal in 1991 identified the top twelve literary reviews. Our collection held all twelve.
- We had 68% of the relevant new periodicals in literary studies identified in annual articles in the Dictionary of Literary Biography Yearbooks 1987, 1988, 1989, 1990.
- We found in 1989, by checking two new bibliographies, that we were particularly strong in plays by 30 contemporary British and American playwrights, owning almost everything they had published.
- Of 74 contemporary British poets I checked in 1988, we had works by 72. For two thirds of these 72 poets we owned 30-70% of their books.
- We have 71% of the anthologies in the Poetry Index Annual 1989-90. The remaining titles, books for children or popular anthologies, are not central to our collection.

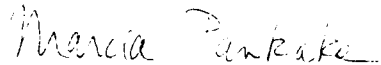
Students and teachers in Creative Writing need not limit their library resources to those at the University of Minnesota. I work with the head of the literature collection at the Minneapolis Public Library, which supplements ours. Their collection, the second largest in the state, is strong in contemporary and Minnesota literature. They also regard their holdings in the short story as one of their strengths. On my recommendation, they often buy periodicals which we do not buy. Similarly, I work with librarians at the University of St. Thomas and at the Minnesota Historical Society. We also have

Page 2
April 8, 1994
Professor Madelon Sprengnether

very strong bibliographic resources to identify and locate materials at other libraries, and our Interlibrary Loans services are second to none.

I expect to continue to work with your faculty and students to provide them with library collections and services that will enrich their work. I hope the new degree will be approved. Please let me know if you have questions or if I may provide other information.

Yours truly,



Marcia Pankake
Professor and Bibliographer
English and American Literature

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of English
College of Liberal Arts*

*207 Lind Hall
207 Church Street S.E.
Minneapolis, MN 55455-0134
612-625-3363*

March 11, 1994

English Department
University of Minnesota
207 Lind Hall
207 Church St.
Minneapolis, MN 55455

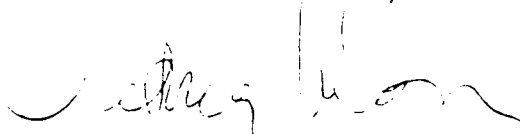
Dear Colleagues:

I want to express my appreciation for your generous invitation to me to be the Edelstein-Keller Writer in Residence for the Winter Quarter. It was a deeply enjoyable experience filled with many fruitful exchanges with my students and fellow faculty members.

As a visitor and not a member of the department's Creative Writing Program, I hope it is not out of place to add an outsider's vote of confidence for the proposed Master of Fine Arts degree. Not only will the proposed degree enhance the quality and reputation of an already strong program, but it will also underscore what visitors recognize as Minnesota's unique opportunities for writers: that rare situation of a state that aggressively promotes and supports the arts with a range of funding. When this much infrastructure is already in place to encourage artistic endeavor, I believe it would be a further bonus if the state's largest and best university offer an arts degree that reflects the strength of its literary community.

Thank you all again for the wonderful hospitality you showed me.

With all best wishes,



Victoria Nelson

MEETING OF THE FACULTY OF THE DEPARTMENT OF ENGLISH
March 15, 1994

Present: All professors who were at the Assembly meeting plus Brown and Wright.

Voting By Proxy: Professors Escure, Messer-Davidow, Copeland, Miner, Sugnet, Hampl.

After the meeting opened at 11:05, the amended proposal by the Creative Writing Program to move from an M.A. degree to an M.F.A. was moved and seconded. Since the proposal was extensively examined at the earlier session, discussion here was brief. The proposal was praised as something which challenged the department to be acceptive rather than exclusionary, and a measure which perhaps should have been enacted earlier. In a voice vote, the faculty passed the proposal unanimously.

MEETING OF THE ASSEMBLY OF THE DEPARTMENT OF ENGLISH
March 15, 1994

Present: Professors Furia [chair], Geffen [secretary], Weinsheimer, McNaron, Garner, Elfenbein, Roth, Damon, Varadharajan, Clayton, MacLeish, Anson, Solotaroff, Leyasmeyer, Sprengnether, Browne, Fitzgerald, Ross, Wallace, Stekert, Hancher, Firchow, Haley; Delegates Hendrickson, Gfrerer, Feldman, Brault, Bass; Observers Gordon, Danley, Scherer, Aitken, Kroll, John, Smith, Meisenheimer, Whitman, Sikorski.

The meeting began at 10:20 with the chair introducing the department's new accountant Linda Danley to the body. The sole item on the agenda was the Creative Writing Program's proposal to change its terminal degree from an M.A. to an M.F.A. Professor Sprengnether, the director of the program, gave the assembly a short history of the program since its inception in 1978, as well as a brief history of how the proposal at hand came into being. She revealed that after passing the department, the proposal must be approved by two Graduate School committees, and then the Board of Regents, optimally at its October, 1994 meeting. The director then outlined the key differences between the current M.A. and the projected M.F.A.

Response to the proposal was uniformly affirmative. One assembly member called the change an excellent idea, and described the proposal as well formulated, and important to the intellectual and creative life of the area. Another member called Sprengnether's work on the project a superb job, and called the key change to the M.F.A. "timely and overdue."

Another member of the body lauded the proposal for being carefully laid out, and singled out the requirement that a candidate for the M.F.A. take courses in another art form for special praise. This member proposed a change to p. 5 of the proposal, whereby "20 credits in literature" would be altered to read "20 credits in language and literature." This was accepted as a friendly amendment by the proposers.

The director of the program and others then fielded questions from the body on such topics as potential changes in the hiring and salary of adjunct faculty, the situation of students midway through the M.A. program, and the continuance of assistantships in literature to M.F.A. candidates.

After the question and answer period, more praise was lavished on the proposal. It was seen as an act which will promote greater unity between the literary and creative sections of the department, a positive move with regard to the department's undergraduate mission, a well-timed and needed measure,

particularly in its elimination of the two-book examination for aspiring creative writers, and the acceptance of a degree which students in the program have desired for a long time.

The meeting concluded at 11:00.

THOMAS A. KELLER III
THIRTY-EIGHTH FLOOR, IDS CENTER
80 SOUTH EIGHTH STREET
MINNEAPOLIS, MINNESOTA 55402

March 4, 1994

Dear Mimi:

Here are my much belated but nonetheless heartfelt thanks for the delightful lunch and the delightful dinner which you and your colleagues arranged -- all to my great delight.

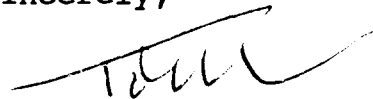
It was thoughtful and gracious of you to do so, Mimi.

Please pass along my thanks to Phil, Chris, Michael and, of course, Vicki.

The dinner and reading were especially memorable.

Finally, another note of heartfelt thanks for the superlative efforts of you and your colleagues in fashioning the Creative Writing Program in such wonderful ways.

Sincerely,



Professor Madelon M. Sprengnether
96 Clarence Avenue SE
Minneapolis, MN 55414

Twin Cities Campus

Department of Educational Policy and
Administration
College of Education

275 Peik Hall
159 Pillsbury Drive S.E.
Minneapolis, MN 55455-0208
612-624-1006
Fax: ~~612-624-7496~~ 612-624-3377

April 29, 1994

Dean Anne C. Petersen
Graduate School
321 Johnson Hall
Minneapolis-East

Dear Dean Petersen:

The College of Education's Committee on Educational Policy will be reviewing on Tuesday, May 3, a request from the Department of Educational Policy and Administration for a free-standing minor in Social and Philosophic Studies of Education (SPSE). The proposal (copy attached) was discussed by the graduate faculty of the Department at a special meeting on March 11 and at a regular Department meeting on April 12; at both meetings faculty attending voiced their unanimous approval. My cover letter attached to the proposal indicates my strong approval.

The proposal for a free-standing minor in being submitted in concurrence with the elimination of the MA degree in Social and Philosophical Foundations of Education (SPFE) and the PhD degree in Educational Policy and Administration (EdPA) with a emphasis in SPFE as recommended by Dean Robert Bruininks after consultation with several committees reviewing programs in the College of Education.

The rationale and purpose for requesting a free-standing minor are provided in the attached proposal.

If you need further information contact me. Thank you for your preliminary review of the request prior to College of Education approval.

Sincerely,



Karen Seashore Louis
Professor and Chair

KSL:mf

Attachment

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Educational Policy and
Administration
College of Education*

*275 Peik Hall
159 Pillsbury Drive S.E.
Minneapolis, MN 55455-0208
612-624-1006
Fax: ~~612-624-7196~~ 612-624-3377*

April 12, 1994

MEMORANDUM

TO: The C.E.P.

FROM: Karen Seashore Louis *KS*

SUBJECT: Proposal for a graduate minor

The recent decision to eliminate graduate level degree programs (M.A. and Ph.D.) in Social and Philosophical Foundations leaves a gap in the College of Education's training programs that needs to be addressed. Many of the EdPA doctoral students take a substantial number of foundations courses over and above the core department requirements. In addition, quite a few students in our remaining programs (and we assume in some other departments) aspire to teach in smaller departments of education in which they must often teach undergraduates across disciplinary boundaries. One area that needs to be covered in many of these settings is foundational studies. In addition, a small number of students from other departments (political science, philosophy, history) in the university are interested in foundational studies in education. In order to ensure that students have access to appropriate training in this area and are able to assert their competence in foundations, we propose to institute a graduate minor, which is described in the attached materials.

This minor is consistent with the Dean's expressed intention to eliminate 8XXX "SPFE" courses with low enrollment. It is based on existing courses that we intend to maintain outside of a degree program because they are either part of our EdPA department core for the Ph.D., or are sufficiently popular to warrant their continuation. No new faculty effort will be required to initiate or maintain this minor. On the other hand, we believe that the social sciences, history and philosophy will continue to be critical to the study of education, and that it is to the College's strategic advantage to maintain a visible non-degree presence in this area.

UNIVERSITY OF MINNESOTA

Twin Cities Campus

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159 Pillsbury Drive S.E.
Minneapolis, MN 55455-0208
612-624-1006
Fax: 612-624-3377*

12 March 1994

Dr. Kenneth Zimmerman
Associate Dean
Graduate School
325 Johnston Hall

Dear Dean Zimmerman:

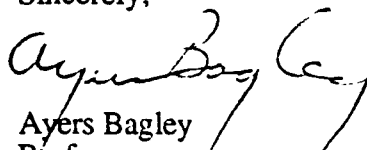
At its March 11 meeting, the faculty of Educational Policy and Administration discussed at length the recent decision of the College of Education to terminate the SPFE graduate programs. After due consideration, the faculty unanimously endorsed a motion designed to preserve optimally the features of SPFE that the College wishes to preserve. The motion calls for reducing the M. A. and Ph. D. concentration in Social and Philosophical Foundations of Education to the status of a free-standing minor at the master's and doctoral levels.

The proposed reduction represents a third step in a sequence that began two years ago, down-shifting SPFE from a graduate program to a concentration in Educational Policy and Administration. Neither the College nor the Department wishes SPFE functions to disappear. We believe that the minor will enable these functions both to maintain visibility and serve the interests of students majoring in the various fields represented in the College and elsewhere in the University, e.g., American Studies, Anthropology, History, Philosophy—to name a few.

We hope that this recommendation can be considered by the Education and Psychology Policy and Review Council at its next meeting. Among relevant considerations are those of costs, faculty participation, and administration. We foresee negligible costs in maintaining graduate minors in Social and Philosophic Foundations of Education (A slight modification of title, "Social and Philosophic Studies of Education," would have the aesthetic advantage of paralleling the "studies" designator used for several other University programs). Members of the EdPA graduate faculty will continue to offer courses essential to the area of study. Registering minors can be done efficiently and with a minimum of form-filing. Existing graduate faculty members in EdPA who have officially participated in SPFE, together with Associate Members of SPFE, can act on occasional questions, e.g., appointments to limited teaching status, representation on graduate committees for students with a declared SPFE (i.e., SPSE) minor.

With regard to students currently pursuing concentrations in SPFE, present EdPA administrative arrangements are sufficient. Professor Karen Louis, Chair of EdPA, has agreed that the department will support the necessary administrative functions.

Sincerely,


Ayers Bagley
Professor
Social and Philosophic Foundations of Education

**Freestanding graduate minor in
Social and Philosophic Studies of Education
University of Minnesota**

Course of Study

The graduate minor in Social and Philosophic Studies of Education serves M.A. and doctoral students in relevant fields such as American Studies, Anthropology, Education, English, History, Philosophy, Political Science, Philosophy, Sociology, Women's Studies.

Curriculum

The graduate minor in Social and Philosophic Studies of Education provides a multidisciplinary foundation for the study of education in the perspectives of history, philosophy, and the social sciences. A minor for either the master's or doctoral degree may be earned in Social and Philosophic Studies of Education. The minor program is shaped to suit the particular needs and interests of the student. Courses are selected in consultation with the coordinator of SPSE graduate studies in Educational Policy and Administration from a list of existing courses in EdPA at the 5-XXX and 8-XXX levels and from 5-XXX and 8-XXX courses in adjacent fields.

Prerequisites for Admission

Admission to the Social and Philosophic Studies of Education graduate minor is contingent on prior admission to a master's or doctoral degree granting program within the Graduate School. Interested students should consult with the coordinator of SPSE graduate studies in Educational Policy and Administration.

Application Requirements

Students who wish to plan or declare a graduate minor in Social and Philosophic Studies of Education should contact the coordinator of SPSE in the Department of Educational Policy and Administration, which provides the administrative home for the graduate minor. The DGS in the department must approve the applicant's proposed course of study and indicate that approval by signing the student's Degree Program form.

Minor Requirements

M.A. students must complete at least 12 graduate credits in approved courses in two areas of study. Ph. D. students must complete at least 18 graduate credits in approved courses in two areas of study and have a faculty member in Social and Philosophic Studies of Education on their preliminary examination committees. See attachment for a list of approved courses and distribution requirements.

Language Requirements

No language requirement is specific to the minor.

For further information and applications

Contact the Director of Graduate Studies, Department of Educational Policy and Administration, 275 Peik Hall,

List of Courses Approved for the Graduate Minor in Social and Philosophic Studies of Education

Distribution Requirements

For the M.A. minor, courses from at least two Areas I–II

For the Ph. D. minor, courses from at least three of Areas I–II

Area I History and Philosophy of Education

EdPA	5101	Foundations of Modern Education
	5102	Education Imagery in Europe and America
	5155	History of Western Educational Thought
	5156	History of Ideas in American Education
	5170	American Pragmatism and Education
	5182	Comparative Philosophies of Education
	5xxx	education and applied ethics
	8261	Problems: History and Philosophy of Education
Phil	5324	Ethics and Education
WoSt	5103	Feminist Pedagogy

Area II Social Sciences and Education

EdPA	5131	Comparative Education
	5171	Anthropology and Education
	5174	Field Method for the Study of Education
	5175	Systems Thinking for Innovative Professionals
	5176	Ethnographic Research Skills Laboratory
	5190	Sociology of Education
	5209	Education in Future Social Systems
	5211	Social Designs and Educational Futures
	5280	Introduction to the Economics of Education
	5202	Politics of Education
	8170	Seminar: Research Methods in Anthropology and Education
	8268	Seminar: Social and Educational Futures
	8340	Policy Systems in Education

4 March 1994

To: EdPA

From: Ayers Bagley, Professor

Re: Memorandum (2/1//94) on the discontinuation of the graduate emphasis in Social and Philosophical Foundations of Education

Terminating the SPFE graduate program eases some administrative problems in EdPA and in the College of Education. The aim of "integrating" EdPA appears to have been advanced through program reduction; program reduction satisfies demands on the College from University administrators. Closing the box labeled SPFE, however, raises a variety of questions regarding the status of foundational studies of education in EdPA, the college, and the University. The Memorandum on SPFE (hereafter, SPFE) clearly answers some of the more basic questions, especially in relation to college-wide functions.

I

SPFE in the college. The Memorandum reaffirms the importance of foundational studies in the college. Pointed phrases and telling examples drawn from SPFE's list of course offerings leave no uncertainty in several areas. Having assured the tenure of three long-term SPFE faculty members in EdPA, the Memorandum proceeds to assert that "The college will still maintain an active program of service courses in this area [i.e., SPFE] . . ." The service courses identified imply recognition of need in the college for (1) the deep perspectives on education provided through studies in the history and philosophy of education, (2) the penetration provided by philosophy of education, (3) the ethnographic/ethnologic expertise and generous views of human diversity and commonality afforded by an anthropological outlook on education, (4) the richly imaginative approach to educational projection and planning enabled by systems-thinking and a futures orientation.

SPFE and qualitative research methods. The Memorandum also asserts that a task force will be appointed "to develop a sequence of core courses in qualitative research methods . . ." Whatever is decided eventually on the specifics of such a college core sequence, the Memorandum clearly implies the relevance of methods in history and philosophy of education, likewise in those of ethnography/ethnology and systems/futures in education.

II

Foundational studies in EdPA. Having declared the demise of the SPFE program, and having affirmed the importance of foundational studies in the College, the Memorandum does not broach further questions concerning the role of foundational studies within the Department of EdPA, neither in its special projects nor its graduate degree programs. It does put into question 8xxx level SPFE courses and some indeterminate number of 5xxx level courses. Exploring such questions belong to future agendas. This memo may be of assistance.

Background. During the mid-70s, long before a Department of EdPA was imagined, several SPFE faculty members regularly gave focal attention to the concept of "educational policy." Textual evidence of this appears in an anthology of readings prepared by the SPFE faculty for "School and Society." Ayers Bagley edited the first edition; Marion Dobbert prepared the second. Featured in the anthology was Stanley Ballinger's innovative treatise on the nature and study of educational policy. (One of Bagley's principal mentors, Ballinger was a professor of history and philosophy of education at Indiana University during the 50s and 60s, and the founder of what was probably the first academic center officially dedicated to the study of educational policy, c.1962.) Impressed by Ballinger's treatise, SPFE faculty members, like Ballinger, recognized that the inherent complexity of educational policy studies required interpretive framing in the perspectives of history, philosophy, and the social sciences. In passing, it may also be noted that Bagley's paper on "Value Dimensions of Comparative Education," presented to the National Society of College Teachers of Education (February 1966) drew heavily from Ballinger's work on policy.

Strategic value of an orientation to policy. It was not difficult for SPFE faculty members to see that educational policy is a strategically useful point of departure for a range of educational studies. In "School and Society" it proved especially useful as one means of getting at many kinds of issues typically addressed in the course. Neither was it difficult to understand that knowledge of educational policy is necessary to the preparation of competent education professionals, whether their duties were inside or outside of classrooms. It should stressed, however, that specialists in the SPFE fields were not alone in recognizing that educational policy studies become unacceptably shallow when provisions for disciplined inquiry and teaching neglect penetration into the foundations of educational policy. The reasons for this requirement are not obscure.

Substance and depth. Educational policies, whatever else they may be, represent formulations intended to guide practice toward the realization of what is valued in the culture that generates the policies. If a culture is deep and complex, its conditions diverse, then its educational policies—ideal and actual—will variously exhibit continuities and discontinuities over time. These will be hardly comprehensible apart from broad-based, long-term historical knowledge of educational thought and practice. In our educational ideals, in our related policy agreements and conflicts, we children of Plato's Athens, of Cicero's Rome, of Alexandria, Jerusalem, Paris, Wittemberg, Oxford and Cambridge, of Cotton Mather's Boston, Franklin's Philadelphia, Jefferson's Monticello, and of many other profoundly influential foster parents.

Because of the dramatic, pressing nature of educational policy disputes in late 20th c. America, and because of the peculiar character of the American moral and intellectual climate, the relevance of political and economic analyses of educational policy is readily apparent, less so the historical and philosophical. Practicalities of politics and economics daily beleaguer school and university administrators. Mass media trumpet economic and political policy disputes relevant to education. Policy-study institutes of various ideological stripes, some of them well-grounded in sophisticated philosophical traditions, vigorously publicize educational policy recommendations. They want reforms. Policy reforms are also wanted by many school personnel and by many professors, including professors of education. However, one of the responsibilities of educational policy-study in a university—perhaps a unique responsibility—is to cultivate an understanding of educational policy that transcends the doctrinaire and that gives due consideration to the historical, philosophical, and cultural depths of the subject.

A concentration or emphasis in foundations of educational policy? Students majoring in Educational Policy and Administration may reasonably be expected to achieve depth of preparation in the foundations of educational policy. Some might wish to achieve considerable depth. The Department of EdPA has strength in the foundational disciplines, particularly in the social sciences—several faculty members are trained in sociology, or political science, or economics. EdPA also has a solid array of courses in the history and philosophy of education (mainly history of ideas). Having lost its position in philosophy of education, EdPA must now obtain most of its course offerings in current philosophies of education through contributions provided by a colleague whose primary responsibilities are to Mathematics Education. Nonetheless, an inventory of EdPA courses suggests that the inclusion of "policy" in the name of the Department and its graduate degrees

may be justified chiefly by departmental courses in foundational studies. Without them, EdPA's claim to policy study might look rather thin if not hollow.

III

SPFE courses essential in a university. Affirming the need for service courses in the foundational studies of education "for students enrolled in other graduate programs in the college," the Memorandum maintains a commitment consonant with long traditions in this and other major American universities. "Education," after all, ranks among the most prominent thematic complexes characterizing western civilization. This is a fact attested by documents from all eras—ancient, medieval, modern. Hence, in a distinguished university aspiring to "world class" status, a college dedicated to studying and teaching about education and to the preparation of education professionals assumes responsibility for disseminating more than pedagogical knowledge and more than technicalities. It assumes responsibility to support disciplined inquiry and teaching designed to enhance understanding of education in the panorama of human civilization. An emblem of this principle at the University of Minnesota may be seen in the career of Regents' Professor Robert H. Beck, in his history of the college, and in the Beck family legacy to the college supporting studies of "educational ideas" beyond pedagogy.

SPFE studies in the college and university. Foundational studies of education housed in a college of education properly give first priority to the needs of that college. Yet college membership in a university suggests the appropriateness of inter-collegiate cooperation. Enlightened college and university administration might be expected both to encourage and facilitate wide access to foundational studies of education relevant to the academic needs and interests of students, whatever the collegiate affiliation students may have within the university. Provisions of this kind would not be novel at the University of Minnesota.

During the 50s to mid-60s, College of Education courses in the history and philosophy of education served cross-collegiate interests. Enrollments included students from a wide diversity of university programs. Such enrollments declined during the 70s and 80s. The contributing causes were several; not least among them were restrictive concerns for departmental "efficiency" and "accountability." A few SPFE courses still continue to serve cross-collegiate interests. Consider, for example, "History of Western Educational Thought" (EdPA 5155), a course in education classics. Enrollment patterns in the course have varied considerably. In recent years, it has sometimes enrolled students

mainly from majors outside the college; in one instance, nine out of twelve. (I use this example because it is available; other SPFE courses may show similar patterns, but such information is not readily at hand as I write.)

IV

A free-standing graduate minor in SPFE studies? Recent college efforts to create an undergraduate minor in education testify to an all-university frame of reference.* Along this line, consideration might be given to exploring prospects for the development of a free-standing graduate minor in foundational studies of education. Faculty members in various academic units of the university have shown transient interests in educational studies. These interests wax and wane, and therefore do not meet the need for stability required by on-going programs.

To be sure, College of Education programs could not afford the discontinuities in teaching and research entailed by the intermittent character of interests in education which typically result when primary allegiances are to disciplines, fields, departmental missions other than those dedicated to foundational studies of education. While transient interests are insufficient to regular program needs, a university-wide graduate minor in foundational studies of education could provide an organizational setting (1) stabilized by *SPFE* faculty and other qualified EdPA faculty, and (2) warmly accommodative of faculty interests in educational studies, which crop-up from time to time in various academic units of the University, e.g., History, Philosophy, Anthropology, Center for Medieval Studies, American Studies, Women's Studies, to name a few.

At this point, it would be premature for me to write more about a free-standing graduate minor in *SPFE* studies. If the idea is seen to have sufficient merit, I would be pleased to participate in exploring it, beginning next fall quarter.

*Exhibit: Here is a key paragraph in a committee-drafted description (4/30/93) of a proposed Education Minor open to all University of Minnesota students pursuing a Bachelor of Arts or a Bachelor of Science Degree.

"The intent of this minor is to provide an introduction to the study of formal and informal education and to the education professions as a component of the liberal arts. The minor will clarify the role of education in preserving and developing human culture. Education is viewed in part as schooling, including attention to patterns of curriculum and instruction, and to related assessments of issues, knowledge, and values. Education is also viewed more broadly: the study of education introduces theoretical bases for understanding human learning, motivation, and individual development; it delineates contexts for interpreting educational processes, institutions, and policies in social, political, historical, and cross-cultural/cross-national perspectives."

*Twin Cities Campus**Department of Educational Policy and
Administration
College of Education**275 Peik Hall
159 Pillsbury Drive S.E.
Minneapolis, MN 55455-0208
612-624-1006
Fax: 612-624-3377*

MEMO: May 2, 1994
TO: Committee on Education Policy
FROM: W. Ammentorp, DGS, EDPA

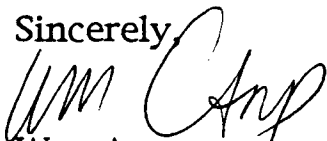
RE: Consolidation of Master of Arts Offerings:

The faculty in Education Policy and Administration has voted to bring its Master of Arts Degrees under the single program area of EdPA. Thus, M.A. Degrees in Higher Education, International Development Education, and Educational Administration will be subsumed under Education Policy and Administration. This configuration is consistent with the Department's recent action on the Ph.D. - which is now offered only in EdPA.

The Department is planning to retain emphases in the above areas even though there would be no formal recognition in student degree programs.

We are asking the Committee to approve this action and to forward their recommendation to the Graduate School so that any changes might be reflected in the upcoming Bulletin.

Sincerely,



Wm. Ammentorp
DGS, EdPA

WA:hs

APR 21 1994

UNIVERSITY OF MINNESOTA

Twin Cities Campus

School of Social Work

*400 Ford Hall
224 Church Street S.E.
Minneapolis, MN 55455
612-624-5888
Fax: 612-626-0395*

April 20, 1994

Dean Kenneth Zimmerman
Graduate School
325 Johnston Hall
Minneapolis Campus

Dear Dean Zimmerman:

The School of Social Work was informed last week that it will receive Strategic Investment Pool (SIP) funds for our proposal to develop a Collaborative Regional MSW Program offered via Distance Education.

We are requesting approval from the Social Sciences Policy and Review Council to proceed to implement this proposal in 1994-95.

In the next three months, the School of Social Work would develop the following:

- In collaboration with the Social Work Department at Moorhead State University, offer a portion of our MSW program through distance education on the Moorhead campus.
- Admit a cohort of students who meet the School of Social Work's admissions standards, to begin taking graduate-level courses beginning fall quarter 1994. BSW graduates who can be admitted to our advanced standing MSW program will be targeted.
- Enter into an agreement with Moorhead State University's Department of Social Work for faculty to provide advising and coordination to students on-site in Moorhead.
- Arrange to offer a minimum of 2 courses per quarter to the Moorhead site via distance technology, using existing MSW courses in our weekend studies program.

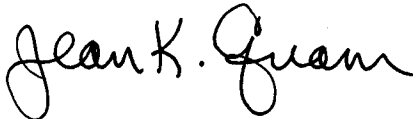
We are beginning the program with Moorhead State University because of planning that has been explored with their faculty and because of that university's experience with distance education offered by the University of Minnesota's School of Nursing. I have begun discussions with the heads of social work departments at Bemidji State University and the University of Minnesota - Duluth, and planning for collaboration with these and other regions will continue in 1994-95. We would expect to have a complete degree program in place by fall of 1995.

Dean Zimmerman

Page 2

I apologize for the haste with which we present this proposal for the Policy and Review Council and the Executive Committee of the Graduate School. A more complete proposal will be presented to the fall quarter 1994 meetings of these bodies. In the meantime, we are asking for approval to admit students to begin a partial MSW program and to offer a portion of our graduate program via distance education in fall quarter 1994.

Sincerely,



Jean K. Quam, Ph.D.
Professor & Director
School of Social Work

enclosure: S.I.P. proposal

1994-1995 Annual Budget-Decision Item

Resource Responsibility Center [Area Class]: TCHE/College of Human Ecology

Item Title: Collaborative Regional M.S.W. Program Offered Via Distance Education

	<u>Request</u> <u>1994-1995</u>	<u>Projected</u> <u>1995-1996</u>
Expenditures:		
O&M	\$385,000	\$425,000
Revenues:		
Graduate Tuition	\$412,000	\$425,000

Description

The School of Social Work is requesting funding for five full-time faculty and one staff coordinator to offer a regional Master's in Social Work (M.S.W.) program in collaboration with state universities and private universities in Minnesota, South Dakota, Iowa, North Dakota and northern Wisconsin via distance education. Specifically, we will offer advanced, second year courses to those areas where existing programs can offer first year generic courses in social work. Recruitment, admissions, and advising will be handled by the faculty and staff on the Twin Cities campus. Currently an on-site model of this program offered on weekends is generating \$400,000 per year in graduate tuition. Three graduate courses have been successfully offered around the region. For example, one graduate course enrolled 87 students at eight different sites. The Minnesota Department of Human Services as well as several county agencies support this proposal.

Rationale

This proposal advances the strategic directions of University 2000 by providing a high-demand professional education to students who will ultimately improve the quality of life in the state; provides greater access to the University of Minnesota's resources, particularly in the areas of child sexual abuse, mediation, family violence, and gerontology; and presents a user-friendly University that cares about Greater Minnesota as well as the metropolitan area.

The mission of the School of Social Work is central to the mission of the University and to the mission of the state. The School of Social Work is a high-quality program which is consistently ranked in the top ten (out of over one hundred and fifty social work programs). But, we will lose our competitive edge as other programs move into regional offerings. The demand for our program is high and applications are increasing. The program attracts students of color such that 30% of the entering M.S.W. class in Fall, 1993 were students of color. The technology to support regional distance education is currently available and is under-utilized on campus, particularly at the times that we would like to use it on weekends and evenings.

Outcomes

Primary outcome is the development of a strong regional Masters in Social Work program that can serve as a model of how to develop quality professional education using distance education technology. Social workers who work in remote areas of this state and surrounding states will have easy access to graduate professional education in their home communities. The image of the University of Minnesota will be enhanced as an institution that serves all of Minnesota and not only the metropolitan area.

MOORHEAD STATE UNIVERSITY

Moorhead, Minnesota 56563

April 20, 1994

Dr. Jean Quam, Director
School of Social Work
400 Ford Hall
University of Minnesota
Minneapolis, MN 55455

Dear Dr. Quam:

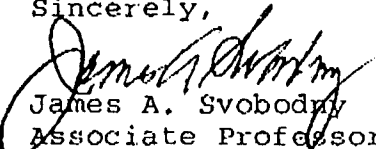
We are excited about working with the University of Minnesota School of Social Work in a collaborative effort to offer a possible Master of Social Work degree program through distance education on the Moorhead State University campus.

We realize that we are at the beginning of the planning process, and details need to be worked out along with approval at many levels. We also recognize that a need could be met in the region by offering an alternative program to BSW graduates, who for various reasons cannot attend a traditional MSW program.

This week we are surveying our graduates (N=403) from the last five years through the mail to determine their interest in such a program. We will forward you the results of that survey when they are available.

We will keep you informed about how the discussions are going on this end. We look forward to this exciting new possibility.

Sincerely,


James A. Svobodny
Associate Professor and Chairman
Social Work Department

110

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Water Resources Research Institute
College of Natural Resources
150 University Avenue
St. Paul, MN 55106

RECEIVED

JL - 6/30/94

GRADUATE SCHOOL

612-624-9282
Fax: 612-625-1263

June 30, 1994

Vice President Anne Petersen
Dean of the Graduate School
321 Johnston Hall
Minneapolis Campus

Dear Anne:

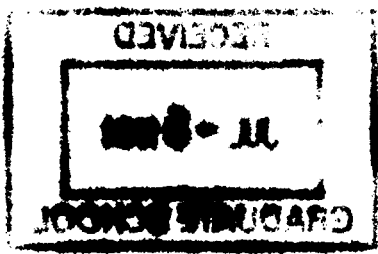
I am pleased to transmit with this letter the proposal for an interdisciplinary graduate degree program (M.S. and Ph.D.) in water resources science. The proposal is changed only slightly from the earlier version that you reviewed and that was approved by the Graduate School Executive Committee. The changes were mostly cosmetic -- corrections, clarifications, and reformatting into the form requested by the Office of Academic Affairs. I understand that you will transmit the proposal to Academic Affairs by the July 15 deadline.

Please contact me if you have any questions about the proposal. On behalf of the planning committee for the proposal, let me express our thanks for your support of the program.

Sincerely yours,



Patrick L. Brezonik
Professor and Director



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Academic Program Proposal Summary
Educational Planning and Policy Committee

Program Title: Water Resources Science (M.S. and Ph.D.)
Campus: Twin Cities and Duluth (CIP Code Number: _____)
College: Graduate School
Proposed Implementation Date: Fall Quarter 1995
Program Length (credits): 44 cr. M.S.; var. cr (~100), Ph.D.
Number of Graduates at Full Operation: ~15 M.S./yr.; 3-6 Ph.D./yr.

Program Description:

Summary Description of Program: This interdisciplinary program will produce graduates with broad training in water-related sciences and a multi-disciplinary perspective on water research and/or management. Graduates will have: (1) technical skills in disciplines relevant to water resources; (2) a holistic understanding of the hydrologic cycle and the interconnectedness of the sciences required to understand it; and (3) an appreciation for the social dimensions of water resources, including the public policy/legal frameworks in which they are managed and protected.

Admission Requirements: B.S. degree in physical or biological science or engineering with minimum GPA of 3.0 (on 4.0 scale); two courses each in calculus, physics, and chemistry, and one course in biological science.

Curriculum: Core program including surface and groundwater hydrology, limnology, and aquatic chemistry; one course in technical aspects of water quality management and one course in policy, legal and institutional aspects of water management. Elective courses in one of three areas of specialization plus supporting course work program. Project, thesis or dissertation as appropriate for the degree.

Internal Review and Support: Proposal has been reviewed by graduate faculty of existing graduate minor in water resources and by other water-related faculty in over 15 departments, eight department heads, five deans, two vice-presidents, three Graduate School P & R Councils, and the Graduate School Executive Committee. One dean and three department heads raised questions regarding support and need for the program. These questions were answered in writing to their satisfaction, and there is no internal opposition to this proposal.

Rationale for Offering Program: Water resources and environmental problems have become increasingly complicated and interdisciplinary in scope. There is a strong need for water professionals with the broad, integrated training this program will provide. The program is within the University's land-grant mission and its role as the leader for graduate education in Minnesota. It is consistent with University's strengths in water-related disciplines.

Collegiate/Campus Priorities: The Graduate School strategic planning committee for research and postbaccalaureate education encourages interdisciplinary programs. The University Strategic Planning Committee on Water has recommended the establishment of an interdisciplinary graduate program in water like the one being proposed.

Budgetary Implications of Program Implementation: This program is well within the capabilities of the University's resources.

Redirection of Resources: Operational costs will be supported by the Graduate School.

Number of New Courses to be Developed: No new courses are needed; some courses will be modified.

New FTE Faculty: None is required.

Physical Facilities: No new facilities required; students will be housed in existing departments.

Information Services: Because of University strengths in water disciplines, library and computer facilities are more than adequate.

Academic Program Proposal Summary
Educational Planning and Policy Committee

Page 2

Program Demand.

Master's graduates of this program will find ready employment by agencies responsible for water and natural resource management at all levels of government, as well as by consulting firms in Minnesota and elsewhere. Ph.D. graduates will find a ready market for their skills in research and teaching institutions (colleges, universities, government laboratories), as well as in private consulting firms. Based on stated interests of applicants to established programs in various water-related disciplines, we find a strong demand by prospective students for an integrated, interdisciplinary program like the one being proposed.

Program Duplication:

There are no comparable programs in Minnesota or elsewhere in the Upper Midwest.

Diversity:

No faculty will be hired directly as a result of this program. The program will follow University guidelines and use established resources for recruiting female and minority students. Based on enrollments in established discipline-based water-related programs, we expect a that substantial fraction of the applicants will be women. The program will make a special effort to recruit Native American students, who may find the program attractive because of increasing emphasis by tribal governments on natural resource management.

Program Quality:

The strengths of the University of Minnesota across a broad range of water-related fields are matched by few if any other universities in the United States. The University has an outstanding group of faculty in a wide range of water-related sciences, and the graduate faculty for this program will be drawn from this group. Input on curriculum and program management was sought from a wide range of faculty in many disciplines developing the proposal for this program. The proposers of the program set high admission standards for the program, established a demanding curriculum, and developed a rigorous preliminary examination procedure for Ph.D. students.

Timetable for Program Evaluation:

A preliminary evaluation will be conducted after the third year of the program's operation to determine whether it is on the right track. The evaluation will be conducted by a team of faculty selected from within the University by the program's administration and Graduate School. A full evaluation will be conducted in the program's sixth year. This evaluation team will be appointed by the Dean of the Graduate School.

**Higher Education Coordinating Board
Application Form for New Academic Program**

COVER SHEET

1) Institution Name University of Minnesota

2) Program Title

M.S. and Ph.D. in Water Resources Science

Classification of Instructional Program (CIP) code number: _____

3) Program Location:

Minneapolis, St. Paul and Duluth campuses

4) Implementation date: Fall quarter 1995

5) Program length (credits): 44 credits, M.S.; ~100 credits, Ph.D.

6) Number of graduates at full operation: ~15 M.S./yr.; 3-6 Ph.D./yr

7) Governing Board approval date: _____

8) Brief Program Description:

This is a system-wide interdisciplinary graduate program in Water Resources Science leading to M.S. and Ph.D. degrees. Its graduates will receive a broad training in water-related sciences and a multi-disciplinary perspective on water research and/or management. Program graduates will have developed the following qualities: (1) technical skills in scientific disciplines relevant to water resources; (2) a holistic understanding of the hydrologic cycle and the interconnectedness of the sciences required to understand the complicated resources (watersheds, aquatic ecosystems) on which they will work; and (3) an appreciation for the socio-cultural dimensions of water as a natural resource, including the public policy and legal frameworks in which water resources are managed and protected.

University Response to the Four Criteria Considered by the Minnesota Higher Education Coordinating Board

1. Is the Program Necessary?

Minnesota has diverse and extensive water resources, and they probably constitute its most important natural assets. They also represent a highly significant economic resource, not only for the recreational industry, but also for commerce and agriculture. Their presence contributes to the way and quality of life that endears this state to its citizens and visitors. Protection and management of these resources is a large enterprise in the state, involving numerous governmental agencies at federal, state, regional, and local levels, as well as a growing number of businesses in the private sector. Water problems are becoming more complicated as our technological society continues to develop, and as the state's population continues to grow and spread to once rural areas. In addition, laws regulating water use have become more numerous and detailed. Water resources experts increasingly face the need for knowledge in a variety of disciplines; water resources management has become a multi-disciplinary and interdisciplinary practice.

Within the past few years, water scientists in higher education have recognized the emergence of water resource science (also called hydrologic science by some) as a distinct field of inquiry. Previously, the field was recognized only as fragmented sub-areas within numerous traditional disciplines. Over time, the study of water problems by scientists at the interfaces between traditional disciplines led to a blurring of the original disciplines. A maturation of these subfields and their integration to address complex water issues in turn has led to a recognition of the field we now call water resources science. A widely publicized 1991 report by the National Academy of Science called *Opportunities in Hydrologic Science* has stimulated the development of inter-disciplinary graduate programs by that name at several graduate research institutions across the country. The NAS report and new programs are a response to the demonstrated need to provide training to water resources professionals that crossed a number of traditional disciplines and the recognition that most existing degree programs are not structured to accomplish this.

This proposal for a system-wide, interdisciplinary graduate program in water resources science was developed in response to the above considerations. There is and will continue to be a need for well-trained technical experts in water resources. At least some of these individuals need a working knowledge of a broader range of scientific disciplines than they would gain from degree programs housed in traditional departments. The solution of current water resources problems requires individuals who can synthesize and integrate information across a range of traditional disciplines, not just individuals who can develop and analyze information in one discipline. These individuals also need an appreciation of the socio-economic and legal-administrative framework in which water resources are managed in this country. This interdisciplinary graduate program will fill these needs in a highly cost-effective manner because the Twin Cities and Duluth campuses of the University of Minnesota already have an impressively broad collection of water resources faculty, courses, and research facilities that rank among the most outstanding in the nation.

2. Is the Program a Needless Duplication?

(a) Geographic Service Area and Prospective Student Market

The geographic areas that we expect to contribute prospective students, in the order of potential numbers, are: metropolitan Twin Cities and Duluth areas, outstate Minnesota, bordering states, the United States, foreign countries and international organizations. The analysis of a prospective student market is closely

linked to the geographic service area to which the program will contribute and thus will be addressed in conjunction with it. Within the prospective student population one has to distinguish between two groups that may need different recruiting strategies and slightly different approaches to program implementation. These are: (1) recent graduates with a bachelor's degree in an appropriate field, who may wish to continue their graduate education directly (or nearly directly) after obtaining their undergraduate degree; and (2) professionals with some years of experience who wish to upgrade their academic background. The latter group is strongly represented in the metropolitan area. The program also should attract students directly from international organizations or from those that sponsor international educational opportunities.

Metropolitan Twin Cities and Duluth Areas. With almost two and a half million population, a large private industry base, numerous federal, state and local government agencies, and about twelve four year degree granting institutions, the Twin Cities Metropolitan Area is one of the largest potential sources for students in this program. The Duluth-Superior area has a population base approximately 10 percent of the Twin Cities metro area, but it also has a diverse industrial base, a variety of state, federal and local government agencies and laboratories, and several four-year degree-granting institutions. The largest number of recent graduates from institutions in these areas probably would come from programs in the University of Minnesota campuses. These prospective students either would have an intrinsic interest in interdisciplinary studies and research or come from broad-based undergraduate programs. Private colleges and four-year metropolitan institutions also will be a primary source of students because many of these colleges pride themselves in giving generalist degrees in the physical and life sciences. Some well-qualified students with interests in the water resources sciences from these programs may have to make up prerequisites to obtain a degree in some traditional disciplines that currently offer training in particular areas of water resources. Therefore, they would prefer this path to a graduate degree.

The Twin Cities area is the seat of state and local governments, many employees of which would welcome the opportunity to upgrade their degree standing. It is also a center for a large private industry involved in environmental and water resources projects, including a substantial consulting business community. The interest in further education is evidenced by high attendance rates at professional workshops and continuing education meetings. Some of these potential students will choose to pursue degrees on a part-time basis while they continue their employment. To attract this clientele, the program will have to be flexible to accommodate scheduling and course offerings appropriate to someone on a normal weekly work schedule, and it will have to guarantee accessibility to advisors and committee members to such students. Similar statements apply to the Duluth-Superior area, although the total numbers of individuals involved in government, industrial, and consulting businesses are proportionately smaller than in the metropolitan Twin Cities area.

In recent years increasing emphasis has been placed on environmental and hydrologic aspects in general science courses offered in K-12 settings. Teachers at both the elementary and high school level will want to concentrate their continuing education by upgrading their skills in these areas. In view of their sometimes variegated undergraduate background, this program at least at the M.S. level may meet their needs. The Twin Cities and Duluth areas have a high proportion of school-age children, and therefore of teachers, in Minnesota.

Outstate Minnesota. In outstate Minnesota, the situation with regard to recent graduates is similar to that of the metropolitan area. The degree-granting institutions are comprised of two University of Minnesota campuses (Morris and Crookston), private colleges, and the State University System. The latter most likely would produce the largest number of students for the program. None of these schools have curricula that grant degrees in water resources science per se, but all have geology, biology, life science and physical science programs that produce the kinds of students interested in our program. The lower density

of practicing professionals in the water resources science field in outstate Minnesota and the logistic problems connected with the larger distances suggest that the program will not attract large numbers of part-time students from this group, but there is some potential for participation by a few students each year, particularly if the program can develop funding opportunities suitable to individuals in this category.

Bordering States. The most obvious competition for students interested in water resources science comes from the University of Wisconsin in Madison, which offers a somewhat comparable program in the form of a water resources management M.S. curriculum. It also offers M.S. and Ph.D. degrees in limnology and oceanography. Individual (discipline-oriented) graduate degree programs related to water resources sciences already compete for students in the national market with similar programs at the University of Wisconsin, just as they do with other top-quality graduate research institutions across the country. Competition with programs in Madison, however, is not the crucial point. The more important questions are: what pull does their program have on the campuses of the Wisconsin system that are close to the Twin Cities and Duluth, and how attractive would our program be to students from these schools? The universities in question are River Falls, Eau Claire, Stout, and Stevens Point. None of these campuses has strong graduate programs in water resources, and thus they are not competitors for the graduate students we are attempting to attract. Several of these campuses have high quality undergraduate programs in physical and biological sciences, and one campus (Stevens Point) has a strong undergraduate program in environmental and aquatic sciences. Thus, these campuses are potential contributors of students to our graduate programs, as well as those in Madison. Our ability to attract these students is enhanced by reciprocity agreements between Minnesota and Wisconsin, which eliminate a potential barrier (tuition costs) for out-of-state students.

None of the colleges and universities in Iowa and the Dakotas have similar programs to the proposed one to attract their own students. Therefore these would be potentially good areas from which to attract students.

National. Because of the University's reputation for strong research and graduate training in water resources fields, the program will be attractive to individuals nationwide as soon as it is approved and becomes known across the country. The program will appeal more to students who are interested in broad issues and work at the interfaces among several disciplines rather than to students interested in focusing in a narrow specialization. At present, these students must apply to departmentally-based water resources programs. Such students may have strong backgrounds in several areas of physical and biological science, but not necessarily in the parent discipline of the water-oriented program to which they are applying for graduate study. As a result, they may be required to make up a large number of prerequisites to enter such a program. The writers of this proposal are aware of many such examples in the University's graduate programs.

In some cases, a student with a high scholarly potential may be denied admission to a departmental program because of course deficiencies that are unrelated to water resources; in other cases they choose not to come to this university because of departmental requirements for articulation work not related to their field of interest. For example, a student interested in graduate studies in watershed hydrology in the department of agricultural engineering may have to take a large number of background courses in mechanics that are not pertinent to the student's graduate program.

Once the program is established, it will attract high quality students on a national basis because relatively few institutions have the broad capabilities that the University of Minnesota has to offer a program similar to the one outlined in this document.

International. Internationally, two user groups are obvious: graduates of foreign institutions who are interested in an interdisciplinary program in water resources and/or need some flexibility in the interpretation of their academic background would prefer this program to more rigid and narrow programs. Furthermore, there are not many similar programs offered in the industrialized nations; the UK, with its Open University, and programs in Wageningen, Holland, are two similar programs that come to mind. The other potential user group is international organizations involved in water resources projects that wish to have some of their employees obtain a graduate education, and organizations that sponsor continuing education for mid-level managers in developing countries. Some international organizations, such as the WHO and WMO, organize and sponsor year-long courses in certain aspects of water resources, but the attraction of actually obtaining a degree (provided the academic quality of the student is acceptable) would make this program more competitive.

Projected Enrollment. Once the program is fully operational, we expect it will have a graduate enrollment of about 40 to 60 students, including 10-15 part-time students from water management agencies and consulting firms in the Twin Cities, and about 10 Ph.D. students. The number of Ph.D. students probably will be limited by the availability of research funds for support; the program will not admit students to the Ph.D. program unless financial support is available and a faculty member has expressed a willingness to serve as the advisor. Approximately 30-50 students will be in the M.S. program at any time, and we expect that a substantial majority (at least two-thirds) will be full-time students. The M.S. program normally should be completed in two years; therefore, we expect to admit approximately 15-25 new students each year (approximately 10-20 full-time students). Roughly one-third to one-half of the students are likely to be based on the Duluth campus, and one-half to two-thirds will be on the Twin Cities campuses.

(b) Similar Programs in Service Area

There are no comparable programs in the primary service area for the University of Minnesota. The University of Wisconsin in Madison offers a variety of graduate programs related to aquatic sciences (including an M.S. in water resources management and M.S. and Ph.D. degrees in limnology and oceanography). However, this institution is not within the primary service area for the University of Minnesota, even though there is some overlap between the two institutions with regard to student recruitment. The same comment can be made about almost any graduate research university across the country in that the service area extends nationwide and indeed internationally for these institutions.

3. Is the Program within the Capability of the Institution's Resources?

(a) Needed and Available Resources

(i) Courses. The University of Minnesota has a long history of offering high quality instruction in subjects related to water. Since 1988 the Graduate School has offered a graduate minor in Water Resources. Associated with the minor are approximately 80 courses that can be selected by a student to meet the requirements of the minor. In developing the minor, faculty selected these courses from an even more extensive list of water-related courses at the University. The approach to be used in the proposed major will be similar to that used in the minor in that most of the courses needed for the major are available in existing degree programs. However, one new course specially tailored to the major and (existing) minor is being developed, and several existing courses will be modified to meet the needs of the major. The new course is related to water resources policy issues. The proposed course programs for the M.S. and

Ph.D. degrees, including core courses and elective courses, are listed in Sections E.2(f) and E.2(g).

(ii) **Faculty.** The University recognizes three levels of graduate faculty membership: examining, associate, and full membership. **Examining membership** is a special category within the graduate faculty. It is intended as a permanent appointment and allows a person to teach courses and serve on examining committees, but it does not confer the right to serve as adviser for master's students or doctoral candidates. Except in special cases approved by the Graduate Council, examining members may be appointed only in programs that offer graduate courses but not graduate degrees. An **associate member** in a graduate program is a regular (or adjunct) member of the University faculty in a degree-granting program who holds a Ph.D. or equivalent degree and who has met the constitutional requirements of approval by the graduate faculty of the program with which he or she is associated. This status confers the right to serve as the advisor to master's students. **Full membership** in a graduate faculty confers the additional right to serve as adviser for doctoral candidates. For full membership the nominee must have strong research record demonstrated by significant refereed publications in which he or she has played a major role in guiding the research. Experience in teaching and advising of graduate students is highly desirable, though not mandatory.

In our current status as a graduate minor program, the highest level of graduate faculty status is examining membership. Upon establishment of the proposed major, a Graduate Program Committee will be selected and a Director of Graduate Studies and a co-Director of Graduate studies will be selected. The Graduate Program Committee will develop the guidelines for graduate faculty membership in the proposed major at the associate and the full membership levels. The Water Resources Minor program currently has approximately 65 faculty at the examining membership level. Many of these faculty also will become active in the proposed major program, and other faculty also will join. Given this large pool of interested and available faculty, no additional FTE faculty are needed to develop and operate the proposed program. An initial poll conducted in winter 1994 indicated that at least 42 faculty have an expressed interest in being members of the graduate faculty in the proposed major.

(iii) **Physical Facilities.** Each graduate student in the major will be officed in his/her home department, that department being the one associated with his/her adviser. However, this will not restrict the graduate student from using laboratory and/or computer facilities located in other departments. An important advantage of the major will be that access to facilities outside of the graduate student's home department will be facilitated by the cooperation between faculty/departments participating in the major. Some of the facilities available through this cooperation are listed below.

- St. Anthony Falls Hydraulics Laboratory, Minneapolis
- Experimental Stream Facility in Monticello
- Gray Freshwater Biological Institute in Navarre
- Limnological Research Center and Core Laboratory, Minneapolis
- Irrigation Research/Demonstration Center (currently being developed), Staples
- Soil Properties Laboratory in Agricultural Engineering
- Hydraulics Laboratory in Agricultural Engineering
- Environmental Engineering laboratories in Civil Engineering
- Minnesota Geological Survey offices and laboratories, Minneapolis
- Water Resources Modeling Laboratory in Agricultural Engineering
- Fisheries/aquaculture facilities, St. Paul campus
- Microcomputer centers at five locations on the Twin Cities Campus
- Biological Field Station at Lake Itasca
- Forestry Field facilities at Cloquet

North Central Soil Conservation Research Laboratory
Minnesota Supercomputer Institute
Natural Resources Research Institute, Duluth
Large Lakes Observatory (currently being developed), Duluth
Water Quality Research Laboratory in Soil Science
Soil Characterization Laboratory in Soil Science
Soil Landscape Analysis Laboratory in Soil Science
Research Analytical and Soil Testing Laboratory in Soil Science
St. Paul Climatological Observatory
The Earl Kuehnast Memorial Climatological Library
Minnesota Agricultural Experiment Station and its 5 branch stations at Waseca,
Lamberton, Morris, Crookston, and Grand Rapids, and other field facilities at
Rosemount, Becker, Staples, and Westport

In addition, each academic department with faculty in the program has laboratory and other research facilities appropriate to its disciplines.

(iv) Information Services. Library facilities at the University of Minnesota (Twin Cities and Duluth campuses) are well stocked with reference books and scientific/professional journals on the subject of water resources. Nearly any publication on water resources is directly available at these library facilities. When a rare publication is not available it can be acquired through interlibrary loan services.

(v) Projected Costs of the Program. Administrative support for the program will be the responsibility of the Graduate School's interdisciplinary program office. Basic administrative costs for the program (Table 1) amount to an estimated \$23,000 per year. The costs include secretarial support, office expenses and supplies, recruiting expenses (for development, printing and distribution of program brochures; visits by fellowship candidates), and funds for seminar speakers. An initial budget of \$10,000 has been requested for 1994-95 to continue the graduate minor program and prepare for implementation of the program in fall of 1995. The full costs listed in Table 1 apply to academic year 1995-96 and thereafter. The program will rely on the extensive array of available course offerings at the University and will not require any new FTE faculty. Incremental costs for the program thus will be small. Except for seminars, independent study and special-topics courses, and thesis/dissertation credits, formal course work for the major will be offered through existing departments and academic programs. All core courses for the program are taught regularly (at least once a year), and there will be no difficulty ensuring that the core program is available. No funds are needed to offer teaching relief to faculty or departments.

As a system-wide, interdisciplinary initiative, the program will require funds for some activities that are not needed by programs based on a single campus and dealing with a smaller set of faculty. In particular, funds are needed to: facilitate interactions among the program's faculty and students, who will be spread among many departments and buildings in the Twin Cities and Duluth; support faculty travel between campuses for meetings of the program's operating committees and student examining committees; and support student and faculty travel to joint seminars, annual retreats, workshops and field activities. Funds also are needed to offer one core course (and possibly some elective courses) by interactive video (ITV). Transmission costs for ITV are covered (at present) by the University administration, but classroom facilities used for ITV have rental costs (amounting to ~\$2,000 for a typical 4-credit course). Once the projected enrollment of 40-60 students is reached, the Director of Graduate Studies [DGS] (Twin Cities) and co-Director of Graduate Studies (Duluth) will need to spend significant fractions of their time leading and administering the program. In aggregate, this may amount to 50% of an FTE faculty position. The DGS and co-DGS will have their primary academic appointments in existing departments, and appropriate

arrangements will need to be made with these departments for release time from departmental duties.

Table 1. Administrative costs for graduate major in water resources science

Salaries and fringe benefits: secretarial (50% FTE):	\$10,000
Office supplies and expenses, including telephone and xerox:	4,000
Recruiting expenses (brochure printing and mailing; partial support for visits of fellowship candidates:	1,000
Travel expenses: seminar speakers:	2,000
intercampus faculty travel for student and programmatic committees:	1,500
students and faculty field activities, seminars, workshops, and retreats:	2,500
Room rental for ITV to provide core courses on both campuses:	2,000

(vi) **Support for Graduate Students.** Student support will be derived mainly through grants, contracts and fellowships awarded to individual participating members of the Graduate Faculty or to departmental programs. Funds are acquired by faculty from such diverse sponsors as the U.S. Environmental Protection Agency, U.S. Forest Service, U.S. Soil Conservation Service, U.S. Agricultural Research Service, U.S. Geological Survey, U.S. Agency for International Development, U.S. Department of Defense, U.S. Department of Energy, U.S. Bureau of Reclamation, National Oceanographic and Atmospheric Administration, National Aeronautics and Space Administration, National Science Foundation, Legislative Commission on Minnesota Resources, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, Minnesota Department of Health, and Minnesota Department of Agriculture.

Funds will be available from some participating departments for teaching assistantships to graduate students involved in the major. There also will be limited funding for teaching assistantships directed to the major for the water resources policy course.

In addition, the program and its graduate students will be eligible for several fellowship programs operated by the University of Minnesota Graduate School, including Graduate School and Dissertation Fellowships, minority and special fellowship competitions, and the block-grant fellowship program. Finally, faculty associated with the major intend to vigorously pursue graduate training grants for the program from federal programs (e.g. NSF, US Department of Education, U.S. AID, etc), and we will explore opportunities for fellowship, scholarship, and summer internship programs with appropriate water-related agencies in Minnesota. Correspondence with high level administrators of several water-related state agencies leads us to believe that the opportunity to develop internship programs with state agencies is very promising.

(b) Plan for Internal Program Evaluation

Internal program evaluations will be patterned according to recent Graduate School recommendations. They will include annual audits that survey data trends such as GPA, GRE, TOEFL, and student progress and also will use the recently introduced Program Management Evaluation Form for program internal use. During the 1994-95 academic year, as the faculty plan the details of program implementation for fall of 1995, we will establish specific program goals, such as dates by which numerical targets for application rates, students within the program and graduation rates are to be met. Success in meeting these goals will be evaluated in a series of program reviews beginning at the end of the third year of program operation and will be important criteria in establishing the usefulness and success of the program.

Internal reviews that include self-surveys and reviews by the appropriate Policy & Review Councils, according to the Graduate School program evaluation procedures, will start at the end of the third year of program operation. The first review will focus on issues related to program start-up: is a governance structure in place; has a student and faculty handbook been written and distributed; what steps have been taken with regard to student recruiting; what is the rate of applications to the program; what is the quality of the applicants; are there any initial indications of needed changes in courses or curriculum structure?

A more thorough review will take place in the sixth year of the program. It will address such issues as the appropriateness of the curriculum, initial rates of student progress and degree production, performance of students in the program, availability of funding for students, effectiveness of field and other activities designed to build a sense of community among the students and faculty, and placement of initial graduates from the program, as well as the issues addressed in the initial review. The six-year review will be conducted by a combination of internal committees (of the program's graduate faculty) and external reviewers appointed by the Graduate School. If the results of the first two reviews are positive, additional program reviews would be scheduled every five years thereafter.

4. Is the Program within the Mission of the University?

The University of Minnesota has a long and distinguished tradition of research, graduate training and outreach programs related to water resources. This is fitting for the only graduate research institution and the land-grant university of a state whose water resources play such a prominent role in the economy and the life styles of its citizens. Approximately 150 faculty and professional staff on the various campuses of the University identify water as an area of expertise or research interest. More than 30 departments in about 12 different colleges offer courses in some aspect of water resources, and about ten departments offer degrees that include focused training in a discipline related to the study of water. In spite of this breadth of expertise, the University does not have a graduate degree program in water resources sciences.

Establishing a graduate program in water resources science is consistent with the University's mission as the leader in graduate education in the state. Water resources science (also known as hydrologic science) is emerging as an important field in its own right, after having been subdivided among numerous traditional disciplines for many years. Several research universities in other states (e.g. Arizona, California, Colorado) have established graduate programs in this field in recent years, and several more are under development. The University of Minnesota will not be the first to establish such a program, but it will be among the leaders nationwide in recognizing the importance and vitality of this field.

There is an obvious good fit between the proposed program and the needs of the state for individuals trained in its subject matter. Its graduates will find employment in a variety of federal, state, regional, and local government agencies in the region, as well as numerous consulting firms throughout the region.

Finally, this program fits the University's goal to develop and enhance interdisciplinary graduate programs. This was a recommendation of the Strategic Planning Committee for Research and Postbaccalaureate Education in their recent report, *Enhancing Research Effectiveness: The Foundation for Learning and Teaching in the 21st Century* (University of Minnesota, February, 1994). The committee cited water resources as an example of an area in which the University has the strengths to develop an interdisciplinary graduate program. The proposed program in water resources sciences is truly interdisciplinary. It will bring together faculty from departments of physical, biological and social sciences and engineering who are housed in at least 14 departments and seven colleges on the Twin Cities and Duluth campuses.

Appendix: Admission Requirements and Curriculum

1. *Admission requirements:* The primary requirement for admission to the graduate major in water resources science is a bachelor's degree with a major in a physical or biological science or engineering and a minimum undergraduate GPA of 3.0 (4.0 scale). Normally, students will have had at least two courses each in calculus, chemistry, and physics, and one course in biological sciences. Students will be expected to be "computer-literate" and have some competency in statistics. If they do not have this, they should take a 5000-level statistics course as part of their supporting program.

Stronger preparation in certain subjects is expected for students wishing to focus in some areas of the program. For example, students wishing to focus on quantitative hydrology should have a math background that includes differential equations. The academic backgrounds of entering students will be reviewed by a faculty admissions committee, which will recommend articulation course work for students deemed admissible but having deficiencies in specific subjects. Students who do not have a master's degree in a related subject will be admitted to the M.S. program first, even if their long-term goal is a Ph.D. degree. Availability of funding and willingness of a member of the graduate faculty to serve as an advisor will be important criteria for admission to the Ph.D. program.

2. *Curriculum:* Course work will consist of a core of six courses (22-24 credits) plus elective courses in one of three areas of water science and an appropriate number of courses in a supporting program. The core is designed to provide all students with a broad background in the hydrologic cycle, hydrologic processes, chemical and biological processes important in aquatic systems, technical aspects of water quality management, and the legal, policy and institutional aspects of water management.

Courses in the core are as follows:

- Surface hydrology (AgET 5410, FR 5114, or CE 5405)
- Hydrogeology (Geol 5611; Geol 5201 [UMD])
- Environmental/water chemistry (CE 5506, PubH 5186, Soil 5310; Geol 5411 [UMD])
- Limnology (Geol 5601/EEB 5601; Biol 5773 [UMD])
- Water quality engineering/management (FR 5060, CE 5505, 8550; Biol 5871 [UMD])
- Policy/water law and regulations/economics/management (WRES 5101)

Elective courses are grouped into three principal topical areas: aquatic biology, hydrologic science, and water engineering and technology. These areas may be subdivided into fields of specialization, and other topical areas may be developed later. Students wishing to include a course not on the list of approved electives (or its annual updates) will be able to petition the Director of Graduate Studies and provide a statement about the proposed course and how it fits into the student's program. Elective courses will be related in a disciplinary or topical sense to provide depth to the degree program.

The M.S. Plan A option is intended primarily for students who have some undergraduate background in water-related course work and thus already have met some of the core requirements of the M.S. program. This degree option will conform with Graduate School standards and require a minimum of 20 course credits in the major field, 8 credits in a supporting program or minor, and 16 credits of thesis work, plus the successful completion and defense of an M.S. thesis. Plan A course work will be individualized to reflect a student's preparation, degree goals and research topic. The M.S. Plan B option will be attractive to students who have little formal undergraduate course work in water resources science and thus need more course work to gain the combination of depth and breadth needed in this field. It also will appeal to students wishing to pursue the Ph.D. degree who would like to receive an M.S. degree as an interim accomplishment. Plan B projects will involve field, laboratory or computer work and the analysis, synthesis, and/or interpretation of data. Literature reviews and term

papers written for courses will not satisfy the Plan B project requirement in Water Resources Science. Students may register for four credits of independent study in water resources science for their work on Plan B projects.

Courses in the related field or supporting program should be related to the student's career objectives to form a coherent program with the course work in the major. In general, supporting program should not consist of water-oriented courses. Courses available as electives for the major normally would not be eligible as courses for the supporting program. The supporting program (or related field) could include course work in many fields, including statistics, computer science, natural resource policy, applied (resource) economics, chemistry, chemical engineering, soil science, microbiology, environmental health, geography, and geology.

Students in the Ph.D. program will need to obtain the equivalent of the M.S. course work in terms of breadth plus additional focus in at least one of the three areas of emphasis within Water Resources Science: aquatic biology; hydrologic science; and water engineering, and an appropriate supporting program or minor. The areas of specialization in the Ph.D. program will be similar to those at the M.S. level, but more flexibility within the tracks will be available because of the opportunity to take additional course work. Greater depth of scholarship will be required for Ph.D. students. Course work will be tailored to the needs and interests of individual students, consistent with the objectives and goals of the program. Examples of subareas in which Ph.D. students may develop specialized course programs in the three broad tracks include:

- (1) aquatic biology: stream ecology; limnology; aquatic biogeochemistry; restoration ecology for aquatic systems
- (2) hydrologic science: hydrogeology; climatology (climatic aspects of the hydrologic cycle; stochastic hydrology; watershed management (analysis of land-water interactions)
- (3) water engineering: water quality analysis, management and engineering; watershed engineering; groundwater remediation technology.

Ph.D. course programs will include a minimum of 60 graduate credits, excluding thesis and Plan B project credits and including at least 18 credits in a supporting program or minor. Transfer of graduate credits from other institutions and from adult-special or CEE courses will be allowed according to Graduate School policies.

Proposal for M.S. and Ph.D. Program in Water Resources Science

1. Introduction

(a) Context of Proposed Program

The understanding, management and stewardship of freshwater systems is a critical global issue. Research in water resources has become increasingly interdisciplinary and multidisciplinary, involving individuals trained in physical and biological sciences, and engineering disciplines. Several leading academic institutions have recognized the need to address these issues on an interdisciplinary level by developing graduate programs focused on the water resources sciences. Federal funding agencies, including NSF, NASA, DOE, EPA, NOAA, and USDA are increasingly interested in funding large, multidisciplinary and interdisciplinary groups to address broad issues in water research and water resources management. Management agencies need individuals with advanced degrees who can address problems from a multidisciplinary perspective. In recognition of these needs, the National Science Foundation recently created a Program in the Hydrologic Sciences within its Division of Earth Sciences. Similarly, NASA has a new grant program called the "Water Cycle Processes Program."

At the University of Minnesota, considerable expertise exists in the water resources sciences. However, that expertise is distributed across the campuses in a variety of research centers and numerous academic departments. No graduate program at the University is specifically identified with any aspect of aquatic sciences, although faculty from many graduate programs train students in such areas as surface and groundwater hydrology, limnology, stream ecology, wetland ecosystems, aquatic chemistry, and agricultural and civil engineering aspects of water and water-mediated processes. In pursuing careers as water researchers and managers, many of these students could benefit from a graduate program that was specifically designed to meet their needs and interests, and that could be recognized by prospective employers as having provided a strong background in water resources sciences. By developing a focused graduate program, the University stands to attract additional high quality graduate students who recognize the value of such a focus but who otherwise would enter one of the few programs that have been developed elsewhere. A focused graduate program in water resources science also would serve as a mechanism for facilitating interaction and cooperation among the various University research and academic programs that currently address water issues.

The graduate degree program in Water Resources Science will draw on existing water-related courses from departments on the St. Paul, Minneapolis, and Duluth campuses. At the master's level, students will be required to take a broad array of water-related core courses in the areas of surface and groundwater hydrology, water chemistry, limnology, water quality management and engineering, and water policy. In addition, students also will choose elective courses from one of three "tracks": aquatic biology, hydrologic science, and water engineering. Course work for the Ph.D. will be tailored to the specific needs of those students, but students will specialize in one of the same three tracks. Courses in the core program will be offered on both the Duluth and Twin Cities campuses or will be available in both regions through interactive video technology (ITV). Because students will be spread among many departments and research centers, the program will organize retreats, short courses, and student research symposia to bring all students and faculty together several times each year. This new program will provide students with a formal opportunity to take advantage of University expertise in water-related disciplines and obtain a degree that identifies them as a water resources expert.

(b) Planning and Development Process

The proposed major in water resources science is an outgrowth of the freestanding graduate minor in water resources developed by a group of water-oriented faculty six years ago. At present, 65 faculty representing 19 different departments are associated with this program. Student enrollment has increased steadily, and there now are approximately 15 students in the program. The graduate minor has been beneficial in coalescing faculty interest in the field of water resources. For example, a new course in water policy, law and other institutional/social aspects of water resources management has been developed by several faculty participating in the program, and it will become a core course for all students in the minor program starting in fall of 1994. The need for such a course at the University has been recognized for years, and the minor program provided the incentive and administrative structure to bring this to fruition.

Enrollment in the minor program has been limited by several factors. Many graduate students enrolled in water-oriented majors do not consider declaring a minor in water resources to be a significant advantage. They are identified as having expertise in some water-related area through their major, and they believe that the additional identification of a minor in water resources provides little further benefit in seeking employment. Furthermore, they can take the same courses that they might in the minor but have fewer requirements (e.g. only eight credits are required in the related field for an M.S. degree, but the water resources minor requires 13 credits). For students majoring in a field not closely related to water, the minor may not provide sufficient course work to enable the student to market himself or herself as a "water expert". Consequently, the minor has been most popular with graduate students in fields like soil science that have a close relationship to water resources but are not considered water fields themselves. None of the above issues are relevant to the proposed major, and the faculty believe that the major will attain high enrollments in a short period of time.

Water Resources Graduate Minor sponsors a seminar course (WRES 8100) that is a core requirement of the program. The seminar also has been popular with graduate students not enrolled in the minor. In most years, the seminar is focused on a technical topic such as restoration of aquatic systems (1991) or the accomplishments and shortcomings of the Clean Water Act (1992). In spring of 1993, the seminar focused on the University's water programs and reviewed the status of its graduate and undergraduate degree programs related to water, its research centers and programs, and its outreach programs. The seminar series was held in preparation for the ongoing University-wide strategic planning effort and the planning initiative that had been proposed (and is now underway) for the University's water programs. A series of panel discussions involved faculty and staff from these four programmatic areas, as well as individuals from the external community who rely on these programs for information and graduates for their employees. Several individuals active in planning or directing graduate water programs at other U.S. universities also were speakers. Graduate students taking the course for credit wrote position papers that summarized existing conditions in the water programs and made recommendations for changes to improve their effectiveness, efficiency and visibility.

Discussions with faculty groups convened during the seminar series to discuss graduate education in water led to a consensus that an interdisciplinary graduate major was needed to bring coherency to the fragmentation that currently exists in the University's graduate degree programs in water fields. The position paper on graduate education written by the students also made this recommendation.

During summer of 1993, an informal group of nine faculty was convened to discuss such an initiative. The initial group represented five departments in three colleges on the Twin Cities campus: Patrick Brezonik, chair (Civil Engineering), Kenneth Brooks (Forest Resources), H.H. Cheng (Soil Science),

Efi Foufoula-Georgiou (Civil Engineering), John Nieber (Agricultural Engineering), James Perry (Forest Resources), H.-Olaf Pfannkuch (Geology & Geophysics), Heinz Stefan (Civil Engineering), and Bruce Wilson (Agricultural Engineering). A proposal that included a tentative curriculum was circulated to the 65 graduate faculty in the Water Resources Graduate Minor program in fall quarter. The proposal was discussed at a meeting of the graduate faculty in November 1993, and consensus was reached that the committee should develop a formal proposal to initiate the degree program.

The Executive Committee of the Graduate Faculty in the Water Resources minor voted unanimously to proceed with the proposal at a meeting in January, 1994. The planning committee was expanded to include faculty from two departments on the Duluth campus, and an additional department from the Twin Cities campus: Ira Adelman (Fisheries and Wildlife), Anne Hershey (Biology [UMD]), Randall Hicks (Biology [UMD]), and Howard Mooers (Geology [UMD]). All members of the planning committee are members of the faculty in the Water Resources Graduate Minor; this proposal is a joint effort of that committee.

The committee chair presented a description of the proposed graduate major to the Minnesota Environmental Quality Board's Water Resources Committee (EQB-WRC) in fall of 1993. This committee includes top administrative-level representatives from all of the state and regional agencies concerned with managing and protecting Minnesota's water resources (e.g., Departments of Natural Resources, Agriculture, and Health, Board on Water and Soil Resources, Pollution Control Agency, Metropolitan Council). The administrators expressed their support for the development of the program, indicating that it would fill a long-standing need. Letters of support from several members of the EQB-WRC are appended to this proposal.

The University's Strategic Planning Committee on Water (SPCOW) has been analyzing the University's water programs and developing recommendations for improving the effectiveness of these programs since January 1994. In an early meeting of the SPCOW, the committee developed a consensus recommendation that an interdisciplinary graduate program in water sciences should be developed at the University. The SPCOW has been involved in the development of this proposal in several ways. First, four members of the planning committee for this proposal also are members of the SPCOW (Brezonik, Hershey, Perry, Stefan). Second, the SPCOW was briefed on the proposed major at several meetings, and an extensive discussion of the details of the proposed major was held at a meeting of the SPCOW in April 1994. A letter from the chair of the SPCOW regarding the proposed major is appended to this proposal.

Finally, members of the planning committee have briefed heads of departments and deans of several colleges that have academic programs in water fields and whose faculty would be involved in the graduate major in Water Resources Science. A total of nine department heads and several deans, including the Dean and two Associate Deans of the Graduate School, were informed of this effort and the nature of the proposed major. Letters of support from several of these administrators are appended to this proposal.

2. Proposed Program

(a) Objectives

1. The primary objective is a system-wide graduate program in Water Resources Science leading to the Master's or Ph.D. degrees that will produce graduates who are broadly trained in water-related sciences and have a multidisciplinary perspective on water resources research and/or management.

2. A second objective is to provide a focus to the University's academic programs and research institutes that deal with water resources management and research. A successful graduate program will serve to integrate research agendas among the various contingents, thereby strengthening the University's reputation as a leader in the water resources sciences.

The program has three broad educational goals: (1) produce students with strong technical skills in disciplines relevant to aquatic/water resource science; (2) develop a holistic understanding of the hydrologic cycle and the interconnectedness of the scientific disciplines required to understand and manage aquatic resources; and (3) develop an appreciation for the interplay between physical/biological sciences and the social sciences in developing and implementing public policies related to water.

In brief, this is a science-based graduate program, and it intends to produce students who have excellent scientific skills. However, it also intends that these students will have (1) the breadth of scientific knowledge appropriate to understand the complicated resources (aquatic ecosystems, watersheds) on which they will work and (2) an appreciation for the social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

(b) Admission Requirements

The primary requirement for admission to the graduate major is an undergraduate major in a physical or biological science or engineering with a minimum undergraduate GPA of 3.0 (on 4.0 scale). Normally, such students will have had at least two courses each in calculus, chemistry, and physics, and one course in biological sciences. Students will be expected to be "computer-literate" and also should have some competency in statistics. If they do not have this, they should take a 5000-level statistics course as part of their supporting program.

Stronger preparation in certain subjects is expected for students wishing to focus in some areas of the program. For example, students wishing to focus on quantitative aspects of hydrologic processes should have a math background that includes differential equations. Under some circumstances, a student may be admitted to the program without some of the course qualifications described above, particularly if there is strong evidence of scholarly abilities or compensating strengths in an appropriate discipline. The academic backgrounds of all entering students will be reviewed by a faculty admissions committee, which will recommend articulation course work for students deemed admissible but having deficiencies in specific subjects. Students applying for admission who do not have a master's degree in a related subject normally will be admitted to the M.S. program first, even if their long-term goal is a Ph.D. degree. Availability of funding and willingness of a member of the graduate faculty to serve as an advisor will be important criteria for admission to the Ph.D. program.

(c) Advising

If a student has not selected an advisor in advance, the Director of Graduate Studies (DGS) or co-Director of Graduate Studies (co-DGS) will assign him/her a temporary advisor and three-person advisory committee (including the temporary advisor as chair) upon entering the program. This is not expected to be a common situation for Ph.D. students, most of whom will have selected an advisor before entering the program. The student will meet with the temporary advisor before selecting classes for the first quarter and will meet with the temporary committee during the first quarter to review academic background, discuss goals for graduate study, and develop a plan of study. The committee will be selected from the Graduate Faculty in Water Resources Science. Temporary advisors and committees will be selected based on the student's academic background and stated inter-

ests, and the DGS or co-DGS will obtain the concurrence of the temporary advisor before making the assignment. Students will select a permanent faculty advisor and committee no later than the middle of their second quarter in residence.

A formal plan of study (graduate degree program) will be developed by the student in consultation with the faculty advisor and committee by the end of the second quarter in residence for M.S. students or the third quarter in residence for Ph.D. students. It should conform with the requirements established by the program; any substitutions or other deviations from the requirements must be approved through a written petition to the Director of Graduate Studies in Water Resources Science. The graduate degree program (Graduate School Form # 89) must be approved by the DGS before being submitted to the Graduate School.

For M.S. students, the DGS shall appoint a three-person final examining committee at the time the graduate degree program is approved. At least two members of the examining committee shall be on the Graduate Faculty in Water Resources Science. The third member also may be a member of the Graduate Faculty, provided that not all members are from the same disciplinary area or same department. For Ph.D. students, an examining committee consisting of at least five faculty members shall be appointed at the time the graduate degree program is approved. This committee shall be composed of at least three members of the Graduate Faculty in Water Resources and two members representing supporting program or designated minor fields. This committee normally will serve as the examining committee for both the oral preliminary exam and the final thesis defense.

(d) Degree Options

Ph.D. students may declare a minor or select a supporting program of related course work. Course requirements for these options are described below. The diploma for a Ph.D. with a supporting program will read: "Ph.D. in Water Resources Science." The diploma for a Ph.D. with a minor will read: "Ph.D. in Water Resources Science with a minor in [field]."

There will be two options for the M.S. degree in Water Resources Science. In the "Plan A" option, students will complete a thesis, as well as the required course work in the major and a supporting program or minor. A substantial number of students will take additional course work instead of a thesis and obtain a "Plan B" M.S. degree. Students in the Plan B option will take a supporting program or minor in addition to course work in the major, and they will do a project that will culminate in a written Plan B report. The work required for the Plan B project will be less extensive than that required for an M.S. thesis, and the format requirements for a Plan B report will be less rigid than those for a thesis. However, Plan B projects normally will involve some field or laboratory work, and all projects will involve the analysis, synthesis, and interpretation of data (e.g. by statistical methods, simulation modeling, etc.).

(e) Graduate Program: Central Considerations

The core curriculum in Water Resources Science will provide all students with the following knowledge and skills: an understanding of the hydrologic cycle and hydrologic processes through course work in surface and groundwater hydrology; the science of inland aquatic ecosystems (through a course in limnology); aquatic chemistry, technical/engineering approaches to manage and protect the quality of aquatic resources; and the socio-economic forces that provide the legal and policy framework for water resources management and protection.

Core courses will be available to students pursuing the degree at both the Twin Cities or Duluth campuses, either by separate offerings of closely-related or parallel courses on the two campuses or by use of interactive video technology. The intention is that students entering the M.S. program on either the Twin Cities or Duluth campuses would be able to complete their course work at the campus in which they enrolled. Ph.D. students focusing on some subfields of specialization (e.g. stream ecology) would be able to do the great majority (perhaps all) of their course work in Duluth, but if they were interested in specializing in other areas, they may need to spend several quarters taking courses on the Twin Cities campus.

Beyond the common core of knowledge that all students in the program will be expected to master, students will be able to individualize their degree programs through the selection of elective and supporting program courses. Most students will focus their major electives within one of three broad tracks: aquatic biology, hydrologic science, and water engineering, and additional specialization will be possible within these tracks, especially at the Ph.D. level. Appendix 1 includes example degree programs for M.S. (Plan A and B) and Ph.D. students interested in specializing in various tracks and subtracks within water resources science.

Developing a community identification among students is critical to the success of any interdisciplinary program in which the students are housed in several departments and on different campuses. The graduate program in Water Resources Science will achieve this by frequent cross-disciplinary seminars and joint field activities (discussed below), as well as informal opportunities for social and intellectual interchange. Student (and faculty) interaction also will be enhanced by the interdisciplinary nature of the topics on which many students will conduct research for their theses and projects. In some cases, students in a given cohort will choose thesis topics related to a single large study, and they will be encouraged to collaborate in both field and laboratory phases of their studies. In general, students will be urged to relate the findings of their specific research to the larger issues of the overall topic.

The Graduate Faculty in Water Resources Science intend to develop a range of opportunities for graduate student field experience. We note that existing water-related programs at the University are generally deficient in this regard. An encouraging recent development to counteract this situation is the new summer program on field techniques in hydrogeology organized by the Department of Geology & Geophysics. This field program will be held at the Lake Itasca Biological Station, and it was developed as part of an NSF graduate training grant for geology majors in the area of geofluids. We intend to develop a similar summer program at the Lake Itasca Biological Station for students entering the graduate program in Water Resources Science. The purpose of the two-week program will be to initiate a sense of community within the cohort of students and simultaneously expose them to techniques used in field studies across a range of aquatic disciplines -- biological and chemical limnology, quantitative stream hydrology, climatology, groundwater hydrology. We also intend to explore the possibility of developing an intensive summer program to introduce students to techniques related to watershed mapping and analysis (e.g. airphoto interpretation, use of GIS).

(f) M.S. Course Program

(i) Plan A option. This option is intended primarily for students who have had some undergraduate background in water-related course work and thus already have met some of the core requirements of the M.S. program. This degree option will conform with Graduate School standards and require at least 20 course credits in the major field, 8 credits in a supporting program or minor, and 16 credits of thesis work, plus the completion and defense of an M.S. thesis. The Plan A course work program will be highly individualized to reflect a student's preparation, degree goals and research topic.

(ii) **Plan B option.** The Plan B option for the M.S. program will be attractive to students who have little formal undergraduate course work in water resources science and thus need more course work to gain the combination of depth and breadth needed in this field. It also will appeal to students wishing to pursue the Ph.D. degree who would like to receive an M.S. degree as an interim accomplishment.

In developing the M.S. curriculum, the faculty realized that they could not produce a Plan A program with only 20 major credits for students who do not have an undergraduate degree that included some basic course work related to aquatic sciences. Rather than imposing articulation course work or restricting admission to the program to those whose undergraduate work includes aquatic science course work, we developed a Plan B program that includes 32 course-work credits in the major field, 4 credits for a Plan B project, and 8 credits in a related field. The major field includes 22-24 credits of core courses and 8-10 credits of electives. Students who had some of the core courses in their undergraduate studies could take more elective credits in a Plan B program or could apply the freed-up credits toward a thesis in a Plan A program. Students who have had none of the core courses as undergraduates still could choose a Plan A program, but they would be required to complete the core program (and thus take more course work credits than normally is required of Plan M.S. programs).

Core courses (22-24 credits)

Surface hydrology (AgET 5410, FR 5114, or CE 5405)

Hydrogeology (Geol 5611; Geol 5201 [UMD])

Environmental/water chemistry (CE 5506, PubH 5186, Soil 5310; Geol 5411 [UMD])

Limnology (Geol 5601/EEB 5601; Biol 5773 [UMD])

Water quality engineering/management (FR 5060, CE 5505, 8550; Biol 5871 [UMD])

Policy/water law and regulations/economics/management (WRES 5101)

Electives (8-10 credits)

A list of elective courses grouped into three topical areas is shown in Table 1. The topical areas represent the principal tracks or areas of specialization that students may pursue under the major in Water Resources Science. The list in Table 1 is not an exhaustive compilation of all possible elective courses but does include water-oriented courses most likely to be used as electives. Students wishing to include a course not on this list (or its annual updates) will be able to do so by petitioning the DGS and providing a brief statement about the proposed course and how it fits into the student's program. Elective courses should be related in a disciplinary or topical sense to provide depth to the degree program.

Plan B Project (4 credits)

Plan B projects normally will involve field, laboratory or computer work; all projects will involve the analysis, synthesis, and interpretation of data. Literature reviews and terms papers written for courses will not be sufficient to satisfy the Plan B project requirement in Water Resources Science. Students may register for up to four credits of WRES 8097,-8,-9 (Independent study in water resources science) for the work they do on their Plan B projects.

Related Field or Minor (8 credits)

The courses should be related to the student's career objectives to form a coherent program with the course work in the major. In general, the supporting program should not consist of water-oriented courses. Courses available as electives for the major normally would not be eligible as courses for the supporting program. The faculty recognizes that it is not always straightforward to decide whether a course is water-oriented or fits in the supporting program category; some courses in civil and agricultural engineering, ecology, geography, geology, and

Table 1. Elective Courses in Water Resources Science

Program in Aquatic Biology

Organism Level

Biol 5523 Natural History of Invertebrates (UMD)
 Biol 5526 Ichthyology (UMD)
 PBio 5231 Introduction to the Algae (5)
 PBio 5811 Freshwater Algae (Itasca) (5)
 EEB 5136 Ichthyology
 EEB 5606 Ecology of Fishes (3)
 EEB 5607 Ecology of Animal Plankton
 EEB 5831 Nat. History of Invertebrates (Itasca) (5)
 Ent 5360 Aquatic Entomology (Itasca) (3)

Ecosystem Level

Biol 5677 Microbial Ecology (UMD) (5)
 Biol 5771 Stream Ecology (UMD)
 Biol 5776 Ecosystems Ecology (UMD)
 Biol 5777 Plankton Ecology (UMD)
 EEB 5812 Comparative Limnology (Itasca) (5)
 EEB 8602 Advanced Limnology (3)
 FW 5601 Assess./Manage. Vertebrate Populations
 FW 8459 Stream and River Ecology
 Soil 5550 Peatlands (3)
 Soil 5605 Microbial Ecology (3)
 Soil 8632 Soil Microbiology (2)

Applications/Management

Biol 5871 Water Pollution Biology (UMD) (3)
 CE 5515 Water and Wastewater Microbiology
 CE 8550 Analysis/Modeling of Aquatic Environ.
 FR 5460 Water Quality: Internat. Dimension (3)
 FW 5455 Aquaculture
 FW 5460 Pollution Impacts on Aquatic Systems (3)
 FW 5604 Fishery and Wildlife Management
 FW 8460 Fish Habitats and Restoration
 NRES 5060 Water Quality in Natural Resource Management (3)
 PubH 5186 Environmental Chemistry (3)

Program in Hydrologic Science

Hydrology and Ecosystems

AgEn 8500 Hydrologic modeling, Small Watersheds
 CE 5405 Hydrology and Hydrologic Design
 FR 5114 Forest Hydrology (3)
 FR 5153 Advanced Forest Hydrology
 Geo 5601 Limnology
 Geog 5444 Geography of Water Resources
 Soil 5550 Peatlands (3)

Hydrogeology

Geo 5108 Advanced Environmental Geology
 Geo 5611 Groundwater Geology
 Geo 8611 Trans. Phenomena in Porus Media (2-3)
 Geo 8612 Analytical Geohydrology (3-4)
 Geo 8621 Tracers in Hydrogeology

Soil 5232 Soil Physics (5)
 Soil 8250 Advanced Soil Physics (3)

Climatology

Geog 5423 Advanced Climatology
 Geog 8420 Seminar: Climatology (3)
 Soil 5240 Microclimatology(3-4)
 Soil 5424 Applied Climatology (3)

Applications/Management

AgEn 5540 Erosion Control, Watershed Engineering
 FR 5115 Forest Hydrology, Field Appl. (Cloquet)

Program in Water Engineering

Applied Hydrology

AgEn 8500 Hydrologic Modeling, Small Watersheds
 AgEn 8700 Moisture and Heat Transfer (3)
 CE 5425 Groundwater Mechanics
 CE 5426 Computer Modeling of Groundwater Flow
 CE 8407 Stochastic Hydrology (3)
 CE 8425 Advanced Groundwater Mechanics
 FR 5153 Advanced Forest Hydrology

Surface Water Flow Analysis and Design

AgEn 8500 Hydrologic Modeling, Small Watersheds
 AgEn 5550 Drainage and Irrigation Engineering
 CE 5401 Introduction to Water Resources Engineering
 CE 5402 Computational Hydraulics
 CE 5403 Hydraulic Structures
 CE 5410 Open Channel Hydraulics
 CE 5504 Mass Transport with Environ. Applications
 CE 8413 Mechanics of Sediment Transport (3)
 CE 8430 Lake and Reservoir Hydrodynamics (3)

Water and Wastewater Treatment

AgEn 5910 Agricultural Waste Management Engrng.
 CE 5500 Analysis/Design of Water Supply Systems
 CE 5501 Analysis/Design of Wastewater Systems
 CE 5540 Groundwater-Soil Pollut. Abatement Technol.
 CE 8500 Physical/Chemical Processes for Water/Wastewater Treatment I (3)
 CE 8501 Physical/Chemical Processes II (3)
 CE 8502 Biol. Processes for Wastewater Treatment (3)

Water Quality Engineering Science

CE 5504 Mass Transport with Environ. Applications
 CE 5505 Water Quality Engineering
 CE 5506 Environmental Water Chemistry
 CE 5507 Water and Wastewater Analysis
 CE 5515 Water and Wastewater Microbiology
 CE 8505 Aquatic Chemistry for Environ. Engineers
 CE 8507 Aquatic Chemistry of Organic Contaminants
 CE 8540 Interfacial Mass Trans. with Environ. Appl.
 CE 8550 Analysis/Modeling of Aquatic Environments
 CE 8551 Seminar: Models of Aquatic Environ. (1-5)

soils science may fit in either category, depending on the circumstances (B.S. background, other course work) of individual students. The program will handle this issue by stating the above philosophy and letting individual cases be decided by faculty advisory committees and the DGS. The supporting program could include course work in many fields, including statistics, computer science, natural resource policy, applied resource) economics, chemistry, chemical engineering, soil science, microbiology, environmental health, geography, and geology.

(g) Course Program (Ph.D.)

Students in the Ph.D. program will be required to obtain the equivalent of the M.S. course work in terms of breadth plus an additional focus in at least one of the three broad areas of emphasis (tracks) within Water Resources Science: aquatic biology; hydrologic science; and water engineering (see Table 1), and an appropriate supporting program or minor. The areas of specialization available in the Ph.D. program will be similar to those at the M.S. level, but more flexibility within the three broad tracks would be available because of the opportunity to take additional course work. Greater depth of scholarship will be required for Ph.D. students. Ph.D. course work will be tailored to the needs and interests of individual students, consistent with the objectives and goals of the program, as stated in section 2(a). Examples of subareas in which Ph.D. students may wish to develop specialized course programs within the three broad tracks include the following:

- (1) aquatic biology: stream ecology; limnology; aquatic biogeochemistry; restoration ecology for aquatic systems
- (2) hydrologic science: hydrogeology; climatology (climatic aspects of the hydrologic cycle; stochastic hydrology; watershed management (analysis of land-water interactions)
- (3) water engineering: water quality analysis, management and engineering; watershed engineering; groundwater remediation technology.

Examples of Ph.D. degree programs that might be developed for students interested in these areas of specialization are included in Appendix 1.

Course programs for Ph.D. students in Water Resources Science will include a minimum of 60 graduate credits, excluding thesis and Plan B project credits and including at least 18 credits in a supporting program or minor. Transfer of graduate credits from other institutions and from adult-special or CEE courses will be allowed according to Graduate School policies and will be reviewed on an individual basis.

(h) Preliminary and Oral Exams

General. Especially within the Ph.D. program, but also in the M.S. program, three areas of concentration are the basis for the content of exam questions. The first is the subject matter most closely related to the research interests of the candidate. This is the research concentration. Second is subject matter in the candidate's core concentration. The core concentration consists of a set of prescribed courses, mostly at the 5000 level, within the program, such as surface hydrology and limnology, plus a certain number of electives mostly at the 8000 level. The third area consists of the related courses in a supporting field taken in areas that are not typically considered "water courses". The choice of subject areas and concentrations the candidate makes will be reflected in the composition of her/his examining committee.

M.S. Examination. The objective of the Master of Science examination is to test the candidate's mastery of the subject matter and research aptitude. Only one final oral examination is administered in connection with the M.S. degree. The mastery component is evaluated by reviewing the outcome

of course work, which should be at a general GPA level of 3.0, and by questioning during the general part of the final oral exam. The research component is demonstrated by the candidate's successful defense of her/his master's thesis or Plan B report during the final oral exam. The examining committee consists of three members, two from the core concentration area, and one from the related field or minor. One of the members from the core concentration will be the advisor, representing the research concentration in the core; a second member will represent the elective part of the major field. Selection and composition of the committee is subject to approval by the DGS, GSC and Graduate School.

Ph.D. Preliminary Exams. Successful completion of a doctoral program includes passing the preliminary exams and defense of the doctoral dissertation in front of a doctoral examination committee. The candidate selects his/her areas of concentration and electives and supporting fields in which he/she will stand for the examination. In part, this will determine the areas and disciplines of the committee members. In consultation with the student, the advisor will propose a committee slate, possibly with alternates, which will be subject to approval by the DGS, GSC and Graduate School.

Ph.D. committees will have five members (occasionally a sixth member may be added at the advisor's request to provide expertise on a particular topic), in accordance with present rules of the Graduate School. The adviser will represent the core and research concentrations of the student. The second reader member will represent a field close to the research concentration, and the third member would represent the elective area from the major field. The fourth and fifth members (one reader) would be selected from areas pertaining to the supporting field or minor.

Written preliminary exam. Testing subject mastery in the selected concentrations is carried out in both the written and oral parts of the preliminary examination. The written exam will consist of questions in the student's research concentration, which should require about five hours to answer. The part of the exam covering the basic core concentration should require approximately three hours. The examination procedure will require a review of exam questions and a review of answers and grading by two members of the Graduate Faculty. Questions and exams will be circulated for inspection by faculty on the Graduate Examinations Committee. Each question in the examination will be graded on a scale of Pass; Pass with Reservation; Fail. In order to pass the examination, the candidate must obtain a Pass grade in the core concentration area, and at least a Pass with Reservation in the elective core concentration area. If the student obtains a Pass with Reservation in the primary core concentration area, the committee may impose additional requirements (such as additional course work, reading, or development of a review paper), which must be completed in a specified time. If a student receives a Fail grade on the written examination and the examining committee recommends that the student not be allowed to retake the exam, the candidate will not be able to pursue a Ph.D. program. The student will be advised to leave the program or may be given the option to switch into a M.S. program.

Oral preliminary exam. The research aptitude of the candidate is tested in the oral preliminary examination. This exam follows the successful completion of the written preliminary exam after some specified time interval (usually one quarter). The candidate will prepare, circulate and present a "dossier" consisting of a summary of academic achievements and background and a research proposal. The latter is a short description of a research topic, a rationale for its selection, state of knowledge in the area, and original ideas to sketch a possible approach to solve the problem. The dossier is circulated among committee members and is the basis for the oral exam, which will concentrate mostly on the research component. The one subject area not tested in the written exam -- the supporting field concentration -- may be the subject of questioning during the oral exam, as may any other question pertaining to the dossier come up in testing the mastery component in the oral exam.

Ph.D. final defense. After the readers have approved the thesis as ready for defense, the candidate will orally defend her/his dissertation. The committee normally is the same as for the qualifying examination. It consists of five members, of which two members in the major field and one member from the supporting field are readers. In a committee of five members, four Pass grades are necessary for a successful outcome of the defense.

(i) Academic Performance Standards

Students must complete the requirements of the Graduate School for residency, course, and thesis (where applicable). To be considered in good academic standing and therefore eligible for support, students will be expected to make reasonable progress toward fulfilling their degree requirements. This includes progress in completing the course work specified on the graduate degree program (with satisfactory grades) and selection of a permanent advisor. Full-time students in Water Resources Science should expect to complete their M.S. requirements in two years (slightly longer if a field-oriented thesis is involved). It is recognized that some students in the M.S. program will participate on a part-time basis, as they continue full-time employment, and progress toward fulfilling the requirements will be proportionally slower for these students. Even in such cases, the program will not recommend exceptions to the Graduate School requirement that all course work for the M.S. be completed within a seven year period, unless there are highly unusual and extenuating circumstances.

The minimal acceptable GPA for completion of the M.S. degree is 2.8 (Graduate School requirement). Students seeking admission to or already in the Ph.D. program will be held to a higher standard of performance. For example, students wishing to be admitted to the Ph.D. program who are in the M.S. program should have a GPA of ~3.5 or better, and students in the Ph.D. program should maintain a GPA above 3.3. Because the Ph.D. is research-oriented rather than coursework-oriented, it is not possible to state the exact time required for its completion. However, the Graduate Faculty in Water Resources Science believes that a reasonable goal for completion of this degree is three years beyond the completion of M.S. degree. Ph.D. students thus should complete any additional course work (beyond the M.S. requirements) within two years after entering the Ph.D. program with an M.S. degree. They should pass their written preliminary examination by spring quarter of the second year and the oral preliminary examination no later than fall quarter of the third year.

3. Educational and Social Need for Program

(a) Student Interest and Institutional Response

Interdisciplinary undergraduate programs. Heightened environmental awareness in the 1970's and 1980's led to greatly increased opportunities for professionals in the hydrologic sciences. Traditional programs in such fields as civil and agricultural engineering, soil science, and geology geared up to emphasize water resources. However, the traditional curricula of these disciplines often do not allow a great deal of flexibility. In response to the emphasis on environmental issues and student demand, many undergraduate and graduate programs have developed interdisciplinary programs under such names as Environmental Science or Environmental Studies. Programs exist at many large research universities and a multitude of state and private colleges. For example, the Institute for Environmental Studies at the University of Wisconsin in Madison has existed since 1970. The program emphasizes the integration of knowledge from a variety of specialized fields and includes a large emphasis on water-related issues. Undergraduate and graduate programs are contained within the program, which integrates faculty across the campus from such disciplines as engineering, geology, economics, soil science, urban and regional planning, and health sciences.

Smaller institutions have embraced an interdisciplinary approach to environmental problem solving even more than larger universities. For example, the University of Wisconsin-Green Bay has had successful interdisciplinary environmental science program at the undergraduate and graduate level (M.S. only) for many years. Environmental Science faculty include biologists, soil scientists, geologists, hydrologists, limnologists, chemists, and policy makers. As an interdisciplinary approach to environmental problem solving is emphasized, the number of students wanting to explore other fields has increased. Students who graduate from these interdisciplinary programs have a different focus than graduates from traditional courses of study, and they have the potential to bring a unique perspective and contribute in complementary ways through graduate research.

The National Science Foundation (NSF), National Endowment for the Humanities (NEH), and Fund for the Improvement of Post-Secondary Education (FIPSE) recently solicited proposals for the development of interdisciplinary programs in environmental studies. Clearly there is a nationwide effort in the academic community to emphasize cross-disciplinary cooperation in the education of environmental professionals.

The above-mentioned national trends are reflected by several program developments at the University of Minnesota. A cross-college undergraduate major in Natural Resources and Environmental Studies (NRES) has existed on the St. Paul campus for the past four years. The program is administered by the Colleges of Agriculture and Natural Resources. Its graduates have a strong resource/environmental policy orientation. An environmental science program with a stronger focus on physical and biological sciences also has been developed as an outgrowth of the NRES program. An ongoing initiative at UMD is developing a major and minor in Environmental Studies. The proposed program would encompass the physical, biological, and social sciences, and humanities. An interdisciplinary core of courses with specialization in the individual's area of interest and a minor would be required; a second major in a traditional discipline would be encouraged. Students in the environmental science track thus would have expertise in a discipline with a supporting background in allied sciences and humanities. Interest from students has been strong. Estimates by the organizing faculty indicate that this undergraduate program could have 100-200 majors as soon as it is established.

Clearly there is a large pool of college graduates nationwide whose interests in environmental and particularly in water-related issues go beyond the bounds of traditional fields of study. A graduate program in water resources science at the University of Minnesota, built around the strengths of a diverse faculty, would provide the opportunity for these students to pursue interdisciplinary graduate studies and research.

Opposition to undergraduate interdisciplinary programs has arisen from some who question whether these students could pursue graduate studies without a traditional major, as they may not meet the course requirements to enter graduate programs in some traditional disciplines. A graduate program in Water Resources Science would be suited for some of these students. Opposition to interdisciplinary graduate programs is less common because it is recognized that advances in science often are made at the interfaces between traditional disciplines (so-called overlapping "academic neighborhoods"). It should be noted that new disciplines emerge from these interfaces. As an interdisciplinary field matures, it becomes recognized as a field of study or discipline in its own right. Many examples of such disciplines can be cited among the graduate programs at the University of Minnesota.

Problems with graduate study in traditional disciplines. Problems often arise for students who have degrees in traditional fields of study but who wish to pursue graduate studies in water resources within a different discipline. Pursuing a graduate degree in a different field may mean making up a large

number of course work deficiencies, often so many that it is impractical to do so. Students with degrees in interdisciplinary programs also may have difficulties when applying to graduate schools. They typically lack some course requirements of traditional graduate programs to which they apply. Graduate programs, particularly at the M.S. level, often do not allow for much flexibility. Once requirements within the discipline are completed there may be time for only two or three additional courses (typically the minor field). Truly effective interdisciplinary environmental problem solving is not favored by traditional programs. A graduate program in Water Resources Science will allow faculty and students to integrate their strengths providing a platform for the education of knowledgeable, interdisciplinary problem-solving professionals.

Student interest at the University of Minnesota. Although the developers of this proposal have not conducted a formal survey of University graduate or undergraduate students regarding their interest in the proposed program, there is anecdotal evidence for substantial student interest in such a program. Several faculty active in the development of this proposal are involved in graduate admission committees in their departments. They report that applications from students interested in interdisciplinary studies on water resources are common in their departments. In some cases, the student is not admitted because of a lack of specific course work in the disciplinary orientation of the department.

In recent years, the Water Resources Research Center and Sea Grant College Program have received an increasing number of inquiries about the existence of a graduate major in water resources. The graduate students participating in the 1993 seminar series for the graduate minor in water resources also recommended that such a program be developed (see section 1(b)).

(b) Employment Prospects

Within the work force the demands on environmental scientists are increasingly interdisciplinary. Examples include: the effects of water quality and water use on lake and riparian ecosystems, the impact of intensive irrigation on water quality and long-term crop yields, the effects of water quality degradation on human health and the development of public health strategies, the implications of global climate change on water-use policies. Aspects of these research themes can be pursued within traditional disciplines, but other aspects clearly would be better accommodated by individuals with interdisciplinary backgrounds.

Environmental and water resources planning has become a major source of employment in federal, state, and local governments. Particularly at the middle management level, people are being forced to make decisions that cross the boundaries of traditional disciplines. Such decisions often involve many aspects of water resources, including human health, ecological and economic dimensions. The need for water resources professionals who can cross discipline boundaries is likely to continue to grow.

According to a 1989 survey of alumni of the Institute for Environmental Studies at the University of Wisconsin, the first job of 94% of the respondents after receiving a degree was related to their graduate study; 73% found jobs in their preferred geographic area. Forty-seven percent were employed by state and local government, 12% by the federal government and 22% by private industry.

Statistics on the regional or national demand for individuals with advanced degrees in water resources science are difficult to find. However, the demand always has been high, even in slow economic times, for M.S. and Ph.D. graduates from existing water programs at the University (e.g. those in water resources and environmental engineering in Civil Engineering). There is reason to believe that the demand for graduates from the program will be high so long as it maintains high standards for its

students. This conclusion is strengthened by letters of support from administrators and management-level individuals at several water-related government agencies in Minnesota (see Appendix 3).

Finally, in response to the rapidly increasing enrollment in interdisciplinary environmental science and water-related programs in universities and colleges nationwide, the demand for faculty by these programs has increased significantly in recent years. We expect that Ph.D. graduates of the proposed program will be attractive candidates for such positions in the future.

(c) Educational, Research and Societal Benefits

The proposed academic program will fulfill an important educational need at the University. Currently, graduate students interested in water science pursue their degrees within existing academic programs. There are two disadvantages with this approach. First, as discussed in the previous section, students need to satisfy entry and/or graduation requirements of their degree program, which may not be well suited for a specialty in water science. For example, an engineering program may require students to take course work to qualify as a professional engineer. These courses frequently do not optimize the needs of students specializing in water science. Second, the University should attempt to grant the student a degree with a name that properly identifies his/her area of study. Students specializing in water science should obtain a degree with that name.

The proposed academic program will have research benefits to the University. Water resources science is a very broad area of study. Inter/multidisciplinary approaches are needed to address issues of state, national and international importance. Many granting agencies seek multidisciplinary research proposals. Because faculty members from numerous departments will be active participants in the proposed program, multidisciplinary interactions are inevitable as programmatic decisions are made. These interactions undoubtedly will lead to discussions on research problems and needs, which in turn, will lead to research proposals and thesis projects of a more multidisciplinary nature.

The proposed academic program will benefit society in that protection and management of water resources is a high societal priority with complex and multidisciplinary issues. The program will produce graduates who understand these issues and will foster multidisciplinary research to solve them.

4. Comparison with Similar Programs

In the past several decades, many universities have established graduate programs in water-related disciplines. Some of these programs are interdisciplinary in nature, but many are found within departments and therefore aligned along disciplinary boundaries. As described in section 3(a), several universities have graduate programs in environmental studies. The Universities of Michigan and Wisconsin have such programs. The Michigan program does not offer degrees in itself, but rather coordinates and supports programs of research and teaching in areas related to environmental quality, particularly water resources. The program provides opportunities for students working within specific disciplines to participate in interdisciplinary environmental research. The Wisconsin program is an "umbrella" for several interdisciplinary (but more specific) M.S. and Ph.D. programs, including an M.S. program in water resources management. This program has existed for the past 20 years and has been quite successful. It produces about 10 students per year. The course work program is designed to be completed in two years, and students within the program work jointly on a multidisciplinary problem in the summer as a "capstone" project to gain experience in analyzing real-world water issues.

Hydrologic science programs often lie within engineering colleges and are usually associated with civil or environmental engineering disciplines. One example close to Minnesota is the Graduate Program in Water Chemistry at the University of Wisconsin in Madison, which is offered through the Department of Civil and Environmental Engineering. Its focus is only on water chemistry. Twenty-four students are currently enrolled in the program and about six students receive M.S. or Ph.D. degrees each year.

Universities and research institutes in many coastal states support Ph.D. programs in oceanography. Although interdisciplinary (including biological, chemical, geological, and physical aspects of oceans), these programs usually are administered within a school or college of marine science. One example is the Joint Program in Oceanography between M.I.T. and the Woods Hole Oceanographic Institution. Closer to Minnesota, the University of Wisconsin in Madison supports a graduate program in Oceanography and Limnology sponsored jointly by the Colleges of Engineering and Letters and Science. More than 20 faculty members supervise 20 graduate students. On average, 3-4 students receive M.S. or Ph.D. degrees each year. Most students who receive Ph.D. degrees go on to postdoctoral positions.

Several universities are currently developing or have already established interdisciplinary M.S. and Ph.D. programs in hydrologic sciences using other administrative models. It seems that each program is different from the others in its emphasis, depending on the existing strengths and resources of the university. Typical programs include the Ph.D. Program in Geophysical Sciences with a Hydrology Option at the University of Colorado (Boulder) and the Graduate Program in Hydrologic Sciences at the University of California-Davis. Each program is interdisciplinary and supported by two or more colleges in its university. The University of Colorado program is supported jointly by the College of Arts and Sciences and the College of Engineering and Applied Sciences. All Ph.D. students are required to take 30 credits including 15-18 credits in core courses (mathematical analysis, probability or statistics, and 9-12 credits in physical hydrology or chemical hydrology classes) and 15-18 credits in elective courses in their area of specialization (physical hydrology or chemical hydrology). A significant gap in this program is the lack of training in biological aspects of water resources.

The University of California-Davis Graduate Program in Hydrologic Sciences is more similar to our proposed Graduate Program in Water Resources Science. It is an interdisciplinary program and draws faculty and courses from several colleges across the campus. Upon entering the program, students are required to take a core curriculum that includes courses in fluid dynamics, hydrology, hydrobiology or hydrochemistry, hydrologic policy, and a seminar in hydrology, or hydrogeochemistry.

Based on personal conversations with faculty at several other universities, we believe that the list of campuses with graduate programs in water resources science will grow in the future, in recognition of societal needs and the emergence of hydrologic (water resources) science as a recognized field of study. The program we propose will build on existing strengths at the University of Minnesota and be a focal point for faculty and researchers with diverse aquatic research interests. Without question, this program has the potential to be ranked among the leaders in hydrologic sciences internationally.

5. Quality Control

(a) Qualifications of Graduate Faculty

The graduate faculty in the proposed program would be accredited within the Graduate School according to the existing guidelines. All members of the Graduate Faculty in Water Resources Science will have their own primary departmental home. Therefore, we propose that the Graduate School status an individual has within his/her department would automatically be conferred to the individual

in the proposed interdisciplinary program. The categories are: full, associate, and examination member. Admission to or change of graduate status will be initiated by the DGS in Water Resources Science but a copy of the change will be sent to the faculty member's home department for information.

(b) List of Faculty and Interests

The Graduate Faculty in the existing water resources minor program includes approximately 65 members representing seven colleges and more than 15 departments on the Twin Cities and Duluth campuses (see Table 2 for a list). Many of these individuals will wish to become members of the Graduate Faculty in Water Resources Science, and some faculty who are not currently members of the Graduate Faculty in the minor program also will wish to be members. A list of 42 faculty who thus far have indicated an interest in being included in the graduate faculty of the proposed major is presented in Table 3, with the names grouped according to area of interest. Abbreviated curricula vitae for representative faculty who will be involved in the proposed program are included in Appendix 2.

(c) Governance of the Program

Governance of this all-Graduate School program will be similar to that of the graduate program in toxicology, which is also a system-wide program. A Director of Graduate Studies (DGS) and co-DGS will have primary administrative responsibility for the program and will serve as program leaders. The DGS will be elected by a majority vote of the Graduate Faculty and will serve a three year term. A DGS may serve for one or more additional terms at the discretion of the faculty. A co-DGS will be elected for the Duluth campus to insure that graduate students participating in the program on that campus will have ready access to advising and that the program will have leadership and visibility on that campus.

The Graduate Program in Water Resources Science will be administered by the Water Resources Research Center, which is housed in the College of Natural Resources on the St. Paul campus. The Center is a University-wide program and provides administrative services for the existing graduate minor in water resources.

The program will have four standing committees. This is more committees than most graduate programs operate, and it represents a conscious effort to involve the faculty in the program's activities. Members of the Graduate Faculty will be geographically dispersed and have their primary academic homes in many different academic departments. Consequently, we believe it is important to provide mechanisms to bring the faculty together and to encourage their active involvement in program governance. The committees and their responsibilities are as follows.

(1) An **Executive Committee** will provide oversight and long-term guidance to the program and review the qualifications of faculty wishing to become members of the Graduate Faculty in Water Resources Science or renew their membership on the faculty.

(2) A **Graduate Admissions and Studies Committee** will consider applications from potential students for the program and review progress of students within the program.

(3) A **Curriculum and Examinations Committee** will review issues relating to existing and/or proposed courses and administer the written preliminary examination to Ph.D. students.

(4) A **Faculty-Student Affairs Committee** will be responsible for helping to build a sense of identity and community among the students and the faculty in the program.

The DGS's will appoint members of these committees, taking care to balance the diverse disciplinary, departmental, and campus affiliations of the graduate faculty. Graduate student representatives will be

Table 2. List of Graduate Faculty in Water Resources Minor

College of Agriculture

James Anderson (Soil Sci.)
Donald Baker (Soil Sci.)
Paul Bloom (Soil Sci.)
H.H. Cheng (Soil Sci.)
Charles Clanton (Agric. Engrg.)
William Easter (Ag. & Appl. Econ.)
David Grigal (Soil Sci.)
Satish Gupta (Soil Sci.)
Ralph Holzenthal (Entomology)
Edward Nater (Soil Sci.)
John Nieber (Agric. Engrg.)
Charles Onstad (Soil Sci.)
C. Ford Runge (Ag. & Appl. Econ.)
Bruce Wilson (Agric. Engrg.)
Robert Young (Soil Sci.)

College of Biological Science

Donald Alstad (Ecol. Evol. & Behav.)
Margaret Davis (Ecol. Evol. & Behav.)
Florence Gleason (Plant Sci.)
Eville Gorham (Ecol. Evol. & Behav.)
Richard Hanson (GFBI)
Donald McNaught (Ecol. Evol. & Behav.)
Robert Megard (Ecol. Evol. & Behav.)
David Tilman (Ecol. Evol. & Behav.)

College of Liberal Arts

Dwight Brown (Geogr.)
Luther Gerlach (Anthropology)
Philip Gersmehl (Geogr.)
Richard Skaggs (Geogr.)

College of Natural Resources

Ira Adelman (Fish. & Wildl.)
Kenneth Brooks (Forest Res.)
Yosef Cohen (Fish & Wildl.)
Hans Gregersen (Forest Res.)
Anne Kapuscinski (Fish. & Wildl.)
Raymond Newman (Fish. & Wildl.)
James Perry (Forest Res.)
Lloyd Queen (Forest Res.)

**College of Science and Engineering
(UMD)**

Robert Carlson (Chemistry)
Hollie Collins (Biol.)
Dianne Dorland (Chem. Engrg.)
Anne Hershey (Biol.)
Randall Hicks (Biol.)
Carol Johnston (NRRRI)
Andrew Klemer (Biol.)
Melbourne Whiteside (Biol.)

Humphrey Institute of Public Affairs
Sandra Archibald

Institute of Technology

E. Calvin Alexander (Geol. & Geophys.)
Roger Arndt (Civil Engrg.)
Randal Barnes (Civil Engrg.)
Patrick Brezonik (Civil Engrg.)
Steven Eisenreich (Civil Engrg.)
Cesar Farell (Civil Engrg.)
Efi Foufoula-Georgiou (Civil Engrg.)
John Gulliver (Civil Engrg.)
Walter Maier (Civil Engrg.)
Chris Paola (Geol. & Geophys.)
Gary Parker (Civil Engrg.)
Mark Person (Geol. & Geophys.)
H. Olaf Pfannkuch (Geol. & Geophys.)
Michael Semmens (Civil Engrg.)
Joseph Shapiro (Geol. & Geophys.)
Charles Song (Civil Engrg.)
Heinz Stefan (Civil Engrg.)
Otto Strack (Civil Engrg.)

School of Business (UMD)

Richard Lichty (Economics)

School of Public Health

Rex Singer (Env. Health)
Deborah Swackhamer (Env. Health)

Table 3. Faculty interested in participating in the proposed major

Aquatic Biology

Ira Adelman (environmental physiology of fishes, aquaculture)
H.H. Cheng (soil biochemistry)
Eville Gorham (wetland ecology, biogeochemistry/paleoecology of peatlands, paleolimnology)
Sagar Goyal (microbiology, virology, public health)
Anne Hershey (stream ecology, limnology, fish-benthos interactions)
Randall Hicks (aquatic microbial ecology, biogeochemistry)
Carol Johnston (wetland ecology, landscape ecology, GIS)
Donald McNaught (aquatic ecology, ecotoxicology, Great Lakes limnology)
Robert Megard (aquatic ecology, limnology, plankton)
Edward Nater (microbial processes, biogeochemical cycles of heavy metals, wet soils)
Raymond Newman (fisheries ecology, stream ecology)
James Perry (applied aquatic ecology, international water quality/resources management)
Carl Richards (stream and landscape ecology, watershed management, risk analysis)
Melbourne Whiteside (aquatic ecology, paleolimnology, zooplankton ecology)

Hydrologic Sciences

E. Calvin Alexander (hydrogeology, groundwater pollution, tracer hydrology)
James Anderson (soil-water systems, impacts of agricultural practices on water quality)
Donald Baker (climatology)
Paul Bloom (soil/water chemistry, mineral weathering, soil nutrients)
Kenneth Brooks (forest and wetland hydrology, watershed management)
Dwight Brown (spatial/temporal variability of water resources, human impacts on water cycle)
Robert Carlson (aquatic chemistry, environmental toxicology)
Steven Eisenreich (environ. organic chemistry, dynamics of organics in large lakes)
Luther Gerlach (social and cultural aspects of water policy and management)
David Grigal (biogeochemical processes, influence of water on ecosystem processes)
Satish Gupta (soil physics, modeling unsaturated flow in soils)
Carol Johnston (landscape ecology, wetlands, GIS)
Howard Mooers (hydrogeology)
H.-Olaf Pfannkuch (hydrogeology)
Lloyd Queen (GIS, physical hydrology, watershed management)
Joseph Scheubauer-Berigan (aquatic microbiology, pollutant biodegradation, limnology)
Richard Skaggs (climatology)
Michael Sydor (environmental physics, numerical modeling, remote sensing)
Deborah Swackhamer (environ. chemistry, limnology, pollutant fate and bioaccumulation)

Water Resources Engineering

Patrick Brezonik (water resour. manage., water qual. modeling, water chemistry of pollutants)
Charles Clanton (animal waste management)
Dianne Dorland (hazardous waste management)
Efi Foufoula-Georgiou (stochastic hydrology, river geomorphology uncertainty analysis)
John Gulliver (hydraulics, water quality modeling, air-water gas transfer)
Michael McDonald (modeling, hazardous waste management, contaminant transport)
John Nieber (hydraulics, unsaturated flow, watershed modeling)
Heinz Stefan (environ. hydraulics, water quality modeling, lake/reservoir hydrodynamics)
Bruce Wilson (hydraulics, hydrologic/water quality modeling of agricultural watersheds)

included on the last two committees (but not be involved in committee work related to written preliminary exams). The DGS's will co-chair the first two committees and serve as *ex officio* members of the other two committees.

Several of the above governance issues are already implemented in the existing graduate minor program. A faculty handbook summarizing the program's governance procedures will be prepared when the program becomes a degree-granting program.

(d) Evaluation and Review.

Individuals will be appointed to the Graduate Faculty in Water Resources Science for five-year terms. During the first year of operation for the program, its executive committee and DGS's will develop criteria regarding the level of program involvement required for re-appointment to the Graduate Faculty. These criteria will be presented as recommendations to the Graduate Faculty, which will adopt such procedures by majority vote. The executive committee and DGS's will be responsible for implementing these policies.

Program reviews will occur on a regular basis according to Graduate School policies. A preliminary review will be scheduled for the end of the third year of the program's operation to determine whether the program is on track. This review will focus on issues related to program start-up: is a governance structure in place; has a student and faculty handbook been written and distributed; what steps have been taken with regard to student recruiting; what is the rate of applications to the program; what is the quality of the applicants; are there any initial indications of needed changes in courses or curriculum structure?

A more thorough review will take place in the sixth year of the program. It will address such issues as the appropriateness of the curriculum, initial rates of student progress and degree production, performance of students in the program, availability of funding for students, effectiveness of field and other activities designed to build a sense of community among the students and faculty, and placement of initial graduates from the program, as well as the issues addressed in the initial review. The six-year review will be conducted by a combination of internal committees (of the program's graduate faculty) and external reviewers appointed by the Graduate School. In evaluating the success of the program, both of the first two reviews will consider the extent to which the program has met its own goals for student enrollments and degree production, as established by the graduate faculty during the 1994-95 academic year in planning for the program's implementation. If the results of the first two reviews are positive, additional program reviews would be scheduled every five years thereafter.

6. Implementation

(a) Time Schedule

If approved by the appropriate governing bodies, the M.S. and Ph.D. program in Water Resources Science would begin at the start of the 1995-96 academic year.

(b) Initial faculty

The initial faculty will be derived from the present Graduate Faculty in the Water Resources minor, which includes approximately 65 individuals from the Twin Cities and Duluth campuses (Table 2). These faculty will be asked if they wish to be nominated for full membership on the graduate faculty

of the degree program. An initial survey indicated that at least 42 faculty (Table 3) are interested in being nominated. Nominations will be reviewed by a committee appointed by the DGS's to determine qualifications for full membership.

(c) University resources

A large number of graduate faculty in existing departments and degree programs are available and interested in participating in the proposed interdisciplinary program, and no new FTE faculty will be required to implement the program. Similarly, the program will rely on existing courses (a few with some modification) and a new course being developed for the existing Minor program. The development of new courses is not required to initiate the program. Some faculty teaching, research, and advising efforts will be redirected from existing programs to the new interdisciplinary program, but the new activities will be complementary to present (department-based) activities. The graduate students in the new program will be housed within existing departmental facilities, and student credit hours and faculty teaching activities undertaken as part of the new program will be automatically credited to the parent department of the advisor or course instructor. Consequently, the new program will not draw significant resources out of any existing program. To the extent that the new program will attract students to the University who otherwise would not enroll here and also will encourage the development of new (externally-funded) training and research grant programs, the program has the potential to add resources to individual departments and to the University as a whole.

The University of Minnesota is one of the premier institutions in the United States with regard to water resources research. As such, it has a diverse array of specialized laboratories and field facilities available for research on virtually any aspect of water. The following is a brief description of the major laboratories and field facilities, but it is not an exhaustive list.

St. Anthony Falls Hydraulics Laboratory, Minneapolis. This laboratory is one of the premier hydraulics laboratories in the United States today and is part of the Department of Civil Engineering in the Institute of Technology. Financial support of the Laboratory is derived primarily from grants and contracts. The Laboratory has a wide variety of experimental facilities for graduate research in water resources, including facilities for open channel hydraulics testing, pipe flow measurements, hydraulic machinery testing, physical and computer facilities to model rivers/lakes/reservoirs, and wind tunnel measurements. The facilities can be used by research faculty by paying a negotiated fee. The laboratory also has limited facilities for teaching activities.

Monticello Experimental Research Streams. This field research facility formerly was owned by the U.S. EPA and recently was deeded to the University of Minnesota. It consists of several stream channels on which studies can be conducted to evaluate stream hydrology, stream hydraulics, and stream chemistry/biology.

Gray Freshwater Research Institute in Navarre. This research facility near Lake Minnetonka has excellent laboratory space for research on freshwater biology and environmental chemistry, including studies on fate and transport of trace organic contaminants in the environment. The facility was donated to the University almost 20 years ago and is maintained by the College of Biological Science.

Limnological Research Center. Located in the Department of Geology and Geophysics (Institute of Technology, Minneapolis campus), the LRC has been one of the premier research centers for modern and paleo-studies on lakes for over 30 years. Aside from its offices and laboratories in Pillsbury Hall, the LRC maintains a laboratory for analysis of sediment cores in the Civil Engineering Building.

Soil Science Laboratories. The Department of Soil Science is one of the premier soils departments in the nation. It has excellent research facilities for studies of the physics, chemistry, biochemistry, microbiology, and morphology of the soil-water systems. In addition to the regular laboratories, it operates the following special facilities:

Water Quality Research Laboratory. This laboratory is devoted to support research on water quality problems involving nitrate and pesticides. Automated analytical systems are capable to analyze large volumes of samples for nitrate, pesticides, and organics. Specialized equipment includes several units of gas chromatographs and high performance liquid chromatographs all with autosamplers, gc-mass spectrometer, two robotic systems for sample extraction, supercritical fluid extraction apparatus, carbon and nitrogen analyzers, autoanalyzers, and isotope-ratio mass spectrometer.

Research Analytical and Soil Testing Laboratory. The Research Analytical Laboratory is approved by EPA for meeting the QA/QC standards in analysis of water samples. It has several ICP emission and atomic absorption spectrophotometers, and ion chromatographs for analysis of inorganic elements.

Soil Characterization Laboratory. In addition to facilities for conducting standard analysis of soil properties for soil classification purposes, the Laboratory has X-ray diffractometer, Fourier-transform infrared spectrophotometer, and cold-vapor atomic fluorometer for mercury analysis.

Soil Landscape Analysis Laboratory. This facility has the computing capability to use geographic information systems technology and conduct research using digital elevation and terrain analysis models. It manages the computerized database: Soil Survey Information System (SSIS).

Climate Resource Facilities. The facilities include: (1) the **St. Paul Climatological Observatory**, which was established in 1960 and has one of the most comprehensive setups in the nation for collecting climatological data, including continuous monitoring of air and soil temperature, precipitation, soil moisture, evaporation, humidity, wind, and solar radiation; (2) a network of computer work stations with access to the state climate database, and links to the National Weather Forecast Center at the MSP Airport, North Central Regional River Forecast Center, Midwest Climate Center, National Climate Data Center, and Climate Assessment Center; (3) a network of 16 automated weather stations at field research sites across the state with daily reporting capabilities; (4) a network of hundreds of voluntary weather observers participating in daily recording of weather conditions across the whole state; some of the records have been kept for over 100 years; and (5) the **Earl Kuehnast Memorial Climatological Library**, which contains rare collections of data and publications.

The Minnesota Agricultural Experiment Station operates branch stations at Waseca, Lamberton, Morris, Crookston, and Grand Rapids, and additional facilities at Rosemount, Becker, Staples, and Westport with extensive facilities, equipment, and support staff for landscape scale field studies.

Staples Irrigation Center. (Currently being developed) This center, located in Staples, MN, is under development by the Minnesota Agricultural Experiment Station. Approximately 320 acres of land with sandy soil at the Center is being leased to the Experiment Station by the Staples School District. Irrigation systems at the location include a 110-acre center-pivot system, a 10-acre center-pivot system, a linear-move system, and several solid-set irrigation systems. Research plot areas are available to University of Minnesota researchers on a scheduled basis.

Soil Physics Laboratory. This laboratory, located in the Department of Agricultural Engineering (St. Paul campus) contains facilities for measuring various water-related physical properties of soil mater-

ials. It also is associated with laboratory space for performing experiments on such items as physical models of soil profiles, drainage systems, and ground water aquifer systems. The laboratory is being relocated and remodeled within the Agricultural Engineering Building.

Hydraulics Laboratory in Agricultural Engineering. The hydraulic laboratory in the Agricultural Engineering Building contains a medium-sized open channel flume, small movable open channel flume, and a Hele-Shaw model. The facility can be used to make measurements on open channel flow, hydraulic structure performance, hydraulic jumps, and drainage flow in porous media. Like the Soil Physics Laboratory, the Hydraulics Laboratory is currently undergoing remodeling.

Fisheries/aquaculture facilities, St. Paul Campus. These facilities consist of two laboratories operated by the Department of Fisheries and Wildlife. A 3000 ft² wet laboratory in Hodson Hall provides 150 gal/min of temperature-controlled well water for a variety of research, ranging from aquatic toxicology to the biology and ecology of aquatic plants and animals. A new 10,000 ft² facility in the Agricultural Engineering Shops Building, to be operational in summer of 1994, will provide 450 gal/min of well water for research similar to that conducted in Hodson Hall but on a larger scale.

Microcomputer centers on the Twin Cities Campus. The University maintains microcomputer centers at five locations on the Twin Cities campus. These centers contain both MacIntosh and DOS-based microcomputers, as well as laser printers. These facilities are available for use by teaching faculty for instruction on the use of software. Outside of formal class activities they are available to students for a nominal fee. Several academic departments also maintain extensive microcomputer facilities, and several departments and research centers maintain specialized computer facilities for research in water resources fields. For example, a new Water Resources Modeling Laboratory in the Agricultural Engineering Building will be available in mid-summer of 1994. It will contain a workstation, microcomputers, and digitizer tablets, and all computers will be connected to the University electronic network to facilitate e-mail communications within and outside the University. The Laboratory also will contain a library of essential water resources journal publications and facilities to access climatic/hydrologic data for locations in the United States.

Field facilities at Itasca Lake Biological Research Station. The Itasca Lake Biological Research Station has facilities for both laboratory and field measurements of chemistry and biology of lakes/streams/soils near Itasca State Park. The facility has living quarters available to make possible extended stays at the facility for teaching and research activities.

Field facilities at the Cloquet Forestry Research Center. Like the Itasca Lake Biological Research Station, the Cloquet Forestry Research Center has living quarters available for extended stays for teaching and research activities.

North Central Soil Conservation Research Laboratory. Located in Morris this research facility is owned and operated by the U.S. Department of Agriculture, Agricultural Research Service. Research activities by permanent scientists at the facility include soil erosion mechanics, contaminant transport in surface waters and subsurface waters, water use by crops, crop production enhancement, alternative pest control, and farming systems. Laboratories for soil physics, soil/water chemistry, and biology facilitate numerous ongoing research activities. Field research activities are also ongoing on local lands either owned or leased by the Laboratory. Cooperative research between University researchers and ARS researchers are possible.

Minnesota Supercomputer Institute (MSI). The MSI maintains state-of-the-art computing facilities

on the Twin Cities Campus. These facilities include numerous workstation computers, color graphics output devices, and supercomputers including CRAY-2 and CRAY-XMP computers. These facilities are available to research faculty and associated graduate students through the MSI grant program.

Center for Water and the Environment (CWE), Natural Resources Research Institute, UMD. The CWE has a core staff of 12 Ph.D. scientists and two postdoctoral fellows conducting water-related research. Extramural funding is approximately \$3 million annually. The CWE facility is equipped for a wide range of water research and has a full suite of field sampling equipment and a fully equipped analytical laboratory that is used for in-house work, as well as regionally on a contract basis. The CWE is an NSF-sponsored GIS center and has a full array of modern equipment and software to support research on spatial problems.

Biology Department, UMD. The department has a strong focus on ecological research, with five faculty and one research associate involved in water-related research. Research equipment and facilities within the department available for graduate student research include dissecting, bright-field, phase-contrast, differential-interference-contrast, and epifluorescence microscopes, image-analysis systems, microcomputers, spectrophotometers, fluorometers, scintillation counter, HPLC, atomic absorption spectrophotometer, refrigerated centrifuges, ultracentrifuge, autoclaves, cold rooms, boats, motors, and a variety of field sampling equipment. Mass spectrometers, scanning electron microscope, and various other pieces of equipment are available for shared use in other departments.

Geology Department, UMD. This department is well equipped for hydrologic and geomorphological research. Available equipment includes a full array of field meters, soil probes, drilling and coring devices, spectrometers for elemental analyses, X-ray diffractometer, laser particle counter, stereoscopes, and computer hardware and software (including scanner, digitizing equipment, autocad, digital state and county maps). The Large Lakes Observatory (LLO) is being developed, and several of its faculty will be housed in the Geology Department. A director has been hired and searches are underway for two LLO faculty who will be housed in the department.

(d) Outside resources

In addition to University fellowships, departmental teaching assistantships, and research assistantships provided by individual faculty, the program will aggressively seek fellowship funds from programs in NSF, EPA, NOAA, USDI, USDA, and other federal agencies, as well as scholarship and internship opportunities with state and regional agencies involved in water resources research and management.

Research scientists associated with several federal and state laboratories and offices in Minnesota represent a pool of potential adjunct members of the Graduate Faculty. For example, the U.S. EPA laboratory in Duluth has Ph.D.-level scientists who would qualify for such adjunct appointments, as does the U.S. Geological Survey (Water Resources Division) in the Twin Cities. To be appointed as adjunct faculty members, such individuals will need to meet the same standards of expertise and professional accomplishment as regular members of the faculty. Appropriate involvement of such individuals as adjunct faculty has several potential benefits. For example, graduate students and regular faculty may become involved in ongoing research programs of adjunct faculty, thus expanding overall funding opportunities for the graduate program.

Appendix 1

Example degree programs for students emphasizing various areas of specialization within Water Resources Science.

Appendix 2

Curriculum Vitae for Graduate Faculty

Resumes of 42 faculty interested in participating in this program are on file with the Graduate School and the Water Resources Research Center.

Appendix 3

Letters of Support

Ira Adelman, Professor and Head, Department of Fisheries and Wildlife, St. Paul Campus
Patricia Bloomgren, Director, Division of Environmental Health, MN Dept. of Health, Minneapolis
H.H. Cheng, Professor and Head, Department of Soil Science, St. Paul Campus
Donald P. Christian, Professor and Head, Department of Biology, UMD
Alan Ek, Professor and Head, Department of Forest Resources, St. Paul Campus
Steven J. Eisenreich, Professor of Civil Engineering and Director, Gray Freshwater Biological
Institute; Chair, Strategic Planning Committee on Water, Minneapolis
Sandra Featherman, Associate Vice-President for Academic Affairs, UMD
James A. Grant, Professor and Head, Department of Geology, UMD
Michael McDonald, Associate Professor and Director of Sea Grant Program
Vance Morey, Professor and Head, Department of Agricultural Engineering, St. Paul Campus
Tom Johnson, Professor and Director-designate, Large Lakes Observatory, UMD
Ronald Nargang, Associate Director, MN Department of Natural Resources, St. Paul
Gilbert Veith, Director, Environmental Research Laboratory, U.S. EPA, Duluth

Twin Cities Campus

*Water Resources Research Center
College of Natural Resources*

*Suite 302
1518 Cleveland Avenue
St. Paul, MN 55108
612-624-9282
Fax: 612-625-1263*

April 16, 1994

Dr. Kenneth Zimmerman
Associate Dean
The Graduate School
Johnston Hall
Minneapolis Campus

Dear Ken,

I am pleased to enclose a copy of the proposal for a new interdisciplinary graduate major in water resources science. The major will be a systemwide program, involving faculty on both the Twin Cities and Duluth campuses, and it will offer both M.S. and Ph.D. programs. The proposal was developed by a group of 13 faculty who are members of the Graduate Faculty in the Water Resources Minor Program, and we regard the development of a major in water resources science as a natural extension of the minor program.

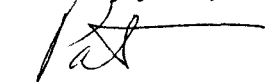
The proposal has been endorsed by the Graduate Faculty in the Water Resources Minor and by the Strategic Planning Committee on Water. Twelve letters of support for the proposed program are attached to the proposal. The letters are from administrators on the Duluth and Twin Cities campuses of the University and administrators of several water-oriented government agencies. I expect to receive several more letters of support and will forward these to you before the first Council meeting in early May.

The proposal was written in the format recommended by the Office of Academic Affairs for applications for new academic programs. The enclosed proposal is complete except for the executive summary requested by the Board of Regents and one-page form required by the HECB. However, if you find any sections that require further information, please contact me.

Please distribute copies of the proposal to the appropriate P& R Councils for their review at the spring Council meetings. The faculty who have developed the proposal hope that it can be submitted to the Board of Regents for approval this fall and that the program can begin in fall of 1995.

I would like to thank you for your helpful comments on earlier drafts of the proposal and your insights regarding issues that needed clarification.

Sincerely yours,



Patrick L. Brezonik
Professor and DGS, Water Resources Graduate Minor

C. University's Responses to the Four Criteria Considered by the Minnesota HECB

1. Is this Program Necessary?

Minnesota has diverse and extensive water resources, and they probably are its most important natural assets. They also represent a highly significant economic resource, not only for the recreational industry, but also for commerce and agriculture, and their presence contributes to the way and quality of life that endears this state to its citizens and visitors. Protection and management of these resources also is a large enterprise within the state, involving numerous governmental agencies at federal, state, regional, and local levels, as well as a growing number of businesses in the private sector. Water resource problems are becoming more complicated as our technological society continues to develop, the state's population continues to grow and spread to once rural areas; in addition, laws regulating water use become more numerous and detailed. Water resources experts increasingly face the need for knowledge in a variety of disciplines; water resources management has become a multi-disciplinary and interdisciplinary practice.

Within the past few years, water scientists within higher education have recognized the emergence of water resource science (also called hydrologic science by some) as a distinct field of inquiry in its own right. Previously, the field was recognized only as fragmented subfields within numerous traditional disciplines. Water-related studies at the interfaces between traditional disciplines has led to a blurring of the original disciplines, and a maturation of these subfields in turn has led to a recognition of the field we now call water resources science. A widely publicized 1991 report by the National Academy of Science-National Research Council called *Opportunities in Hydrologic Science* has stimulated the development of interdisciplinary graduate programs by that name at several graduate research institutions across the country. These developments are in response for the demonstrated need to provide training to water resources professionals that crossed a number of traditional disciplines and the recognition that most existing degree programs are not structured to accomplish this.

This proposal for a system-wide, interdisciplinary graduate program in water resources science was written in response to the above considerations. There is and will continue to be a need for well-trained technical experts in water resources. At least some of these individuals need a working knowledge of a broader range of scientific disciplines than they would gain from degree programs housed in traditional departments. They also need an appreciation of the socio-economic and legal-administrative framework in which water resources are managed in this country. The proposed interdisciplinary graduate program in water resources science will fill these needs and do so in a highly cost-effective manner because the Twin Cities and Duluth campuses of the University of Minnesota already has an impressively broad collection of water resources faculty, courses, and research facilities that rank among the most outstanding in the nation.

2. Is the Program a Needless Duplication?

(a) Geographic Service Area and Prospective Student Market

The geographic areas that we expect to contribute prospective students, in the order of potential numbers, are: metropolitan Twin Cities and Duluth areas, outstate Minnesota, bordering states, the United States, foreign countries and international organizations. The analysis of a prospective student market is closely linked to the geographic areas, or "brainsheds", contributing to the program and thus will be

addressed in conjunction with it. Among the prospective student populations one has to distinguish between two groups that may need different recruiting strategies and slightly different approaches to program implementation. These are: (1) recent graduates with a bachelor's degree in an appropriate field, who may wish to continue their graduate education directly (or nearly directly) after obtaining their undergraduate degree; and (2) professionals with some years of experience who wish to upgrade their academic background. The latter group is strongly represented in the metropolitan area. The program also should attract students directly from international organizations or from those that sponsor international educational opportunities.

Metropolitan Twin Cities and Duluth Areas. With almost two and a half million population, a large private industry base, numerous federal, state and local government agencies, and about twelve four year degree granting institutions, the Twin Cities Metropolitan Area is one of the largest potential sources for students in this program. The Duluth-Superior area has a population base approximately 10 percent of the Twin Cities metro area, but it also has a diverse industrial base, a variety of state, federal and local government agencies and laboratories, and several four-year degree-granting institutions. The largest number of recent graduates from institutions in these areas probably would come from programs in the University of Minnesota campuses. These prospective students either would have an intrinsic interest in interdisciplinary studies and research or come from broad-based undergraduate programs. Private colleges and four-year metropolitan institutions also will be a primary source of students because many of these colleges pride themselves in giving generalist degrees in the physical and life sciences. Some well-qualified students with interests in the water resources sciences from these programs may have to make up prerequisites to obtain a degree in some traditional disciplines that currently offer training within particular areas of water resources. Therefore, they would prefer this path to a graduate degree.

The Twin Cities area is the seat of state and local governments, many employees of which would welcome the opportunity to upgrade their degree standing. It is also a center for private industry involved in environmental and water resources projects, as well as a large consulting business community. The interest in further education is evidenced by high attendance rates at professional workshops and continuing education meetings. Some of these potential students will choose to pursue degrees on a part-time basis while they continue their employment. To attract this clientele, the program will have to be flexible to accommodate scheduling and course offerings appropriate to someone on a normal weekly work schedule, and it will have to guarantee accessibility to advisors and committee members to such students. Similar statements apply to the Duluth-Superior area, although the total numbers of individuals involved in government, industrial, and consulting businesses are proportionately smaller than in the metropolitan Twin Cities area.

In recent years increasing emphasis has been placed on environmental and hydrologic aspects in general science courses offered in K-12 settings. Teachers at both the elementary and high school level will want to concentrate their continuing education by upgrading their skills in these areas. In view of their sometimes variegated undergraduate background, this program at least at the M.S. level would meet their needs. The Twin Cities and Duluth areas have a high proportion of school-age children, and therefore of teachers, in Minnesota.

Outstate Minnesota. In outstate Minnesota, the situation with regard to recent graduates is similar to that of the metropolitan area. The degree-granting institutions are comprised of two University of Minnesota campuses (Morris and Crookston), private colleges, and the State University System. The latter most likely would produce the largest number of students for the program. None of the schools have curricula that grant degrees in water resources science per se, but all have geology, biology, life

science and physical science programs that produce the kinds of students interested in our program. The lower density of practicing professionals in the water resources science field in outstate Minnesota and the logistic problems connected with the larger distances suggest that the program will not attract large numbers of part-time students from this group, but there is some potential for participation by a few students each year, particularly if the program can develop funding opportunities suitable to individuals in this category.

Bordering States. The most obvious competition for students interested in water resources science would come from the University of Wisconsin in Madison, which offers a somewhat comparable program in the form of a water resources management M.S. curriculum. It also offers M.S. and Ph.D. degrees in limnology and oceanography. Individual (discipline-oriented) graduate degree programs related to water resources sciences already compete for students in the national market with similar programs at the University of Wisconsin, just as they do with other top-quality graduate research institutions across the country. Competition with programs in Madison, however, is not the crucial point. The more important questions are: what pull does their program have on the campuses of the Wisconsin system that are close to the Twin Cities and Duluth, and how attractive would our program be to students from these schools? The universities in question are River Falls, Eau Claire, Stout, and Stevens Point. None of these campuses has strong graduate programs in water resources, and thus they are not competitors for the graduate students we are attempting to attract. Several of these campuses have high quality undergraduate programs in physical and biological sciences, and one campus (Stevens Point) has a strong undergraduate program in environmental and aquatic sciences. Thus, these campuses are potential contributors of students to our graduate programs, as well as those in Madison. Our ability to attract these students is enhanced by reciprocity agreements between Minnesota and Wisconsin, which eliminate a potential barrier (tuition costs) for out-of-state students.

None of the colleges near the Minnesota border in Iowa and the Dakotas have similar programs to the proposed one, nor do the main universities of these states have anything comparable to attract their own students. Therefore these would be potentially good areas from which to attract students.

National. Because of the University's reputation for strong research and graduate training in water resources fields, the program will be attractive to individuals nationwide as soon as it is approved and becomes known across the country. The program will appeal more to students who are interested in broad issues and work at the interfaces among several disciplines rather than to students interested in focusing in a narrow specialization. At present, these students must apply to departmentally-based water resources programs. Such students may have strong backgrounds in several areas of physical and biological science, but not necessarily in the parent discipline of the water-oriented program to which they are applying for graduate study. As a result, they may be required to make up a large number of prerequisites to enter such a program. The writers of this proposal are aware of many such examples in their own graduate programs.

In some cases, a student with a high scholarly potential may be denied admission to a departmental program because of course deficiencies that are unrelated to water resources; in other cases they choose not to come to this university because of departmental requirements for articulation work not related to their field of interest. For example, a student interested in graduate work in groundwater studies (hydrogeology) in a geology department may be required to take several undergraduate courses oriented toward "hard-rock" aspects of geology (e.g. petrology, lithology, crystallography) if he/she does not have an undergraduate major in geology. A student interested in graduate studies in watershed hydrology in the department of agricultural engineering may have to take a large number of background courses in mechanics that are not pertinent to the student's graduate program.

Once the program is established, it will attract high quality students on a national basis since relatively few institutions have the broad capabilities that the University of Minnesota has to offer a program similar to the one outlined in this document.

International. Internationally, two user groups are obvious: graduates of foreign institutions who are interested in an interdisciplinary program in water resources and/or need some flexibility in the interpretation of their academic background would prefer this program to more rigid and narrow programs. Furthermore, there are not many similar programs offered in the industrialized nations; the UK, with its Open University, and programs in Wageningen, Holland, are two similar programs that come to mind. The other potential user group is international organizations involved in water resources projects that find it advantageous to have some of their employees obtain a graduate education, and organizations that sponsor continuing education for mid-level managers in developing countries. Some international organizations, such as the WHO and WMO, organize and sponsor year-long courses in certain aspects of water resources, but the attraction of actually obtaining a degree (provided the academic quality of the student is acceptable) would make this program much more competitive.

Projected Enrollment. Once the program is fully operational, we expect it will have a graduate enrollment of about 40 to 60 students, including 10-15 part-time students from water management agencies and consulting firms in the Twin Cities, and about 10 Ph.D. students. The number of Ph.D. students probably will be limited by the availability of research funds for support; the program will not admit students to the Ph.D. program unless financial support is available and a faculty member has expressed a willingness to serve as an advisor. Approximately 30-50 students will be in the M.S. program at any time, and we expect that a substantial majority (at least two-thirds) will be full-time students. The M.S. program normally should be completed in two years; therefore, we expect to admit approximately 15-25 new students each year (approximately 10-20 full-time students). Roughly one-third to one-half of the students are likely to be based on the Duluth campus, and one-half to two-thirds will be on the Twin Cities campuses.

(b) Similar Programs in Service Area

There are no comparable programs in the primary service area for the University of Minnesota. The University of Wisconsin in Madison offers a variety of graduate programs related to aquatic sciences (including an M.S. in water resources management and M.S. and Ph.D. degrees in limnology and oceanography). However, this institution is not within the primary service area for the University of Minnesota, even though there is some overlap between the two institutions with regard to student recruitment. The same comment can be made about almost any graduate research university across the country in that the service area extends nationwide and indeed internationally for these institutions.

3. Is the Program within the Capability of the Institution's Resources?

(a) Needed and Available Resources

(i) Courses. The University of Minnesota has a long history of offering high quality instruction in subject matter related to water. Since 1988 the Graduate School has offered a Graduate Minor in Water Resources. Associated with the minor are approximately 80 courses that can be selected by a student to meet the requirements of the minor. In developing the minor, faculty selected these courses from an even more extensive list of water-related courses at the University. The approach to be used in the proposed major will be similar to that used in the minor in that most of the courses needed to offer the major are already available in existing degree programs. However, one new course specially

tailored to the major and (existing) minor is being developed, and several existing courses will be modified to meet the needs of the major. The new course is related to water resources policy issues. The proposed course programs for the M.S. and Ph.D. degrees, including core courses and elective courses, are listed in Sections D.2(f) and D.2(g).

(ii) **Faculty.** The University recognizes three levels of graduate faculty membership: examining, associate, and full membership. **Examining membership** is a special category within the graduate faculty. It is intended as a permanent appointment and allows a person to teach courses and serve on examining committees, but it does not confer the right to serve as adviser for master's students or doctoral candidates. Except in special cases approved by the Graduate Council, examining members may be appointed only in programs that offer graduate courses but not graduate degrees. An associate member in a graduate program is a regular (or adjunct) member of the University faculty in a degree-granting program who holds a Ph.D. or equivalent degree and who has met the constitutional requirements of approval by the graduate faculty of the program with which he or she is associated. This status confers the right to serve as the advisor to master's students. **Full membership** in a graduate faculty confers the additional right to serve as adviser for doctoral candidates. For full membership the nominee must have strong research record demonstrated by significant refereed publications in which he or she has played a major role in guiding the research. Experience in teaching and advising of graduate students is highly desirable, though not mandatory.

In our current status as a graduate minor program, the highest level of graduate faculty status is examining membership. Upon establishment of the proposed major, a Graduate Program Committee will be selected and a Director of Graduate Studies and a co-Director of Graduate studies will be selected. The Graduate Program Committee will develop the guidelines for graduate faculty membership in the proposed major at the associate and the full membership levels. The Water Resources Minor program currently has approximately 65 faculty at the examining membership level. Many of these faculty also will become active in the proposed major program, and other faculty also will join. Given this large pool of interested and available faculty, no additional FTE faculty are needed to develop and operate the proposed program. A list of the graduate faculty in the current minor arranged by college and department within each college is given in Table 3 of Section D.5(b), and Table 4 of that section lists 39 faculty who have expressed an interest in being members of the graduate faculty in the proposed major. Appendix 1 contains abbreviated curricula vitae for these faculty.

(iii) **Physical Facilities.** Each graduate student in the major will be officed in his/her home department, that department being the one associated with his/her adviser. However, this will not restrict the graduate student from using laboratory and/or computer facilities located in other departments. An important advantage of the major will be that access to facilities outside of the graduate student's home department will be facilitated by the cooperation between faculty/departments participating in the major. Some of the facilities available through this cooperation are listed below.

- St. Anthony Falls Hydraulics Laboratory, Minneapolis
- Experimental Stream Facility in Monticello
- Gray Freshwater Biological Institute in Navarre
- Limnological Research Center and Core Laboratory, Minneapolis
- Irrigation Research/Demonstration Center (currently being developed), Staples
- Soil Properties Laboratory in Agricultural Engineering
- Hydraulics Laboratory in Agricultural Engineering
- Environmental Engineering laboratories in Civil Engineering
- Minnesota Geological Survey offices and laboratories, Minneapolis

Water Resources Modeling Laboratory in Agricultural Engineering
Fisheries/aquaculture facilities, St. Paul campus
Microcomputer centers at five locations on the Twin Cities Campus
Biological Field Station at Lake Itasca
Forestry Field facilities at Cloquet
North Central Soil Conservation Research Laboratory
Minnesota Supercomputer Institute
Natural Resources Research Institute, Duluth
Large Lakes Observatory (currently being developed), Duluth
Water Quality Research Laboratory in Soil Science
Soil Characterization Laboratory in Soil Science
Soil Landscape Analysis Laboratory in Soil Science
Research Analytical and Soil Testing Laboratory in Soil Science
St. Paul Climatological Observatory
The Earl Kuehnast Memorial Climatological Library
Minnesota Agricultural Experiment Station and its 5 branch stations at Waseca, Lamberton,
Morris, Crookston, and Grand Rapids, and other field facilities at Rosemount, Becker,
Staples, and Westport

In addition, each academic department with faculty in the program has laboratory and other research facilities appropriate to its disciplines.

(iv) Information Services. Library facilities at the University of Minnesota (Twin Cities and Duluth campuses) are well stocked with reference books and scientific/professional journals on the subject of water resources. Nearly any publication on water resources is directly available at these library facilities. When a rare publication is not available it can be acquired through interlibrary loan services.

(v) Projected Costs of the Program. Because the program will rely on the extensive array of course offerings already available on the graduate campuses of the University and because it will not require any new FTE faculty, the incremental costs for this program will be quite small. Except for seminars, special-topics courses, thesis and dissertation credits, and independent study courses, all formal course work for the proposed major will be offered through existing departments and academic programs. This includes a new course in water policy and institutions, which will be co-listed in several departments, as well as in the Water Resources Program. All the core courses for the program are taught regularly (at least once a year), and there will be no difficulty ensuring that the core program is available. Consequently, no funds are needed to offer teaching relief to departments or faculty.

The basic administrative costs for the program are listed in Table 1 and amount to an estimated \$28,000 per year. Funds for these costs will be requested from the Graduate School interdisciplinary program office. The costs include secretarial support, office expenses and supplies, recruiting expenses (for development, printing and distribution of program brochures; visits by fellowship candidates), funds for seminar speakers, and partial support for a teaching assistant for the water policy course.

Once the projected enrollment of 40-60 students is reached, the Director of Graduate Studies [DGS] (Twin Cities) and co-Director of Graduate Studies (Duluth) will need to spend significant fractions of their time leading and administering the program. In aggregate, this may be as much as 50% of an FTE faculty position. Because the DGS and co-DGS will have their primary academic appointments in existing departments, it may be necessary to provide funds to reimburse one or both of those de-

partments for the time spent by those faculty in administering the graduate program in water resources science. We are not requesting funds for this purpose in the initial budget request, but the possibility that this will need to be done later should be recognized.

Table 1. Projected administrative costs for the graduate major in water resources science

Salaries and fringe benefits: secretarial (50% FTE):	\$10,000
teaching assistant for WRES 5101:	3,000
Office supplies and expenses, including telephone and xerox:	4,000
Recruiting expenses (brochure printing and mailing; partial support for visits of fellowship candidates:	2,000
Travel expenses: seminar speakers:	3,000
faculty for intercampus travel to participate in student and programmatic committees:	2,000
students and faculty for field activities, joint symposia, seminars, workshops, and retreats:	3,000
Room rental for interactive video to provide core courses on both campuses:	2,000

As a system-wide, interdisciplinary initiative, the program will require funds for some activities that are not needed by programs based on a single campus and dealing with a single discipline. In particular, funds will be needed to facilitate interactions among the program's faculty and students, who will be spread among several departments and buildings in the Twin Cities and Duluth. Funds are needed to support travel between the campuses for faculty serving on the program's operating committees and on student examining committees (\$2,000) and for both students and faculty to attend joint seminars, annual research symposia, retreats, workshops and field activities (\$3,000). Small amounts of funds also will be needed to offer one of the core courses (and possibly some elective courses) by interactive video (ITV). Although the transmission costs for ITV are covered (at present) by the University administration and thus are not a direct cost to the program, some of the classroom facilities used for ITV have rental costs; these amount to about \$2,000 for a typical 4-credit course.

(vi) Support for Graduate Students. Graduate student support will be derived mainly through grants, contracts and fellowships awarded to individual participating members of the Graduate Faculty or to departmental programs. Funds are acquired by faculty from such diverse sponsors as the U.S. Environmental Protection Agency, U.S. Forest Service, U.S. Soil Conservation Service, U.S. Agricultural Research Service, U.S. Geological Survey, U.S. Agency for International Development, U.S. Department of Defense, U.S. Department of Energy, U.S. Bureau of Reclamation, National Oceanographic and Atmospheric Administration, National Aeronautics and Space Administration, National Science Foundation, Legislative Commission on Minnesota Resources, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, Minnesota Department of Health, and the Minnesota Department of Agriculture.

Funds will be available from some participating departments for teaching assistantships to graduate students involved in the Major. There also will be limited funding for teaching assistantships directed to the Major from the Graduate School for teaching the water resources policy course developed for the Major.

In addition, the program and its graduate students will be eligible for several fellowship programs operated by the University of Minnesota Graduate School, including Graduate School and Dissertation

Fellowships, minority and special fellowship competitions, and the block-grant fellowship program. Finally, faculty associated with the Major intend to vigorously pursue graduate training grants for the program from federal programs (e.g. NSF, US Department of Education, U.S. AID, etc), and we will explore opportunities for fellowship, scholarship, and summer internship programs with appropriate water-related agencies in Minnesota. We believe that the opportunity to develop internship programs with several state agencies is particularly promising (see letter by P. Bloomgren in Appendix 3).

(b) Plan for Internal Program Evaluation

An internal program evaluation will be patterned according to the recent Graduate School recommendations. It would consist of annual audits that survey data trends such as GPA, GRE, TOEFL, and student progress. It would also make use of the recently introduced Program Management Evaluation Form for program internal use. Internal reviews that include self-surveys, as well as reviews by the appropriate Policy & Review Councils, according to the program management evaluation procedure would follow in four to five year cycles, possibly starting after first three years.

4. Is the Program within the Mission of the University?

The University of Minnesota has a long and distinguished tradition of research, graduate training and outreach programs related to water resources. This is appropriate for the only graduate research institution and the land-grant university of a state whose water resources play such a prominent role in its economy and the life styles of its citizens. Approximately 200 faculty and professional staff on the various campuses of the University identify water as an area of expertise or research interest. More than 30 departments in about 12 different colleges offer courses in some aspect of water resources, and about ten departments offer degrees that include focused training in a discipline related to the study of water. In spite of this breadth of expertise, the University does not presently have a graduate program that offers a degree in the water resources sciences.

Establishing a graduate program in water resources science is consistent with the University's mission as the leader in graduate education in the state. Water resources science (also known as hydrologic science) is emerging as an important field in its own right, after having been subdivided among numerous traditional disciplines for many years. Several research universities in other states (e.g. Arizona, California, Colorado) have established graduate programs in this field in recent years, and several more are under development. The University of Minnesota will not be the first to establish such a program, but it will be among the leaders nationwide in recognizing the importance and vitality of this field.

There is an obvious good fit between the proposed program and the needs of the state for individuals trained in its subject matter. Its graduates will find ready employment in a variety of federal, state, regional, and local government agencies in the region, as well as the large number of consulting firms distributed throughout the region.

Finally, this program fits the University's goal to develop and enhance interdisciplinary graduate programs. This was a general recommendation of the Strategic Planning Committee for Research and Postbaccalaureate Education in their recent report, *Enhancing Research Effectiveness: The Foundation for Learning and Teaching in the 21st Century* (University of Minnesota, February, 1994). Water resources was cited by the committee as an example of an area in which the University has the strengths to develop an interdisciplinary graduate program. The proposed program in water resources sciences is truly interdisciplinary. It will bring together faculty from departments of engineering and the physi-

cal, biological and social sciences. These faculty are housed in at least 12 departments and seven colleges on the Minneapolis, St. Paul and Duluth campuses.

D. Program Description

1. Introduction

(a) Context of Proposed Program

The understanding, management and stewardship of freshwater systems is a critical global issue. Research in water resources has become increasingly interdisciplinary and multidisciplinary, involving individuals trained in physical and biological sciences, and engineering disciplines. Several leading academic institutions have recognized the need to address these issues on an interdisciplinary level by developing graduate programs focused on the water resources sciences. Federal funding agencies, including NSF, NASA, DOE, EPA, NOAA, and USDA are increasingly interested in funding large, multidisciplinary and interdisciplinary groups to address broad issues in water research and water resources management. Management agencies need individuals with advanced degrees who can address problems from a multidisciplinary perspective. In recognition of these needs, the National Science Foundation recently created a Program in the Hydrologic Sciences within its Division of Earth Sciences. Similarly, NASA has a new grant program called the "Water Cycle Processes Program."

At the University of Minnesota, considerable expertise exists in the water resources sciences. However, that expertise is distributed across the campuses in a variety of research centers and numerous academic departments. No graduate program at the University is specifically identified with any aspect of aquatic sciences, although faculty from many graduate programs train students in such areas as surface and groundwater hydrology, limnology, stream ecology, wetland ecosystems, aquatic chemistry, and agricultural and civil engineering aspects of water and water-mediated processes. In pursuing careers as water researchers and managers, many of these students could benefit from a graduate program that was specifically designed to meet their needs and interests, and that could be recognized by prospective employers as having provided a strong background in water resources sciences. By developing a focused graduate program, the University stands to attract additional high quality graduate students who recognize the value of such a focus but who otherwise would enter one of the few programs that have been developed elsewhere. A focused graduate program in water resources science also would serve as a mechanism for facilitating interaction and cooperation among the various University research and academic programs that currently address water issues.

The graduate degree program in Water Resources Science will draw on existing water-related courses from departments on the St. Paul, Minneapolis, and Duluth campuses. At the master's level, students will be required to take a broad array of water-related core courses in the areas of surface and groundwater hydrology, water chemistry, limnology, water quality management and engineering, and water policy. In addition, students also will choose elective courses from one of three "tracks": aquatic biology, hydrologic science, and water engineering. Course work for the Ph.D. will be tailored to the specific needs of those students, but students will specialize in one of the same three tracks. Courses that are core to the program will be offered on both the Duluth and Twin Cities campuses or will be available in both regions through interactive video technology (ITV). Because students will be spread among many departments and research centers, the program will organize retreats, short courses, and student research symposia to bring all students and faculty together several times each year. This new program will provide students with a formal opportunity to take advantage of University expertise in

water-related disciplines and obtain a degree that identifies them as a water resources expert.

(b) Planning and Development Process

The proposed major in water resources science is an outgrowth of the freestanding graduate minor in water resources developed by a group of water-oriented faculty six years ago. At present, there are 65 faculty representing 19 different departments who are associated with this program. Student enrollment has increased steadily, and there now are approximately 14 students in the program. The graduate minor has been beneficial in coalescing faculty interest in the field of water resources. For example, a new course in water policy, law and other institutional/social aspects of water resources management has been developed by several faculty participating in the program, and it will become a core course for all students in the minor program starting in fall of 1994. The need for such a course at the University has been recognized for years, and the minor program provided the incentive and administrative structure to bring this to fruition.

Enrollment in the minor program has been limited for several reasons. Many graduate students enrolled in a water-oriented major do not consider declaring a minor in water resources to be a significant advantage. They are identified as having expertise in some water-related area through their major, and they believe that the additional identification of a minor in water resources provides little further benefit in seeking employment. Furthermore, they can take the same courses that they might in the minor but have fewer requirements (e.g. only eight credits are required in the related field for an M.S. degree, but the water resources minor requires 13 credits). For students majoring in a field not closely related to water, the minor may not provide sufficient course work to enable the student to market himself or herself as a "water expert". Consequently, the minor has been most popular with graduate students in fields like soil science that have a close relationship to water resources but are not considered water fields themselves. None of the above issues are relevant to the proposed major, and the faculty believe that the major will attain much higher enrollments in a short period of time.

Water Resources Graduate Minor has sponsored a seminar course (WRES 8100) that is a core requirement of the program. The seminar also has been popular with graduate students not enrolled in the minor. In most years, the seminar is focused on a technical topic such as restoration of aquatic systems (1991) or the accomplishments and shortcomings of the Clean Water Act (1992). In spring of 1993, the seminar focused on the University's water programs and reviewed the status of its graduate and undergraduate degree programs related to water, its research centers and programs, and its outreach programs. The seminar series was held in preparation for the ongoing University-wide strategic planning effort and the planning initiative that had been proposed (and is now underway) for the University's water programs. A series of panel discussions involved faculty and staff from these four programmatic areas, as well as individuals from the external community who rely on these programs for information and graduates for their employees. Several individuals active in planning or directing graduate water programs at other U.S. universities also were speakers. Graduate students taking the course for credit wrote position papers that summarized existing conditions in the water programs and made recommendations for changes to improve their effectiveness, efficiency and visibility.

Discussions with faculty groups convened during the seminar series to discuss graduate education in water led to a consensus that an interdisciplinary graduate major was needed to bring coherency to the fragmentation that currently exists in the University's graduate degree programs in water fields. The position paper on graduate education written by the students also made this recommendation.

During summer of 1993, an informal group of nine faculty was convened to discuss such an initiative.

The initial group represented five departments in three colleges on the Twin Cities campus: Patrick Brezonik, chair (Civil Engineering), Kenneth Brooks (Forest Resources), H.H. Cheng (Soil Science), Efi Foufoula-Georgiou (Civil Engineering), John Nieber (Agricultural Engineering), James Perry (Forest Resources), H.-Olaf Pfannkuch (Geology & Geophysics), Heinz Stefan (Civil Engineering), and Bruce Wilson (Agricultural Engineering). A proposal that included a tentative curriculum was drafted and circulated to the 65 graduate faculty in the Water Resources Graduate Minor program in fall quarter. The proposal was discussed at a meeting of the graduate faculty in November 1993, and consensus was reached that the committee should proceed to develop a formal proposal to initiate the degree program.

The Executive Committee of the Graduate Faculty in the Water Resources minor voted unanimously to proceed with the proposal at a meeting in January, 1994. The planning committee was expanded to include faculty from two departments on the Duluth campus, and an additional department from the Twin Cities campus: Ira Adelman (Fisheries and Wildlife), Anne Hershey (Biology [UMD]), Randall Hicks (Biology [UMD]), and Howard Mooers (Geology [UMD]). All members of the planning committee are members of the faculty in the Water Resources Graduate Minor; this proposal is a joint effort of that committee.

The committee chair presented a description of the proposed graduate major to the Minnesota Environmental Quality Board's Water Resources Committee (EQB-WRC) in fall of 1993. This committee includes top administrative-level representatives from all of the state and regional agencies concerned with managing and protecting Minnesota's water resources (e.g., Departments of Natural Resources, Agriculture, and Health, Board on Water and Soil Resources, Pollution Control Agency, Metropolitan Council). The administrators expressed their support for the development of the program, indicating that it would fill a long-standing need. Letters of support from several members of the EQB-WRC are appended to this proposal.

The University's Strategic Planning Committee on Water (SPCOW) has been analyzing the University's water programs and developing recommendations for improving the effectiveness of these programs since January 1994. In an early meeting of the SPCOW, the committee developed a consensus recommendation that an interdisciplinary graduate program in water sciences should be developed at the University. The SPCOW has been involved in the development of this proposal in several ways. First, four members of the planning committee for this proposal also are members of the SPCOW (Brezonik, Hershey, Perry, Stefan). Second, the SPCOW was briefed on the proposed major at several meetings, and an extensive discussion of the details of the proposed major was held at a meeting of the SPCOW in April 1994. A letter from the chair of the SPCOW regarding the proposed major is appended to this proposal.

Finally, members of the planning committee have briefed heads of departments and deans of several colleges that have academic programs in water fields and whose faculty would be involved in the graduate major in Water Resources Science. A total of nine department heads and several deans, including the Dean and two Associate Deans of the Graduate School, were informed of this effort and the nature of the proposed major. Letters of support from several of these administrators are appended to this proposal.

2. Proposed Program

(a) Objectives

1. The primary objective is to provide a system-wide graduate program in Water Resources Science leading to the Master's or Ph.D. degrees. This program will produce students who are broadly trained in water-related sciences and have a multidisciplinary perspective on water resources research and/or management.

2. A second objective is to provide a focus to the University's research institutes and academic programs that deal with water resources management and research. A successful graduate program will serve to integrate water research agendas among the various contingents, thereby strengthening the University's reputation as a leader in the water resources sciences.

The program has three broad educational goals: (1) produce students with strong technical skills in disciplines relevant to aquatic/water resource science; (2) develop a holistic understanding of the hydrologic cycle and the interconnectedness of the scientific disciplines required to understand and manage aquatic resources; and (3) develop an appreciation for the interplay between physical/biological sciences and the social sciences in developing and implementing public policies related to water.

In brief, this is a science-based graduate program, and it intends to produce students who have excellent scientific skills. However, it also intends that these students will have (1) the breadth of scientific knowledge appropriate to understand the complicated resources (aquatic ecosystems, watersheds) on which they will work and (2) an appreciation for the social dimensions of the topic, including the public policy and legal frameworks in which water resources are protected and managed.

(b) Admission Requirements

The primary requirement for admission to the graduate major is an undergraduate major in a physical or biological science or engineering with a minimum undergraduate GPA of 3.0 (on 4.0 scale). Normally, such students will have had at least two courses each in calculus, chemistry, and physics, and one course in biological sciences. Students will be expected to be "computer-literate" and also should have some competency in statistics. If they do not have this, they should take a 5000-level statistics course as part of their supporting program.

Stronger preparation in certain subjects is expected for students wishing to focus in some areas of the program. For example, students wishing to focus on quantitative aspects of hydrologic processes should have a math background that includes differential equations. Under some circumstances, a student may be admitted to the program without some of the course qualifications described above, particularly if there is strong evidence of scholarly abilities or compensating strengths in an appropriate discipline. The academic backgrounds of all entering students will be reviewed by a faculty admissions committee, which will recommend articulation course work for students deemed admissible but having deficiencies in specific subjects. Students applying for admission who do not have a master's degree in a related subject normally will be admitted to the M.S. program first, even if their long-term goal is a Ph.D. degree. Availability of funding and willingness of a member of the graduate faculty to serve as an advisor will be important criteria for admission to the Ph.D. program.

(c) Advising

If a student has not selected an advisor in advance, the Director of Graduate Studies (DGS) or co-Director of Graduate Studies (co-DGS) will assign him/her a temporary advisor and three-person advisory committee (including the temporary advisor as chair) upon entering the program. This is not expected to be a common situation for Ph.D. students, most of whom will have selected an advisor

before entering the program. The student will meet with the temporary advisor before selecting classes for the first quarter and will meet with the temporary committee during the first quarter to review academic background, discuss goals for graduate study, and develop a plan of study. The committee will be selected from the Graduate Faculty in Water Resources Science. Temporary advisors and committees will be selected based on the student's academic background and stated interests, and the DGS or co-DGS will obtain the concurrence of the temporary advisor before making the assignment. Students will select a permanent faculty advisor and committee no later than the middle of their second quarter in residence.

A formal plan of study (graduate degree program) should be developed by the student in consultation with the faculty advisor and committee by the end of the second quarter in residence for M.S. students or the third quarter in residence for Ph.D. students. It should conform with the requirements established by the program; any substitutions or other deviations from the requirements must be approved through a written petition to the Director of Graduate Studies in Water Resources Science. The graduate degree program (Graduate School Form # 89) must be approved by the DGS before being submitted to the Graduate School.

For M.S. students, the DGS shall appoint a three-person final examining committee at the time the graduate degree program is approved. At least two members of the examining committee shall be on the Graduate Faculty in Water Resources Science. The third member also may be a member of the Graduate Faculty, provided that not all members are from the same disciplinary area or same department. For Ph.D. students, an examining committee consisting of at least five faculty members shall be appointed at the time the graduate degree program is approved. This committee shall be composed of at least three members of the Graduate Faculty in Water Resources and two members representing supporting program or designated minor fields. This committee normally will serve as the examining committee for both the oral preliminary exam and the final thesis defense.

(d) Degree Options

Ph.D. students may declare a minor or select a supporting program of related course work. Course requirements for these options are described below. The diploma for a Ph.D. with a supporting program will read: "Ph.D. in Water Resources Science." The diploma for a Ph.D. with a minor will read: "Ph.D. in Water Resources Science with a minor in [field]."

There will be two options for the M.S. degree in Water Resources Science. In the "Plan A" option, students will complete a thesis, as well as the required course work and a supporting program or minor. A substantial number of students will take additional course work instead of a thesis and obtain a "Plan B" M.S. degree. Students in the Plan B option will take a supporting program or minor in addition to course work in the major, and they will do a project that will culminate in a written Plan B report. The work required for the Plan B project will be less extensive than that required for an M.S. thesis, and the format requirements for a Plan B report will be less rigid than those for a thesis. However, Plan B projects normally will involve some field or laboratory work, and all projects will involve the analysis, synthesis, and interpretation of data (e.g. by statistical methods, simulation modeling, etc.).

(e) Graduate Program: Central Considerations

The core curriculum in Water Resources Science will provide all students with the following knowledge and skills: an understanding of the hydrologic cycle and hydrologic processes through course

work in surface and groundwater hydrology; the science of inland aquatic ecosystems (through a course in limnology); aquatic chemistry, engineering approaches to manage and protect the quality of aquatic resources; and the socio-economic forces that provide the legal and policy framework for water resources management and protection.

The core courses will be available to students pursuing the degree at both the Twin Cities or Duluth campuses, either by separate offerings of closely-related or parallel courses on the two campuses or by use of interactive video technology. The intention is that students entering the M.S. program on either the Twin Cities or Duluth campuses would be able to complete their course work at the campus in which they enrolled. Ph.D. students focusing on some subfields of specialization (e.g. stream ecology) would be able to do the great majority (perhaps all) of their course work in Duluth, but if they were interested in specializing in other areas, they may need to spend several quarters taking courses on the Twin Cities campus.

Beyond the common core of knowledge that all students in the program will be expected to master, students will be able to individualize their degree programs through the selection of elective and supporting program courses. Most students will focus their major electives within one of three broad tracks: aquatic biology, hydrologic science, and water engineering, and additional specialization will be possible within these tracks, especially at the Ph.D. level. Appendix 2 includes example degree programs for M.S. (Plan A and B) and Ph.D. students interested in specializing in various tracks and subtracks within water resources science.

Developing a community identification among students is critical to the success of any interdisciplinary program in which the students are housed in several departments and on different campuses. The graduate program in Water Resources Science will achieve this by frequent cross-disciplinary seminars and joint field activities (discussed below), as well as informal opportunities for social and intellectual interchange. Student (and faculty) interaction also will be enhanced by the interdisciplinary nature of the topics on which many students will conduct research for their theses and projects. In some cases, students in a given cohort will choose thesis topics related to a single large study, and they will be encouraged to collaborate in both field and laboratory phases of their studies. In general, students will be urged to relate the findings of their specific research to the larger issues of the overall topic.

The Graduate Faculty in Water Resources Science intend to develop a range of opportunities for graduate student field experience. We note that existing water-related programs at the University of Minnesota are generally deficient in this regard. An encouraging recent development to counteract this situation is the new summer program on field techniques in hydrogeology organized by the Department of Geology & Geophysics. This field program will be held at the Lake Itasca Biological Station, and it was developed as part of an NSF graduate training grant for geology majors in the area of geofluids. We intend to develop a similar summer program at the Lake Itasca Biological Station for students entering the graduate program in Water Resources Science. The purpose of the two-week program will be to initiate a sense of community within the cohort of students and simultaneously expose them to techniques used in field studies across a range of aquatic disciplines -- biological and chemical limnology, quantitative stream hydrology, climatology, groundwater hydrology. We also intend to explore the possibility of developing an intensive summer program to introduce students to techniques related to watershed mapping and analysis (e.g. airphoto interpretation, use of GIS).

(f) M.S. Course Program

(i) Plan A option. The plan A option is intended primarily for students who have had some under-

graduate background in water-related course work and therefore already have met some of the core requirements of the M.S. program. This degree option will conform with Graduate School standards and require a minimum of 20 course credits in the major field, 8 credits in a supporting program or minor, and 16 credits of thesis work, plus the successful completion and defense of an M.S. thesis. The Plan A course work program will be highly individualized to reflect a student's preparation, degree goals and research topic.

(ii) **Plan B option.** The Plan B option for the M.S. program will be attractive to students who have little formal undergraduate course work in water resources science and thus need more course work to gain the combination of depth and breadth needed in this field. It also will appeal to students wishing to pursue the Ph.D. degree who would like to receive an M.S. degree as an interim accomplishment.

In developing the M.S. curriculum, the faculty realized that they could not produce a Plan A program with only 20 major credits for students who do not have an undergraduate degree that included some basic course work related to aquatic sciences. Rather than imposing articulation course work or limiting admission to the program to those whose undergraduate work includes aquatic science course work, we developed a Plan B program that includes 32 course-work credits in the major field, 4 credits for a Plan B project, and 8 credits in a related field. The major field includes 22-24 credits of core courses and 8-10 credits of electives. Students who had some of the core courses in their undergraduate studies could take more elective credits in a Plan B program or could apply the freed-up credits toward a thesis in a Plan A program. Students who have had none of the core courses as undergraduates still could choose a Plan A program, but they would be required to complete the core program (and thus take more course work credits than normally is required of Plan M.S. programs).

Core courses (22-24 credits)

Surface hydrology (AgET 5410, FR 5114, or CE 5405)

Hydrogeology (Geol 5611; Geol 5201 [UMD])

Environmental/water chemistry (CE 5506, PubH 5186, Soil 5310; Geol 5411 [UMD])

Limnology (Geol 5601/EEB 5601; Biol 5773 [UMD])

Water quality engineering/management (FR 5060, CE 5505, 8550; Biol 5871 [UMD])

Policy/water law and regulations/economics/management (WRES 5101)

Electives (8-10 credits)

A list of possible elective courses grouped into three topical areas is shown in Table 2. The topical areas represent the principal tracks or areas of specialization that students may pursue under the major in Water Resources Science. The list in Table 2 is not an exhaustive compilation of all possible elective courses but does include the water-oriented courses most likely to be used as electives. Students wishing to include a course not on this list (or its annual updates) will be able to do so by petitioning the DGS and providing a brief statement about the proposed course and how it fits into the student's program. Elective courses should be related in a disciplinary or topical sense to provide depth to the degree program.

Plan B Project (4 credits)

Plan B projects normally will involve field, laboratory or computer work; all projects will involve the analysis, synthesis, and interpretation of data. Literature reviews and terms papers written for courses will not be sufficient to satisfy the Plan B project requirement in Water Resources Science. Students may register for up to four credits of WRES 8097,-8,-9 (Independent study in water resources science) for the work they do on their Plan B projects.

Table 2. Possible elective courses for three tracks in the proposed major

Program in Aquatic Biology

Organism Level

Biol 5523 Natural History of Invertebrates (UMD)
 Biol 5526 Ichthyology (UMD)
 PBio 5231 Introduction to the Algae (5)
 PBio 5811 Freshwater Algae (Itasca) (5)
 EEB 5136 Ichthyology
 EEB 5606 Ecology of Fishes (3)
 EEB 5607 Ecology of Animal Plankton
 EEB 5831 Natural History of Invertebrates (Itasca) (5)
 Ent 5360 Aquatic Entomology (Itasca) (3)

Ecosystem Level

Biol 5677 Microbial Ecology (UMD) (5)
 Biol 5771 Stream Ecology (UMD)
 Biol 5776 Ecosystems Ecology (UMD)
 Biol 5777 Plankton Ecology (UMD)
 EEB 5812 Comparative Limnology (Itasca) (5)
 EEB 8602 Advanced Limnology (3)
 FW 5601 Assessment and Management of
 Vertebrate Populations

FW 8459 Stream and River Ecology
 Soil 5550 Peatlands: (3)
 Soil 5605 Microbial Ecology (3)
 Soil 8632 Soil Microbiology (2)

Applications/Management

Biol 5871 Water Pollution Biology (UMD) (3)
 CE 5515 Water and Wastewater Microbiology
 CE 8550 Anal. and Modeling of Aquatic Environments
 FR 5460 Water Quality: the International Dimension (3)
 FW 5455 Aquaculture
 FW 5460 Pollution Impacts on Aquatic Systems (3)
 FW 5604 Fishery and Wildlife Management
 FW 8451 Production Biology of Fishery Environments
 NRES 5060 Water Qual. in Nat. Resource Manag. (3)
 PubH 5186 Environmental Chemistry (3)

Program in Hydrologic Science

Hydrology and Ecosystems

AgEn 8500 Hydrologic modeling, Small Watersheds
 CE 5405 Hydrology and Hydrologic Design
 FR 5114 Forest Hydrology (3)
 FR 5153 Advanced Forest Hydrology
 Geog 5444 Geography of Water Resources
 Soil 5550 Peatlands (3)

Hydrogeology

Geo 5108 Advanced Environmental Geology
 Geo 5611 Groundwater Geology
 Geo 8611 Transport Phenomena in Porous Media (2-3)
 Geo 8612 Analytical Geohydrology (3-4)
 Geo 8621 Tracers in Hydrogeology
 Soil 5232 Soil Physics (5)

Soil 8250 Advanced Soil Physics (3)

Climatology

Geog 5423 Advanced Climatology
 Geog 8420 Seminar: Climatology (3)
 Soil 5240 Microclimatology(3-4)
 Soil 5424 Applied Climatology (3)

Applications/Management

AgEn 5540 Erosion Control, Watershed Engrg.
 FR 5115 Forest Hydrology, Field Appl. (Cloquet)

Program in Water Resources Engineering

Applied Hydrology

AgEn 8500 Hydrologic Modeling, Small Watersheds
 AgEn 8700 Moisture and Heat Transfer (3)
 CE 5425 Groundwater Mechanics
 CE 5426 Computer Modeling of Groundwater Flow
 CE 8407 Stochastic Hydrology (3)
 CE 8425 Advanced Groundwater Mechanics
 FR 5153 Advanced Forest Hydrology

Surface Water Flow Analysis and Design

AgEn 8500 Hydrologic Modeling, Small Watersheds
 AgEn 5550 Drainage and Irrigation Engineering
 CE 5401 Introduction to Water Resources Eng.
 CE 5402 Computational Hydraulics
 CE 5403 Hydraulic Structures
 CE 5410 Open Channel Hydraulics
 CE 5504 Mass Transport with Environ. Applications
 CE 8413 Mechanics of Sediment Transport (3)
 CE 8430 Lake and Reservoir Hydrodynamics (3)

Water and Wastewater Treatment

AgEn 5910 Agric. Waste Management Eng.
 CE 5500 Anal. and Design of Water Supply Systems
 CE 5501 Anal. and Design of Wastewater Systems
 CE 5540 Anal. of Groundwater-Soil Pollution
 Abatement Technology
 CE 8500 Phys./ Chem. Processes for Water and
 Wastewater Treatment I (3)
 CE 8501 Physical and Chemical Processes II (3)
 CE 8502 Biol. Processes for Wastewater Treatment (3)

Water Quality Engineering Science

CE 5504 Mass Transport with Environ. Applications
 CE 5505 Water Quality Engineering
 CE 5506 Environmental Water Chemistry
 CE 5507 Environmental Engineering Lab
 CE 5515 Water and Wastewater Microbiology
 CE 8505 Aquatic Chemistry
 CE 8507 Aquatic Chemistry of Organic Contaminants
 CE 8540 Interfac. Mass Transport with Environ. Appl.
 CE 8550 Anal. and Modeling of Aquatic Environ.
 CE 8551 Seminar: Models of Aquatic Environ. (1-5)

Related Field or Minor (8 credits)

The courses should be related to the student's career objectives to form a coherent program with the course work in the major. In general, the supporting program should **not** consist of water-oriented courses. Courses available as electives for the major normally would not be eligible as courses for the supporting program. The faculty recognizes that it is not always straightforward to decide whether a course is water-oriented or fits in the supporting program category; some courses in civil and agricultural engineering, ecology, geography, geology, and soils science may fit in either category, depending on circumstances (B.S. background, other course work) of individual students. The program will handle this issue by stating the above philosophy and letting individual cases be decided by faculty advisory committees and the DGS. The supporting program could include course work in many fields, including statistics, computer science, natural resource policy, applied resource economics, chemistry, chemical engineering, soil science, microbiology, environmental health, geography, and geology.

(g) Course Program (Ph.D.)

Students in the Ph.D. program will be required to obtain the equivalent of the M.S. course work in terms of breadth plus an additional focus in at least one of the three broad areas of emphasis (tracks) within Water Resources Science: aquatic biology; hydrologic science; and water engineering (see Table 2), and an appropriate supporting program or minor. The areas of specialization available in the Ph.D. program will be similar to those at the M.S. level. However, more flexibility within the three broad tracks would be available because of the opportunity to take additional course work, and greater depth of scholarship will be required for Ph.D. students. Ph.D. course work will be tailored to the needs and interests of individual students, consistent with the objectives and goals of the program, as stated in section D.2(a). Examples of subareas in which Ph.D. students may wish to develop specialized course programs within the three broad tracks include the following:

- (1) aquatic biology: stream ecology; limnology; aquatic biogeochemistry; restoration ecology for aquatic systems
- (2) hydrologic science: hydrogeology; climatology (climatic aspects of the hydrologic cycle; stochastic hydrology; watershed management (analysis of land-water interactions)
- (3) water engineering: water quality analysis, management and engineering; watershed engineering; groundwater remediation technology.

Examples of Ph.D. degree programs that might be developed for students interested in these areas of specialization are included in Appendix 2.

Course programs for Ph.D. students in Water Resources Science will include a minimum of 60 graduate credits, excluding thesis and Plan B project credits and including at least 18 credits in a supporting program or minor. Transfer of graduate credits from other institutions and from adult-special or CEE courses will be allowed according to Graduate School policies and will be reviewed on an individual basis.

(h) Preliminary and Oral Exams

General. Especially within the Ph.D. program, but also in the M.S. program, three areas of concentration are the basis for the content of exam questions. The first is the subject matter most closely related to the research interests of the candidate. This is the research concentration. Second is subject matter in the candidate's core concentration. The core concentration consists of a set of prescribed courses, mostly at the 5000 level, within the program, such as surface hydrology and limnology, plus a certain number of electives mostly at the 8000 level. The third area consists of the related courses in

a supporting field taken in areas that are not typically considered "water courses ". The choice of subject areas and concentrations the candidate makes will be reflected in the composition of her/his examining committee.

M.S. Examination. The objective of the Master of Science examination is to test the candidate's mastery of the subject matter and research aptitude. Only one final oral examination is administered in connection with the M.S. degree. The mastery component is evaluated by reviewing the outcome of course work, which should be at a general GPA level of 3.0, and by questioning during the general part of the final oral exam. The research component is demonstrated by the candidate's successful defense of her/his master's thesis or Plan B report during the final oral exam. The examining committee consists of three members, two from the core concentration area, and one from the related field or minor. One of the members from the core concentration will be the advisor, representing the research concentration in the core; a second member will represent the elective part of the major field. Selection and composition of the committee is subject to approval by the DGS, GSC and Graduate School.

Ph.D. Preliminary Exams. Successful completion of a doctoral program includes passing the preliminary exams and defense of the doctoral dissertation in front of a doctoral examination committee. The candidate selects his/her areas of concentration and electives and supporting fields in which he/she will stand for the examination. In part, this will determine the areas and disciplines of the committee members. In consultation with the student, the advisor will propose a committee slate, possibly with alternates, which would have to be approved by the DGS, GSC and Graduate School.

Ph.D. committees will have five members (occasionally a sixth member may be added at the advisor's request to provide expertise on a particular topic), in accordance with present rules of the Graduate School. The adviser will represent the core and research concentrations of the student. The second reader member will represent a field close to the research concentration, and the third member would represent the elective area from the major field. The fourth and fifth members (one reader) would be selected from areas pertaining to the supporting field or minor.

Written preliminary exam. Testing subject mastery in the selected concentrations is carried out in both the written and oral parts of the preliminary examination. The written exam will consist of questions in the student's research concentration within the core which should require about five hours to answer. The part of the exam covering the elective core concentration should require approximately three hours. The examination procedure would require a review of exam questions and a review of answers and grading by two members of the Graduate Faculty. Questions and exams will be circulated for inspection by faculty on the Graduate Examinations Committee. Each question in the examination will be graded on a scale of Pass; Pass with Reservation; Fail. In order to pass the examination, the candidate must obtain a Pass grade in the core concentration area, and at least a Pass with Reservation in the elective core concentration area. If the student obtains a Pass with Reservation in the primary core concentration area, the committee may impose additional requirements (such as additional course work, reading, or development of a review paper), which must be completed in a specified time. If a student receives a Fail grade on the written examination and the examining committee recommends that the student not be allowed to retake the exam, the candidate will not be able to pursue a Ph.D. program. The student will be advised to leave the program or may be given the option to switch into a M.S. program.

Oral preliminary exam. The research aptitude of the candidate is tested in the oral preliminary examination. This exam follows the successful completion of the written preliminary exam after some specified time interval (usually one quarter). The candidate will prepare, circulate and present a "dos-

sier" consisting of a summary of academic achievements and background and a research proposal. The latter is a short description of a research topic, a rationale for its selection, state of knowledge in the area, and original ideas to sketch a possible approach to solve the problem. The dossier is circulated among committee members and is the basis for the oral exam, which will concentrate mostly on the research component. The one subject area not tested in the written exam -- the supporting field concentration -- may be the subject of questioning during the oral exam, as may any other question pertaining to the dossier may come up in testing the mastery component in the oral exam.

Ph.D. final defense. After the readers have approved the thesis as ready for defense, the candidate will orally defend her/his dissertation. The committee normally is the same as for the qualifying examination. It consists of five members, of which two members in the major field and one member from the supporting field are readers. In a committee of five members, four Pass grades are necessary for a successful outcome of the defense.

(i) Academic Performance Standards

Students must complete the requirements of the Graduate School for residency, course, and thesis (where applicable). To be considered in good academic standing and therefore eligible for support, students will be expected to make reasonable progress toward fulfilling their degree requirements. This includes progress in completing the course work specified on the graduate degree program (with satisfactory grades) and selection of a permanent advisor. Full-time students in Water Resources Science should expect to complete their M.S. requirements in two years (slightly longer if a field-oriented thesis is involved). It is recognized that some students in the M.S. program will participate on a part-time basis, as they continue full-time employment, and progress toward fulfilling the requirements will be proportionally slower for these students. Even in such cases, the program will not recommend exceptions to the Graduate School requirement that all course work for the M.S. be completed within a seven year period, unless there are highly unusual and extenuating circumstances.

The minimal acceptable GPA for completion of the M.S. degree is 2.8 (Graduate School requirement). Students seeking admission to or already in the Ph.D. program will be held to a higher standard of performance. For example, students wishing to be admitted to the Ph.D. program who are in the M.S. program should have a GPA of ~3.5 or better, and students in the Ph.D. program should maintain a GPA above 3.3. Because the Ph.D. is research-oriented rather than coursework-oriented, it is not possible to state the exact time required for its completion. However, the Graduate Faculty in Water Resources Science believes that a reasonable goal for completion of this degree is three years beyond the completion of M.S. degree. Ph.D. students thus should complete any additional course work (beyond the M.S. requirements) within two years after entering the Ph.D. program with an M.S. degree. They should pass their written preliminary examination by spring quarter of the second year and the oral preliminary examination no later than fall quarter of the third year.

3. Educational and Social Need for Program

(a) Student Interest and Institutional Response

Interdisciplinary undergraduate programs. Heightened environmental awareness in the 1970's and 1980's has led to greatly increased opportunities for professionals in the hydrologic sciences. Traditional programs in such fields as civil and agricultural engineering, soil science, and geology geared up to emphasize water resources. However, the traditional curricula of these disciplines often do not allow a great deal of flexibility. In response to the emphasis on environmental issues and student de-

mand, many undergraduate and graduate programs have developed interdisciplinary programs under such names as Environmental Science or Environmental Studies. Programs exist at many large research universities and a multitude of state and private colleges. For example, the Institute for Environmental Studies at the University of Wisconsin in Madison has existed since 1970. The program emphasizes the integration of knowledge from a variety of specialized fields and includes a large emphasis on water-related issues. Undergraduate and graduate programs are contained within the program, which integrates faculty across the campus from such disciplines as engineering, geology, economics, soil science, urban and regional planning, and health sciences.

Smaller institutions have embraced an interdisciplinary approach to environmental problem solving even more than larger universities. For example, the University of Wisconsin-Green Bay has had successful interdisciplinary environmental science program at the undergraduate and graduate level (M.S. only) for many years. Environmental Science faculty include biologists, soil scientists, geologists, hydrologists, limnologists, chemists, and policy makers. As an interdisciplinary approach to environmental problem solving is emphasized, the number of students wanting to explore other fields has increased. Students who graduate from these interdisciplinary programs have a different focus than graduates from traditional courses of study, and they have the potential to bring a unique perspective and contribute in complementary ways through graduate research.

The National Science Foundation (NSF), National Endowment for the Humanities (NEH), and Fund for the Improvement of Post-Secondary Education (FIPSE) recently solicited proposals for the development of interdisciplinary programs in environmental studies. Clearly there is a nationwide effort in the academic community to emphasize cross-disciplinary cooperation in the education of environmental professionals.

The above-mentioned national trends are reflected by several program developments at the University of Minnesota. A cross-college undergraduate major in Natural Resources and Environmental Studies (NRES) has existed on the St. Paul campus for the past four years. The program is administered by the Colleges of Agriculture and Natural Resources. Its graduates have a strong resource/environmental policy orientation. An environmental science program with a stronger focus on physical and biological sciences also has been developed as an outgrowth of the NRES program. An ongoing initiative at UMD is developing a major and minor in Environmental Studies. The proposed program would encompass the physical, biological, and social sciences, and humanities. An interdisciplinary core of courses with specialization in the individual's area of interest and a minor would be required; a second major in a traditional discipline would be encouraged. Students in the environmental science track thus would have expertise in a discipline with a supporting background in allied sciences and humanities. Interest from students has been strong. Estimates by the organizing faculty indicate that this undergraduate program could have 100-200 majors as soon as it is established.

Clearly there is a large pool of college graduates nationwide whose interests in environmental and particularly in water-related issues go beyond the bounds of traditional fields of study. A graduate program in water resources science at the University of Minnesota, built around the strengths of a diverse faculty, would provide the opportunity for these students to pursue interdisciplinary graduate studies and research.

Opposition to undergraduate interdisciplinary programs has arisen from some who question whether these students could pursue graduate studies without a traditional major, as they may not meet the course requirements to enter graduate programs in some traditional disciplines. A graduate program in Water Resources Science would be suited for some of these students. Opposition to interdisciplinary

graduate programs is less common because it generally is recognized that advances in science are made most often at the interfaces between traditional disciplines (so-called overlapping "academic neighborhoods"). It should be noted that new disciplines emerge from these interfaces. As an interdisciplinary field matures, it becomes recognized as a field of study or discipline in its own right. Many examples of such disciplines can be cited among the graduate programs at the University of Minnesota.

Problems with graduate study in traditional disciplines. Problems often arise for students who have degrees in traditional fields of study but who wish to pursue graduate studies in water resources within a different discipline. Pursuing a graduate degree in a different field usually means making up a large number of course work deficiencies, often so many that it is impractical to do so. The planning committee for the proposed major is aware of several examples like that of a recent, outstanding graduate in soil science, who also had several years of job-related experience, and wished to pursue graduate studies in hydrogeology. Because the M.S. degree was to be in geology, the applicant would have been required to take several freshman- and sophomore-level courses. The student opted not to enroll. A graduate program in Water Resources would have allowed this exceptional student the opportunity to pursue graduate studies along his interests without completing unrelated "remedial" course work.

Students with degrees in interdisciplinary programs also may have difficulties when applying to graduate schools. They typically lack some course requirements of traditional graduate programs to which they are forced to apply. Graduate programs, particularly at the M.S. level, often do not allow for much flexibility. Once requirements within the discipline are completed there may be time for only two or three additional courses (typically the minor field). Truly effective interdisciplinary environmental problem solving is not favored by traditional programs. A graduate program in Water Resources Science will allow faculty and students to integrate their strengths providing a platform for the education of knowledgeable, interdisciplinary problem-solving professionals.

Student interest at the University of Minnesota. Although the developers of this proposal have not conducted a formal survey of University graduate or undergraduate students regarding their interest in the proposed program, there is strong anecdotal evidence for substantial student interest in such a program. Several faculty active in the development of this proposal are involved in graduate admissions committees in their departments. These faculty report that applications from students interested in interdisciplinary studies related to water resources science are common in their departments. In many cases, the student is not admitted because of a lack a specific course work in the disciplinary orientation of the department.

In recent years, the Water Resources Research Center and Sea Grant College Program have received an increasing number of inquiries about the existence of a graduate major in water resources. The graduate students participating in the 1993 seminar series for the graduate minor in water resources also recommended that such a program be developed (see section D.1(b)).

(b) Employment Prospects

Within the work force the demands on environmental scientists are increasingly interdisciplinary. Examples include: the effects of water quality and water use on lake and riparian ecosystems, the impact of intensive irrigation on water quality and long-term crop yields, the effects of water quality degradation on human health and the development of public health strategies, the implications of global climate change on water-use policies. Aspects of these research themes can be pursued within traditional disciplines, but other aspects clearly would be better accommodated by individuals with

interdisciplinary backgrounds.

Environmental and water resources planning has become a major source of employment in federal, state, and local governments. Particularly at the middle management level, people are being forced to make decisions that cross the boundaries of traditional disciplines. Such decisions often involve many aspects of water resources, including human health, ecological and economic dimensions. The need for water resources professionals who can cross discipline boundaries is likely to continue to grow.

According to a 1989 survey of alumni of the Institute for Environmental Studies at the University of Wisconsin, the first job of 94% of the respondents after receiving a degree was related to their graduate study; 73% found jobs in their preferred geographic area. Forty-seven percent were employed by state and local government, 12% by the federal government and 22% by private industry.

Precise statistics on the regional or national demand for individuals with advanced degrees in water resources science are difficult to find. However, the demand always has been high, even in slow economic times, for M.S. and Ph.D. graduates from existing water-related programs at the University (for example, those in water resources and environmental engineering in Civil Engineering). There is reason to believe that the demand for graduates from the proposed program will be high so long as the program maintains high standards for its students. This conclusion is strengthened by letters of support from administrators and management-level individuals at several water-related government agencies in Minnesota (see Appendix 3).

Finally, in response to the rapidly increasing enrollment in interdisciplinary environmental science and water-related programs in universities and colleges nationwide, the demand for faculty by these programs has increased significantly in recent years. We expect that Ph.D. graduates of the proposed program will be attractive candidates for such positions in the future.

(c) Educational, Research and Societal Benefits

The proposed academic program will fulfill an important educational need at the University. Currently, graduate students interested in water science pursue their degrees within existing academic programs. There are two disadvantages with this approach. First, as discussed in the previous section, students need to satisfy entry and/or graduation requirements of their degree program, which may not be well suited for a specialty in water science. For example, an engineering program may require students to take course work to qualify as a professional engineer. These courses frequently do not optimize the needs of students specializing in water science. Second, the University should attempt to grant the student a degree with a name that properly identifies his/her area of study. Students specializing in water science should obtain a degree with that name.

The proposed academic program will have research benefits to the University. Water resources science is a very broad area of study. Inter/multidisciplinary approaches are needed to address issues of state, national and international importance. Many granting agencies seek multidisciplinary research proposals. Because faculty members from numerous departments will be active participants in the proposed program, multidisciplinary interactions are inevitable as programmatic decisions are made. These interactions undoubtedly will lead to discussions on research problems and needs, which in turn, will lead to research proposals and thesis projects of a more multidisciplinary nature.

The proposed academic program will be beneficial to society. The protection and management of water resources is a high societal priority. Issues are complex and multidisciplinary. The proposed

program will produce graduates who understand these complex issues and will foster multidisciplinary research to solve them.

4. Comparison with Similar Programs

In the past several decades, many universities have established graduate programs in water-related disciplines. Some of these programs are interdisciplinary in nature, but many are found within departments and therefore aligned along disciplinary boundaries. As described in section D.3(a), several universities have graduate programs in environmental studies. The Universities of Michigan and Wisconsin have such programs. The Michigan program does not offer degrees in itself, but rather coordinates and supports programs of research and teaching in areas related to environmental quality, particularly water resources. The program provides opportunities for students working within specific disciplines to participate in interdisciplinary environmental research. The Wisconsin program is an "umbrella" for several interdisciplinary (but more specific) M.S. and Ph.D. programs, including an M.S. program in water resources management. This program has existed for the past 20 years and has been quite successful. It produces about 10 students per year. The course work program is designed to be completed in two years, and students within the program work jointly on a multidisciplinary problem in the summer as a "capstone" project to gain experience in analyzing real-world water issues.

Hydrologic science programs often lie within engineering colleges and are usually associated with civil or environmental engineering disciplines. One example close to Minnesota is the Graduate Program in Water Chemistry at the University of Wisconsin in Madison, which is offered through the Department of Civil and Environmental Engineering. Its focus is only on water chemistry. Twenty-four students are currently enrolled in the program and about six students receive M.S. or Ph.D. degrees each year.

Universities and research institutes in many coastal states support Ph.D. programs in oceanography. Although interdisciplinary (including biological, chemical, geological, and physical aspects of oceans), these programs usually are administered within a School of Marine Science. One example is the Joint Program in Oceanography between M.I.T. and the Woods Hole Oceanographic Institution. Closer to Minnesota, the University of Wisconsin in Madison supports a graduate program in Oceanography and Limnology sponsored jointly by the Colleges of Engineering and Letters and Science. More than 20 faculty members supervise 20 graduate students. On average, 3-4 students receive M.S. or Ph.D. degrees each year. Most students who receive Ph.D. degrees go on to postdoctoral positions.

Several universities are currently developing or have already established interdisciplinary M.S. and Ph.D. programs in hydrologic sciences using other administrative models. It seems that each program is different from the others in its emphasis, depending on the existing strengths and resources of the university. Typical programs include the Ph.D. Program in Geophysical Sciences with a Hydrology Option at the University of Colorado (Boulder) and the Graduate Program in Hydrologic Sciences at the University of California-Davis. Each program is interdisciplinary and supported by two or more colleges in its university. The University of Colorado program is supported jointly by the College of Arts and Sciences and the College of Engineering and Applied Sciences. All Ph.D. students are required to take 30 credits including 15-18 credits in core courses (mathematical analysis, probability or statistics, and 9-12 credits in physical hydrology or chemical hydrology classes) and 15-18 credits in elective courses in their area of specialization (physical hydrology or chemical hydrology). A significant gap in this program is the lack of training in biological aspects of water resources.

The University of California-Davis Graduate Program in Hydrologic Sciences is more similar to our proposed Graduate Program in Water Resources Science. It is an interdisciplinary program and draws

faculty and courses from several colleges across the campus. Upon entering the program, students are required to take a core curriculum that includes courses in fluid dynamics, hydrology, hydrobiology or hydrochemistry, hydrologic policy, and a seminar in hydrology, or hydrogeochemistry.

Based on personal conversations with faculty at several other universities, we believe that the list of campuses with graduate programs in water resources science will grow in the future, in recognition of societal needs and the emergence of hydrologic (water resources) science as a recognized field of study. The program we propose will build on existing strengths at the University of Minnesota and be a focal point for faculty and researchers with diverse aquatic research interests. Without question, this program has the potential to be ranked among the leaders in hydrologic sciences internationally.

5. Quality Control

(a) Qualifications of Graduate Faculty

The graduate faculty in the proposed program would be accredited within the Graduate School according to the existing guidelines. All members of the Graduate Faculty in Water Resources Science will have their own primary departmental home. Therefore, we propose that the Graduate School status an individual has within his/her department would automatically be conferred to the individual in the proposed interdisciplinary program. The categories are: full, associate, and examination member. Admission to or change of graduate status could be initiated by the DGS in Water Resources Science but should also be routed through the faculty member's home department for information.

(b) List of Faculty and Interests

The Graduate Faculty in the existing water resources minor program includes approximately 65 members representing seven colleges and more than 15 departments on the Twin Cities and Duluth campuses (see Table 3 for a list). Many of these individuals will wish to become members of the Graduate Faculty in Water Resources Science, and some faculty who are not currently members of the Graduate Faculty in the minor program also will wish to be members. A list of 39 faculty who thus far have indicated an interest in being included in the graduate faculty of the proposed major is presented in Table 4, with the names grouped according to area of interest. Abbreviated curricula vitae for representative faculty who will be involved in the proposed program are included in Appendix 1.

(c) Governance of the Program

Governance of this all-Graduate School program will be similar to that of the graduate program in toxicology, which is also a system-wide program. A Director of Graduate Studies (DGS) and co-DGS will have primary administrative responsibility for the program and will serve as program leaders. The DGS will be elected by a majority vote of the Graduate Faculty and will serve a three year term. A DGS may serve for one or more additional terms at the discretion of the faculty. A co-DGS will be elected for the Duluth campus to insure that graduate students participating in the program on that campus will have ready access to advising and that the program will have leadership and visibility on that campus.

The Graduate Program in Water Resources Science will be administered by the Water Resources Research Center, which is housed in the College of Natural Resources on the St. Paul campus. The Center is a University-wide program and provides administrative services for the existing graduate minor in water resources.

Table 3. List of Graduate Faculty in Water Resources Minor

College of Agriculture

James Anderson (Soil Sci.)
Donald Baker (Soil Sci.)
Paul Bloom (Soil Sci.)
H.H. Cheng (Soil Sci.)
Charles Clanton (Agric. Engrg.)
William Easter (Ag. & Appl. Econ.)
David Grigal (Soil Sci.)
Satish Gupta (Soil Sci.)
Ralph Holzenthal (Entomology)
Edward Nater (Soil Sci.)
John Nieber (Agric. Engrg.)
Charles Onstad (Soil Sci.)
C. Ford Runge (Ag. & Appl. Econ.)
Bruce Wilson (Agric. Engrg.)
Robert Young (Soil Sci.)

College of Biological Science

Donald Alstad (Ecol. Evol. & Behav.)
Margaret Davis (Ecol. Evol. & Behav.)
Florence Gleason (Plant Sci.)
Eville Gorham (Ecol. Evol. & Behav.)
Richard Hanson (GFBI)
Donald McNaught (Ecol. Evol. & Behav.)
Robert Megard (Ecol. Evol. & Behav.)
David Tilman (Ecol. Evol. & Behav.)

College of Liberal Arts

Dwight Brown (Geogr.)
Luther Gerlach (Anthropology)
Philip Gersmehl (Geogr.)
Richard Skaggs (Geogr.)

College of Natural Resources

Ira Adelman (Fish. & Wildl.)
Kenneth Brooks (Forest Res.)
Yosef Cohen (Fish & Wildl.)
Hans Gregersen (Forest Res.)
Anne Kapuscinski (Fish. & Wildl.)
Raymond Newman (Fish. & Wildl.)
James Perry (Forest Res.)
Lloyd Queen (Forest Res.)

**College of Science and Engineering
(UMD)**

Robert Carlson (Chemistry)
Hollie Collins (Biol.)
Dianne Dorland (Chem. Engrg.)
Anne Hershey (Biol.)
Randall Hicks (Biol.)
Carol Johnston (NRRI)
Andrew Klemer (Biol.)
Melbourne Whiteside (Biol.)

College of Veterinary Medicine

Sagar Goyal (Vet. Diag.Med.)

Humphrey Institute of Public Affairs

Sandra Archibald

Institute of Technology

E. Calvin Alexander (Geol. & Geophys.)
Roger Arndt (Civil Engrg.)
Randal Barnes (Civil Engrg.)
Patrick Brezonik (Civil Engrg.)
Steven Eisenreich (Civil Engrg.)
Cesar Farell (Civil Engrg.)
Efi Foufoula-Georgiou (Civil Engrg.)
John Gulliver (Civil Engrg.)
Walter Maier (Civil Engrg.)
Chris Paola (Geol. & Geophys.)
Gary Parker (Civil Engrg.)
Mark Person (Geol. & Geophys.)
H. Olaf Pfannkuch (Geol. & Geophys.)
Michael Semmens (Civil Engrg.)
Joseph Shapiro (Geol. & Geophys.)
Charles Song (Civil Engrg.)
Heinz Stefan (Civil Engrg.)
Otto Strack (Civil Engrg.)

School of Business (UMD)

Richard Lichty (Economics)

School of Public Health

Rex Singer (Env. Health)
Deborah Swackhamer (Env. Health)

Table 4. Faculty interested in participating in the proposed major

Aquatic Biology

Ira Adelman (environmental physiology of fishes, aquaculture)
H.H. Cheng (soil biochemistry)
Eville Gorham (wetland ecology, biogeochemistry/paleoecology of peatlands, paleolimnology)
Sagar Goyal (microbiology, virology, public health)
Anne Hershey (stream ecology, limnology, fish-benthos interactions)
Randall Hicks (aquatic microbial ecology, biogeochemistry)
Donald McNaught (aquatic ecology, ecotoxicology, Great Lakes limnology)
Robert Megard (aquatic ecology, limnology, plankton)
Edward Nater (microbial processes, biogeochemical cycles of heavy metals, wet soils)
Raymond Newman (fisheries ecology, stream ecology)
James Perry (applied aquatic ecology, international water quality/resources management)
Carl Richards (stream and landscape ecology, watershed management, risk analysis)
Melbourne Whiteside (aquatic ecology, paleolimnology, zooplankton ecology)

Hydrologic Sciences

E. Calvin Alexander (hydrogeology, groundwater pollution, tracer hydrology)
Jamies Anderson (soil-water systems, impacts of agricultural practices on water quality)
Donald Baker (climatology)
Paul Bloom (soil/water chemistry, mineral weathering, soil nutrients)
Kenneth Brooks (forest and wetland hydrology, watershed management)
Dwight Brown (spatial/temporal variability of water resources, human impacts on water cycle)
Robert Carlson (aquatic chemistry, environmental toxicology)
Steven Eisenreich (environ. organic chemistry, dynamics of organics in large lakes)
Luther Gerlach (social and cultural aspects of water policy and management)
David Grigal (biogeochemical processes, influence of water on ecosystem processes)
Satish Gupta (soil physics, modeling unsaturated flow in soils)
Carol Johnston (landscape ecology, wetlands, GIS)
Howard Mooers (hydrogeology)
H.-Olaf Pfannkuch (hydrogeology)
Lloyd Queen (GIS, physical hydrology, watershed management)
Joseph Scheubauer-Berigan (aquatic microbiology, pollutant biodegradation, limnology)
Richard Skaggs (climatology)

Water Resources Engineering

Patrick Brezonik (water resour. manage., water qual. modeling, water chemistry of pollutants)
Charles Clanton (animal waste management)
Efi Fofoula-Georgiou (stochastic hydrology, river geomorphology uncertainty analysis)
Michael McDonald (modeling, hazardous waste management, contaminant transport)
Heinz Stefan (environ. hydraulics, water quality modeling, lake/reservoir hydrodynamics)
Bruce Wilson (hydraulics, hydrologic/water quality modeling of agricultural watersheds)

The program will have four standing committees. This is more committees than most graduate programs operate, and it represents a conscious effort to involve the faculty in the program's activities. Members of the Graduate Faculty will be geographically dispersed and have their primary academic homes in many different academic departments. Consequently, we believe it is important to provide mechanisms to bring the faculty together and to encourage their active involvement in program governance. The committees and their responsibilities are as follows.

(1) An **Executive Committee** will provide oversight and long-term guidance to the program and review the qualifications of faculty wishing to become members of the Graduate Faculty in Water Resources Science or renew their membership on the faculty.

(2) A **Graduate Admissions and Studies Committee** will consider applications from potential students for the program and review progress of students within the program.

(3) A **Curriculum and Examinations Committee** will review and examine issues relating to existing and/or proposed courses and administer the written preliminary examination to Ph.D. students.

(4) A **Faculty-Student Affairs Committee** will be responsible for helping to build a sense of identity and community among the students and the faculty in the program.

The DGS's will appoint members of these committees, taking care to balance the diverse disciplinary, departmental, and campus affiliations of the graduate faculty. Graduate student representatives will be included on the last two committees (but not be involved in committee work related to written preliminary exams). The DGS's will co-chair the first two committees and serve as *ex officio* members of the other two committees.

Several of the above governance issues are already implemented in the existing graduate minor program. A faculty handbook summarizing the program's governance procedures will be prepared when the program becomes a degree-granting program.

(d) Evaluation and Review.

Individuals will be appointed to the Graduate Faculty in Water Resources Science for five-year terms. During the first year of operation for the program, its executive committee and DGS's will develop criteria regarding the level of program involvement required for re-appointment to the Graduate Faculty. These criteria will be presented as recommendations to the Graduate Faculty, which will adopt such procedures by majority vote. The executive committee and DGS's will be responsible for implementing these policies.

6. Implementation

(a) Time Schedule

If approved by the appropriate governing bodies, the M.S. and Ph.D. program in Water Resources Science would begin at the start of the 1995-96 academic year.

(b) Initial faculty

The initial faculty will be derived from the present Graduate Faculty in the Water Resources minor, which includes approximately 65 individuals from the Twin Cities and Duluth campuses (Table 3). These faculty will be asked if they wish to be nominated for full membership on the graduate faculty of the degree program. An initial survey indicated that at least 38 faculty (Table 4) are interested in being nominated. Nominations will be reviewed by a committee appointed by the DGS's to determine

qualifications for full membership.

(c) University resources

A large number of graduate faculty in existing departments and degree programs are available and interested in participating in the proposed interdisciplinary program, and no new FTE faculty will be required to implement the program. Similarly, the program will rely on existing courses (a few with some modification) and a new course being developed for the existing Minor program. The development of new courses is not required to initiate the program. Some faculty teaching, research, and advising efforts will be redirected from existing programs to the new interdisciplinary program, but the new activities will be complementary to present (department-based) activities. The graduate students in the new program will be housed within existing departmental facilities, and student credit hours and faculty teaching activities undertaken as part of the new program will be automatically credited to the parent department of the advisor or course instructor. Consequently, the new program will not draw significant resources out of any existing program. To the extent that the new program will attract students to the University who otherwise would not enroll here and also will encourage the development of new (externally-funded) training and research grant programs, the program has the potential to add resources to individual departments and to the University as a whole.

The University of Minnesota is one of the premier institutions in the United States with regard to water resources research. As such, it has a diverse array of specialized laboratories and field facilities available for research on virtually any aspect of water. The following is a brief description of the major laboratories and field facilities, but it is not an exhaustive list.

St. Anthony Falls Hydraulics Laboratory, Minneapolis. This laboratory is one of the premier hydraulics laboratories in the United States today and is part of the Department of Civil Engineering in the Institute of Technology. Financial support of the Laboratory is derived primarily from grants and contracts. The Laboratory has a wide variety of experimental facilities for graduate research in water resources, including facilities for open channel hydraulics testing, pipe flow measurements, hydraulic machinery testing, physical and computer facilities to model rivers/lakes/reservoirs, and wind tunnel measurements. The facilities can be used by research faculty by paying a negotiated fee. The laboratory also has limited facilities for teaching activities.

Monticello Experimental Research Streams. This field research facility formerly was owned by the U.S. EPA and recently was deeded to the University of Minnesota. It consists of several stream channels on which studies can be conducted to evaluate stream hydrology, stream hydraulics, and stream chemistry/biology.

Gray Freshwater Research Institute in Navarre. This research facility near Lake Minnetonka has excellent laboratory space for research on freshwater biology and environmental chemistry, including studies on fate and transport of trace organic contaminants in the environment. The facility was donated to the University almost 20 years ago and is maintained by the College of Biological Science.

Limnological Research Center. Located in the Department of geology and Geophysics (Institute of Technology, Minneapolis campus), the LRC has been one of the premier research centers for modern and paleo-studies on lakes for over 30 years. Aside from its offices and laboratories in Pillsbury Hall, the LRC maintains a core laboratory for storage, processing, and analysis of sediment cores in the Civil Engineering Building.

Soil Science Laboratories. The Department of Soil Science is one of the premier departments in the nation. It has excellent research facilities for studies of the physics, chemistry, biochemistry, microbiology, and morphology of the soil-water systems. In addition to the regular laboratories, it operates the following special facilities:

Water Quality Research Laboratory. This Laboratory is devoted to support research on water quality problems involving nitrate and pesticides. Automated analytical systems are capable to analyze large volumes of samples for nitrate, pesticides, and organics. Specialized equipment includes several units of gas chromatographs and high performance liquid chromatographs all with autosamplers, gc-mass spectrometer, two robotic systems for sample extraction, supercritical fluid extraction apparatus, carbon and nitrogen analyzers, autoanalyzers, and isotope-ratio mass spectrometer.

Research Analytical and Soil Testing Laboratory. The Research Analytical Laboratory is approved by EPA for meeting the QA/QC standards in analysis of water samples. It has several ICP emission and atomic absorption spectrophotometers, and ion chromatographs for analysis of inorganic elements.

Soil Characterization Laboratory. In addition to facilities for conducting standard analysis of soil properties for soil classification purposes, the Laboratory has X-ray diffractometer, Fourier-transform infra-red spectrophotometer, and cold-vapor atomic fluorometer for mercury analysis.

Soil Landscape Analysis Laboratory. This laboratory has the computing capability to use geographic information systems technology and conduct research using digital elevation and terrain analysis models. It manages the computerized database: Soil Survey Information System (SSIS).

Climate Resource Facilities. The facilities include: (1) The St. Paul Climatological Observatory, which was established in 1960 and has one of the most comprehensive setups in the nation for collecting climatological data, including continuous monitoring of air and soil temperature, precipitation, soil moisture, evaporation, humidity, wind, and solar radiation; (2) a network of computer work stations with access to the state climate database, and linkage to the National Weather Forecast Center at the MSP Airport, North Central Regional River Forecast Center, Midwest Climate Center, National Climate Data Center, and Climate Assessment Center; (3) a network of 16 automated weather stations located at field research sites across the state with daily reporting capabilities; (4) a network of hundreds of voluntary weather observers participating in daily recording of weather conditions across the whole state; some of the records have been kept for over 100 years; and (5) the Earl Kuehnast Memorial Climatological Library, which contains rare collections of data and publications.

The Minnesota Agricultural Experiment Station operates branch stations at Waseca, Lamberton, Morris, Crookston, and Grand Rapids, and additional facilities at Rosemount, Becker, Staples, and Westport with extensive facilities, equipment, and support staff for landscape scale field studies.

Staples Irrigation Center. (Currently being developed) This center, located in Staples, MN, is under development by the Minnesota Agricultural Experiment Station. Approximately 320 acres of land with sandy soil at the Center is being leased to the Experiment Station by the Staples School District. Irrigation systems at the location include a 110-acre center-pivot system, a 10-acre center-pivot system, a linear-move system, and several solid-set irrigation systems. Research plot areas are available to University of Minnesota researchers on a scheduled basis.

Soil Physics Laboratory. This laboratory, located in the Department of Agricultural Engineering (St. Paul campus) contains facilities for measuring various water-related physical properties of soil materials. It also is associated with laboratory space for performing experiments on such items as physical models of soil profiles, drainage systems, and ground water aquifer systems. The laboratory is being relocated and remodeled within the Agricultural Engineering Building.

Hydraulics Laboratory in Agricultural Engineering. The hydraulic laboratory in the Agricultural Engineering Building contains a medium-sized open channel flume, small movable open channel flume, and a Hele-Shaw model. The facility can be used to make measurements on open channel flow, hydraulic structure performance, hydraulic jumps, and drainage flow in porous media. Like the Soil Physics Laboratory, the Hydraulics Laboratory is currently undergoing remodeling.

Fisheries/aquaculture facilities, St. Paul Campus. These facilities consist of two laboratories operated by the Department of Fisheries and Wildlife. A 3000 square foot wet laboratory in Hodson Hall provides 150 gallons per minute of temperature-controlled well water for a variety of aquatic research, ranging from aquatic toxicology to the biology and ecology of aquatic plants and animals. A new 10,000 square foot facility in the Agricultural Engineering Shops Building, to be operational in summer of 1994, will provide 450 gallons per minute of well water for aquatic research similar to that conducted in Hodson Hall but on a larger scale.

Microcomputer centers on the Twin Cities Campus. The University maintains microcomputer centers at five locations on the Twin Cities campus. These centers contain both MacIntosh and DOS-based microcomputers, as well as laser printers. These facilities are available for use by teaching faculty for instruction on the use of software. Outside of formal class activities they are available to students for a nominal fee. Several academic departments also maintain extensive microcomputer facilities, and several departments and research centers maintain specialized computer facilities for research in water resources fields. For example, a new Water Resources Modeling Laboratory in the Agricultural Engineering Building will be available in mid-summer of 1994. It will contain a workstation, microcomputers, and digitizer tablets, and all computers will be connected to the University electronic network to facilitate e-mail communications within and outside the University. The Laboratory also will contain a library of essential water resources journal publications and facilities to access climatic/hydrologic data for locations in the United States.

Field facilities at Itasca Lake Biological Research Station. The Itasca Lake Biological Research Station has facilities for both laboratory and field measurements of chemistry and biology of lakes/streams/soils near Itasca State Park. The facility has living quarters available to make possible extended stays at the facility for teaching and research activities.

Field facilities at the Cloquet Forestry Research Center. Like the Itasca Lake Biological Research Station, the Cloquet Forestry Research Center has living quarters available for extended stays for teaching and research activities.

North Central Soil Conservation Research Laboratory. Located in Morris this research facility is owned and operated by the U.S. Department of Agriculture, Agricultural Research Service. Research activities by permanent scientists at the facility include soil erosion mechanics, contaminant transport in surface waters and subsurface waters, water use by crops, crop production enhancement, alternative pest control, and farming systems. Laboratories for soil physics, soil/water chemistry, and biology facilitate numerous ongoing research activities. Field research activities are also ongoing on local lands either owned or leased by the Laboratory. Cooperative research between University researchers

and ARS researchers are possible.

Minnesota Supercomputer Institute (MSI). The MSI maintains state-of-the-art computing facilities on the Twin Cities Campus. These facilities include numerous workstation computers, color graphics output devices, and supercomputers including a CRAY-2 and a CRAY-XMP computer. These facilities are available to research faculty and associated graduate students through the MSI grant program.

Center for Water and the Environment, Natural Resources Research Institute, UMD. Text to be added.

(d) Outside resources

In addition to University fellowships, departmental teaching assistantships, and research assistantships provided by individual faculty, the program will aggressively seek fellowship funds from programs in NSF, EPA, NOAA, USDI, USDA, and other federal agencies, as well as scholarship and internship opportunities with state and regional agencies involved in water resources research and management.

Research scientists associated with several federal and state laboratories and offices in Minnesota represent a pool of potential adjunct members of the Graduate Faculty. For example, the U.S. EPA laboratory in Duluth has Ph.D.-level scientists who would qualify for such adjunct appointments, as does the U.S. Geological Survey (Water Resources Division) in the Twin Cities. To be appointed as adjunct faculty members, such individuals will need to meet the same standards of expertise and professional accomplishment as regular members of the faculty. Appropriate involvement of such individuals as adjunct faculty has several potential benefits. For example, graduate students and regular faculty may become involved in ongoing research programs of adjunct faculty, thus expanding overall funding opportunities for the graduate program.

Appendices

1. Example degree programs for students emphasizing various areas of specialization within Water Resources Science.

2. Curriculum Vitae for Graduate Faculty

Resumes of 39 faculty interested in participating in this program are on file with the Graduate School and the Water Resources Research Center.

3. Letters of Support

Ira Adelman, Professor and Head, Department of Fisheries and Wildlife, St. Paul Campus
Patricia Bloomgren, Director, Division of Environmental Health, MN Dept. of Health, Minneapolis
H.H. Cheng, Professor and Head, Department of Soil Science, St. Paul Campus
Donald P. Christian, Professor and Head, Department of Biology, UMD
Steven J. Eisenreich, Professor of Civil Engineering and Director, Gray Freshwater Biological Institute; Chair, Strategic Planning Committee on Water, Minneapolis
Sandra Featherman, Associate Vice-President for Academic Affairs, UMD
James A. Grant, Professor and Head, Department of Geology, UMD
Vance Morey, Professor and Head, Department of Agricultural Engineering, St. Paul Campus
Tom Johnson, Professor and Director-designate, Large Lakes Observatory, UMD
Ronald Nargang, Associate Director, MN Department of Natural Resources, St. Paul
Gilbert Veith, Director, Environmental Research Laboratory, U.S. EPA, Duluth

Appendix 1. Sample Degree Programs for Various Areas of Specialization within Water Resources Science

M.S. Program on Twin Cities Campus Elective Emphasis: Water Quality Management

Core Courses (24 cr)

- Surface hydrology (AgET 5410 or FR 5114, 4 cr)
- Hydrogeology (Geol 5611, 4 cr)
- Environmental/water chemistry (CE 5506, 3 cr)
- Limnology (EEB 5601, 4 cr)
- Water quality engineering (CE 5505, 4 cr)
- Water resources: policy, law, and institutions (WRES 5101, ITV)

Elective Courses (8 cr)

- Analysis and modeling of aquatic environments (CE 8550, 4 cr)
- Aquatic chemistry for engineers (CE 8505, 4 cr)

Related Fields (8 cr)

- Environmental toxicology (PubH 5561, 4 cr)
- Air pollution (ME 5401, 4 cr)

Plan B Project (4 cr)

- Independent study (WRES 8097, 4 cr)

Ph.D. Program on Twin Cities Campus Elective Emphasis: Water Quality Analysis and Modeling

Major courses

Core courses:

- Same as listed for M.S. program

Elective Courses (25 cr)

- Analysis and modeling of aquatic environments (CE 8550, 4 cr)
- Aquatic chemistry for engineers (CE 8505, 4 cr)
- Analysis of toxic contaminants in aquatic systems (PubH 8185, 3 cr)
- Aquatic chemistry of organic contaminants (CE 8507), 4 cr)
- Hydrologic Modeling, Small Watersheds (AgEn 8500, 4 cr)
- Analysis of Groundwater-Soil Pollution Abatement Technology (CE 5540, 4 cr)
- Seminar in water resources (WRES 8100, 2 cr)

Supporting Program (19 cr)

- Environmental toxicology (PubH 5261, 3 cr)
- Risk assessment and management (PubH 5266, 1 cr)
- Air pollution (ME 5609, 4 cr)
- Soil chemistry (Soil 5310, 4 cr)
- Ecosystem form and function (EEB 5608, 4 cr)
- Geographic information systems (FR 5130, 3 cr)

Dissertation

- WRES 8888 (36 cr)

M.S. Programs in Hydrology on Twin Cities Campus

1. Surface Hydrology focus

Core Courses (20-24 cr)

Surface hydrology (AgET 5410 or FR 5114, 4 cr)*

Hydrogeology (Geol 5611, 4 cr)

Environmental/water chemistry (CE 5506, 3 cr)

Limnology (EEB 5601, 4 cr)

Water quality engineering (CE 5505, 4 cr)

Water resources: policy, law, and institutions (WRES 5101, ITV)

Elective Courses (12 cr)

Hydrologic modeling, small watersheds (AgEn 8500, 4 cr)

Advanced forest hydrology (FR 5153, 4 cr)

Open channel hydraulics (CE 5410, 4 cr)

Supporting Program (8 cr)

Statistical analysis (Stat 5021, 4 cr)

Applied regression analysis (Stat 5302, 4 cr)

Plan B project

WRES 8097, 4 cr)

2. Groundwater focus

Core courses (20-24 cr)

Same as above

Electives (10-11 cr)

Groundwater mechanics (CE 5425, 4 cr)

Transport phenomena in porous media (Geo 8611, 3 cr)

Analytical geohydrology (Geo 8612, 4 cr) or

Tracers in hydrogeology (Geo 8621, 3 cr)

Supporting Program (10 cr)

Statistical analysis (Stat 5021, 4 cr)

Peatlands (Soil 5550, 3 cr)

Geographic information systems (FR 5130, 3 cr)

Plan B Project

WRES 8097, 4 cr

*Students focusing in the area of hydrology most likely will have had an introductory hydrology course such as AgET 5410 or FR 5114 in their undergraduate program.

Ph.D. Program in Hydrology on Twin Cities Campus

Course and research focus: watershed hydrology

Coursework in Major: (Assuming an M.S. with core hydrologic science courses)

Watershed engineering (AgEn 5540, 4 cr)

Hydrologic modeling, small watersheds (4 cr)

Advanced forest hydrology (FR 5153, 4 cr)

Stochastic hydrology (CE 8405, 4 cr)

Lake and reservoir hydrodynamics (CE 8430, 4 cr)

Analysis and modeling of the aquatic environment (CE 8550, 4 cr)

Transport phenomena in porous media (Geo 8611, 3 cr)

Advanced soil physics (Soil 8250, 3 cr)

Seminar: climatology (Geog 8420, 3 cr)

Seminar in water resources (WRES 8100, 2 cr)

Supporting Program (18 cr)

Geographic information systems (FR 5130, 3 cr)

Peatlands: formation, classification, utilization (Soil 5550, 3 cr)

Economics of natural resource policy (AgEc 56504, 4 cr)

Designing experiments (Stat 5301, 4 cr)

Multivariate statistics (Stat 5401, 4 cr)

Dissertation:

WRES 8888 (36 cr)

Sample Degree Programs on Duluth Campus Elective Emphasis: Aquatic Ecology

M.S. Program

Core Courses (22 cr)

Surface hydrology (Geog 5430, 4 cr, or FR 5114 or AgET 5410, ITV)

Hydrogeology (Geol 5201, 4 cr)

Environmental/water chemistry (Geol 5411, 3 cr)

Limnology (Biol 5773, 4 cr)

Water quality management: water pollution biology (Biol 5871, 3 cr)

Water resources: policy, law, and institutions (WRES 5101, ITV)

Elective Courses (10 cr)

Stream ecology (Biol 5771, 5 cr)

Microbial ecology (Biol 5677, 5 cr)

Related Fields (8 cr)

Applied statistical analysis (Stat 5561, 4 cr)

Regression analysis (Stat 5562, 4 cr)

Plan B Project (4 cr)

Independent study (WRES 8097, 4 cr)

Ph.D. Program

The following courses would be added to the above M.S. program:

Major Courses

Ecosystem ecology (Biol 5776, 4 cr)

Plankton ecology (Biol 5777, 3 cr)

Seminar in ecology (Biol. 8871, 1 cr)

Topics in biology (e.g. Wetlands ecology) (Biol 8900, 2 cr)

Supporting Program

Multivariate statistics (Stat 5562, 3 cr)

Experimental design (Stat 5569, 3 cr)

Laboratory in geographic information systems (Geog 5563, 4 cr)

Dissertation

WRES 8888 (36 cr)

Appendix 2

Brief Resumes for Potential Members of Graduate Faculty

CURRICULUM VITAE OF IRA R. ADELMAN

OFFICE ADDRESS:

Department of Fisheries and Wildlife
University of Minnesota
1980 Folwell Ave.
St. Paul, MN 55108-1036
Phone: (612) 624-4228
FAX: (612) 625-5299
Internet: ira@finsandfur.fw.umn.edu

HOME ADDRESS:

144 S. Mississippi River Blvd.
St. Paul, MN 55105
(612) 690-0291

EDUCATION:

University of Vermont, B.A., 1963, Psychology
State University of New York at New Paltz, 1964, Zoology
University of Minnesota, Ph.D., 1969, Fisheries

EMPLOYMENT:

Department Head, University of Minnesota - 1982-present
Special Assistant to the Director, Division of Fish & Wildl., Minn. Dept. of Natural Resources - 1990 (sabbatical position)
Professor, University of Minnesota - 1984-present
Assistant/Associate Professor, University of Minnesota - 1974-84
Research Associate, University of Minnesota - 1969-74

SCIENTIFIC AND PROFESSIONAL MEMBERSHIPS AND HONORS:

AMERICAN INSTITUTE OF FISHERIES RESEARCH BIOLOGISTS (Fellow)
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
AMERICAN FISHERIES SOCIETY
NATIONAL ASSOCIATION OF UNIVERSITY FISHERIES AND WILDLIFE PROGRAMS
Certified Fisheries Scientist, American Fisheries Society
Bush Foundation Leadership Fellow - 1989

SELECTED RECENT PUBLICATIONS:

- Adelman, I. R. 1987. Uptake of radioactive amino acids as indices of current growth rate of fish: a review. pp. 65-79. In R. C. Summerfelt and G. E. Hall, ed. Age and growth of fish. Iowa State Univ. Press. Ames, IA.
- Busacker, G. P. and I. R. Adelman. 1987. Uptake of ¹⁴C-glycine by fish scales (invitro) as an index of current growth rate. pp. 355-357. In R. C. Summerfelt and G. E. Hall, ed. Age and growth of fish. Iowa State Univ. Press. Ames, IA.
- Goolish, E. M. and I. R. Adelman. 1987. Tissue-specific cytochrome oxidase activity in largemouth bass: The metabolic costs of feeding and growth. *Physiol. Zool.* 60:454-464.
- Goolish, E. M. and I.R. Adelman. 1988. Tissue-specific allometry of an aerobic respiratory enzyme in a large and small species of cyprinid (Teleostei). *Can. J. Zool.* 66:2199-2208.
- Woiwode, J. G. and I. R. Adelman. 1989. Influence of density and multipass water use on channel catfish performance in raceways. *Prog. Fish-Cult.* 54: 183-188.
- Cai, Y. and I. R. Adelman. 1990. Temperature acclimation in respiratory and cytochrome c oxidase activity in common carp (*Cyprinus carpio*). *Comp. Biochem. Physiol.* 95A: 139-144.
- Busacker, G.P., I.R. Adelman, and E.M. Goolish. 1990. Growth. Pages 363-387 in P. Moyle and C. Schreck (eds.). *Methods in Fish Biology*. American Fisheries Society. Bethesda, MD.
- Woiwode, J.G. and I.R. Adelman. 1991. Effects of temperature, photoperiod, and ration size on growth of hybrid striped x white bass. *Trans. Amer. Fish. Soc.* 120:
- Woiwode, J.G. and I.R. Adelman. 1992. Effects of starvation, oscillating temperatures, and photoperiod on the Critical Thermal Maximum of hybrid striped by white bass. *J. Thermal Biol.* 17: 271-275.

CURRICULUM VITAE

Professor E. Calvin Alexander, Jr.
Department of Geology and Geophysics
University of Minnesota
Minneapolis, MN 55455

Academic Background:

B.S. Chemistry, Oklahoma State University, 1966
Ph.D. Chemistry, University of Missouri at Rolla, 1970

Professional Experience:

1987-Present Professor Geology and Geophysics Dept., Univ. of Minn.
1978-1987 Associate Professor Geol. and Geophys. Dept., Univ. of Minn.
1973-1978 Assistant Professor Geol. and Geophys. Dept., Univ. of Minn.
1970-1973 Assist. Res. Chemist, Physics Dept., Univ. of Calif., Berkley
1969-1970 Instructor in Chemistry, Chem. Dept., Univ. of Missouri at Rolla

Research Experience:

The central theme of my research interests is the rate of movement of fluids in hydrogeology. This research includes the use of isotopic techniques (tritium, carbon-13, and stable oxygen and hydrogen isotopes) and inadvertent tracers (pollutants, pesticides, and nutrients) to measure fluid flow or residence times on time scales ranging from months to tens of thousands of years. Much of my current work involves the use of artificial tracers such as fluorescent dyes and anions to measure fluid flows on time scales of minutes to years. My initial interests in karst hydrology have expanded into the whole range of non-Darcian phenomena such as preferential flow in soils, and flow in fractured and granular media. I am also very interested in how the results of recent hydrogeologic research can be quickly and effectively included into public policy questions of non-point source pollution, Best Management Practices, Well Head Protection Regulations, etc.

Relevant Publications:

- Dalgleish, J. and *E.C. Alexander, Jr.* 1984. Sinkhole distribution in Winona County, Minnesota. In: B.Beck (ed.) Sinkholes: Their Geology, Engineering and Environmental Impact, A.A.Balkema, Rotterdam, The Netherlands, pp.79-85.
- Alexander, E.C., Jr.* and J.A. Milske 1986. Dye tracing studies of the Fountain Minnesota sewage system. Proceedings of the Environmental Problems in Karst Terranes and Their Solutions Conference, National Water Well Association, Dublin, Ohio, pp.249-262.
- Alexander, E., M. Davis* and J. Dalgleish 1986. Dye tracing through thick unsaturated zones. Proceedings of the 5th International Symposium on Underground Water Tracing, Athens, Instit. of Geol. and Mineral Expl., Athens, Greece, pp.181-188.
- Everts, C.J., R.S. Kanwar, *E.C. Alexander, Jr.* and S.C. Alexander 1989. Comparison of tracer mobilities under laboratory and field conditions. Jour. Environ. Qual., V. 18, n. 4. pp. 491-498.
- Alexander, S.C. and *E.C. Alexander, Jr.* 1989. Residence times of Minnesota ground water. Jour. Minn Academy of Sci., v. 55, n. 1, pp. 48-52.
- Quinlan, James F., Peter L. Smart, Geary M. Schindel, *E. Calvin Alexander, Jr.*, Alan J. Edwards, and A. Richard Smith 1992. Recommended administrative/regulatory definition of karst aquifers, principles for classification of carbonate aquifers, practical evaluation of vulnerability of karst aquifers, and determination of optimum sampling frequency at springs. In: (Quinlan, J, and Stanley, A., eds.) Proceedings of 3rd Conf. on Hydrology, Ecology, Monitoring and Management of Groun Water in Karst Terranes. Nashville, Tenn., Dec. 4-6, 1991, NGWA, Dublin, Ohio, pp. 573-635.
- Foster, M.J.B., *E. Calvin Alexander, Jr.*, D. Misra, and J.L. Nieber 1992. Development and testing of a two meter diameter conical infiltrometer. 1992 Fall Meeting, Amer. Geophys. Union, Eos, v. 7, n. 43, pp. 207-208.
- Foster, Michael B.J., Scott. C. Alexander, and *E. Calvin Alexander, Jr.*, 1992. A concurrent dye trace method for environmental impact investigations in karst. submitted to Contaminant Hydrology.
- Alexander, E. Calvin, Jr.*, J.S. Broberg, A.R. Kehren, M.M. Graziani, and W.L. Turri, 1993. Bellechester, Minnesota, USA, lagoon collapses. Environ. Geol., v. 22, pp. 353-361

CURRICULUM VITAE

Name: James L. Anderson

Present Position: Professor

Director of The Center for Agricultural Impacts on Water Quality

Department: Department of Soil Science

439 Borlaug Hall

University of Minnesota

St. Paul, MN 55108

Education: Bachelor of Natural Resources (Honors), emphasis in Soil Science, University of Wisconsin, Madison, 1971

Master of Science in Soil Genesis, Classification, and Morphology, University of Wisconsin, Madison, 1972

Doctor of Philosophy, Soil Genesis, Classification, and Morphology, University of Wisconsin, Madison 1976

Employment History:

1976-1978: District Soil Scientist, Hennepin Soil and Water Conservation District. Worked with community planning commissions to develop and implement ordinances related to natural resources, including individual sewage treatment system requirements and wetland identification and preservation.

1978-1983: Assistant Professor, University of Minnesota. Temporary Extension (100% extension) faculty position at the University of Minnesota, St. Paul. Participated in the Minnesota Accelerated Soil Survey Program. Primary responsibility was to develop educational programs about the conduct and use of soil surveys.

1983-1985: Assistant Professor and Extension Soil Scientist (91% extension, 9% teaching) University of Minnesota. Primary focus was to provide extension teaching, conduct applied research field demonstrations in the use and interpretation of soil survey information for land management and evaluation, and teach a graduate level course in soil morphology, classification and genesis.

1985-1991: Associate Professor, and Extension Soil Scientist (appointment: 91% extension, 9% teaching) University of Minnesota. Responsibilities include extension teaching, applied research and field demonstrations to promote the use of soil survey information and teach a graduate level course in soil morphology, classification and genesis.

1986-present: Director, Center for Agricultural Impacts on Water Quality (1/2-time assignment) University of Minnesota. Primary responsibilities in addition to extension teaching was to develop a multidisciplinary research program to investigate the impact of agricultural management systems on water quality.

1991-present: Professor and Extension Soil Scientist (appointment: 91% extension, 9% teaching) University of Minnesota.

PUBLICATIONS:

Anderson, J.L. and D.B. Breitbach. 1990. Agrichemical Management Handbook for County Extension Agents and Soil Conservation Service, District Conservationists.

Anderson, J.L., R.H. Dowdy and G.N. Delin. 1991. Ground water impacts from irrigated ridge-tillage. Irrigation and Drainage Proceedings 1991, IR Div./ASCE; Honolulu, HI, July 22-26, 1991. p. 604-610.

Clay, D.E., G.L. Malzer and J.L. Anderson. 1990. Tillage and Dicyandiamide influence on fertilizer immobilization, remineralization, and utilization by corn. Biol. and Fert. of Soils, 9:220-225.

Clay, D.E., G.L. Malzer and J.L. Anderson. 1990. Ammonia volatilization from urea as influenced by soil temperature, soil water content, and nitrification and hydrologic inhibitors. Soil Sci. Soc. Am. J. 54:263-266.

Delin, G.N., J.L. Anderson, and R.H. Dowdy. 1991. Integrated hydrologic research at the Northern Corn Belt Sand Plain Management System Evaluation Area, Minnesota. U.S. Geological Survey Toxic Substances Hydrology Program Proceedings, p. 214-218.

CURRICULUM VITAE

Name and Title: Donald G. Baker, Professor

Address: Department of Soil Science
University of Minnesota
439 Borlaug Hall
St. Paul, MN 55108

Education:

Ph.D.	1958	University of Minnesota	Soil Science
M.S.	1951	University of Minnesota	Soil Science
B.S.	1949	University of Minnesota	Agriculture
(1)	1944	University of Chicago	Meteorology
(2)	1943	University of Wisconsin	Pre-Meteorology
1.	Certificate of Competence; Meteorology Cadet A Program; U.S. Army Air Corps.		
2.	Certificate; Pre-Meteorology B Program; U.S. Army Air Corps		

Professional Experience:

1982	Adjunct Prof.	Geography Department, University of Minnesota, Mpls., MN
1969	Professor	Soil Science Department University of Minnesota, St. Paul, MN
1965	Assoc. Prof.	Soil Science Department, University of Minnesota, St. Paul, MN
1961	Asst. Prof.	Soil Science Department University of Minnesota, St. Paul, MN
1958	Instructor	Soil Science Department University of Minnesota, St. Paul, MN
1951-52	Staff Briefing Officer,	U.S. Air Force
1943-46	Meteorologist	U.S. Army Air Corps

Honorary Societies and Awards:

Bronze Star, USAF, 1952; Sigma Xi, Gamma Sigma Delta, Gamma Alpha; Fellow, American Society of Agronomy, 1987; Honorary FFA State Farmer, 1973; U.S. Dept. Commerce, NOAA, NWS Special Service Award, 1986.

Professional Societies:

American Association for Advancement of Sciences
American Meteorological Society
American Geophysical Union
American Society of Agronomy
Royal Meteorological Society
Soil Science Society of America

Current Research:

- Climatic Variation and Change
- Influence of Greenhouse Effect Scenarios on Water Supplies
- Soil Moisture and the Hydrologic Cycle
- Agriculture and the Physical Environment

Selected Publications:

Baker, D.G. 1960. Temperature Trends in Minnesota. Bull. Amer. Meteor. Soc. 41:18-27.
Baker, D.G. 1962. Seasonal Temperature and Precipitation Trends at Five Minnesota Stations. Mon. Wea. Rev. 90:283-286.
Idso, S.B., and D.G. Baker. 1968. The Naturally Varying Energy Environment and Its Effect Upon Photosynthesis. Ecol. 49:311-316.
Klink, J.C., and D.G. Baker. 1976. The Role of the Atmosphere in Seasonal Changes of Global Solar Radiation Climates. Proc. Assoc. Amer. Geog. 8:4-5.

- Baker, D.G., W.W. Nelson, and E.L. Kuehnast, 1979. Climate of Minnesota. Part XII. The Hydrological Cycle and Soil Water. Minn. Agric. Exp. Sta. Tech. Bull. 322.
- Baker, D.G. 1980. Botanical and Chemical Change: A Comment. *J. Interdisciplinary History*. 10:813-819.
- Winkler, J., R.H. Skaggs, and D.G. Baker. 1981. Adjusted Urban-Rural Temperate Differences. *J. App. Meteor.* 20:1295-1300.
- Skaggs, R.H., D.G. Baker, and J.E. Ljungkull. 1982. The Influence of Persistence and Variability on the Required Solar Radiation Record Length. *Solar Energy*. 28:281-287.
- Reicosky, D.C., B.S. Sharratt, J.E. Ljungkull, and D.G. Baker. 1983. Comparison of Alfalfa Evapotranspiration Measured by a Weighing Lysimeter and a Portable Chamber. *Agric. Meteor.* 28:205-211.
- Sharratt, B.S., D.C. Reicosky, S.B. Idso, and D.G. Baker. 1983. Relationship Between Leaf Water Potential, Canopy Temperature, and Evapotranspiration in Irrigated and Non-Irrigated Alfalfa. *Agron. J.* 75:891-894.
- Baker, D.G., and R.H. Skaggs. 1984. The Distance Factor in the Relationship Between Solar Radiation and Sunshine. *J. Climatol.* 4:123-132.
- Baker, D.G., B.S. Sharratt, H.C. Chiang, J.A. Zandlo and D.L. Ruschy. 1984. Base Temperature Selection for the Prediction of European Corn Borer Instars by the Growing Degree Day Method. *Agric. and For. Meteor.* 32:55-60.
- Baker, D.G., D.F. Watson and R.H. Skaggs. 1985. The Minnesota Long-Term Temperature Record. *Climate Change* 7:225-236.
- Skaggs, R.H. and D.G. Baker. 1985. Fluctuations in the Length of the Growing Season in Minnesota. *Climatic Change* 7:403-414.
- Skaggs, R.H. and D.G. Baker. 1986. The Contribution of Months and Seasons to Fluctuations of the Mean Annual Temperature in Eastern Minnesota. *Theor. Appl. Climatol.* 37:158-165.
- Sharratt, B.S., and D.G. Baker. 1986. Alfalfa Leaf Area as a Function of Dry Matter. *Crop Sci.* 26:1040-1043.
- Sharratt, B.S., D.G. Baker and C.C. Sheaffer. 1986. Climatic Effects on Alfalfa Dry Matter Production. I. Spring Harvest. *Agric. and Forest Meteor.* 37:123-131.
- Swerman, R.S. and D.G. Baker. 1987. Precipitation Network Density Requirements for Short Term Analysis. (Chap. 3), *In* File Structure Design and Data Specifications for Water Resources Geographic Information Systems. D.A. Brown and P.J. Germehl, Ed. Special Report No. 10, Water Resources Res. Ctr., Univ. of Minn., St. Paul, MN. Pp 3-1 to 3-16.
- Swerman, R.S., D.L. Ruschy, and D.G. Baker. 1987. Precipitation Data for Water Resources GIS. (Chap. 5), *In* File Structure Design and Data Specification for Water Resources Geographic Information Systems. D.A. Brown and P.J. Gersmehl, Ed. Special Report No. 10, Water Resources Res. Ctr., Univ. of Minn., St. Paul, MN. Pp 5-1 to 5-24.
- Swerman, R.S., D.G. Baker and R.H. Skaggs. 1987. Minnesota Drought. Special Report No. 15, Water Resources Res. Ctr., Univ. of Minn., St. Paul, MN.
- Baker, D.G. and D.L. Ruschy. 1988. Historical Albedo Values at St. Paul, MN., 1969-1985. *J. Appl. Meteor.* 27:244-253.
- Baker, D.G. and D.L. Ruschy. 1989. Winter Albedo Characteristics at St. Paul, MN. *J. Appl. Meteor.* 28:227-232.
- Skaggs, R.H. and D.G. Baker. 1989. Temperature Change in Eastern Minnesota. *J. Climate* 2:629-630.
- Baker, D.G., D.L. Ruschy, and D.B. Wall. 1990. The albedo decay of prairie snows. *J. Appl. Meteor.* 29:179-187.
- Baker, D.G., D.L. Ruschy, and D.B. Wall. 1990. The albedo decay of prairie snows. *J. Appl. Meteor.* 29:179-187.
- Baker, D.G., R. H. Skaggs, and D.L. Ruschy. 1991. Snow depth required to mask the underlying surface. *J. Appl. Meteor.* 3p: 387-392.
- Ruschy, D.L., D.G. Baker, and R.H. Skaggs. 1991. Seasonal variation in daily temperature ranges. *J. Climate.* 4:1211-1216.
- Sharratt, B.S., D.G. Baker, D.B. Wall, R.H. Skaggs, and D. L. Ruschy. 1992. Air and soil temperature variations for given snow depths. *Agric. and For. Meteor.* 57:243-251.
- Baker, D.G., D.L. Ruschy, R. H. Skaggs, and D.B. Wall. 1992. Air temperature and radiation depressions associated with a snow cover. *J. Appl. Meteor.* 31:247-254.
- Baker, D. G., and D. L. Ruschy. 1993. The recent warming in eastern Minnesota shown by ground temperatures. *Geophys. Res. Lett.* 20:371-374.
- Baker, D. G., D. L. Ruschy, and R. H. Skaggs. Agriculture and the Recent 'Benign Climate' in Minnesota. *Bull. Amer. Meteor. Soc.* 74:1035-1040.

ANNUAL SUMMARY OF ACTIVITIES

Paul R. Bloom

A. PERSONAL DATA

1. Calendar 1993
2. Paul R. Bloom, Professor, appointed 1988
3. Appointment: research 65%, teaching 35%
4. Job description: Conduct research in the more basic aspects of soil chemistry. Teach graduate courses in soil chemistry.

B. TEACHING ACTIVITIES

<u>Course</u>	<u>Credits</u>	<u>Enrolled</u>	<u>Quarter</u>	<u>Contribution</u>
Soil Chemistry 5310	4	15	S 93	100%
Soil Chemistry Laboratory 5311	1	10	S 93	100%
Soil Colloquium 8111	1	6	F 93	100%

B. RESEARCH ACTIVITIES

Refereed Publications

- Gourley, C. J. P., D. L. Allan, M. P. Russelle, and P. R. Bloom. 1993. Evaluation and improvements of a sand alumina culture technique to screen plants for low phosphorus tolerance. *Soil Sci. Soc. Am. J.* 57:103-110.
- Zhang, H. P. R. Bloom, and E. A. Nater. 1993. Change in surface area and dissolution rates during hornblende dissolution at pH 4.0. *Geochim. et Cosmochim. Acta* 57:1681-1689.
- Meyer, M.L., and P. R. Bloom. 1993. Lithium metaborate fusion for silicon calcium magnesium and potassium analysis of wild rice. *Plant and Soil* 153:281-185.

MAES Reports

- Bloom, P. 1993. Prediction of topdress nitrogen by soil and plant sampling. *Miscellaneous Publication.* 74-1993.

Scientific Papers Presented

- Bloom, P. R. and B. D. Cook. 1993. Fate of a synthetic polymer during composting. *Agron. Abst.* 1993:28.
- Porter, R. A. and P. R. Bloom. 1993. Response of pistillate (all female flowers) and normal (monoecious) wild rice to topdress urea. *Agron. Abst.* 1993:144.
- Bloom, P. R., C. L. Trostle and D. L. Allan. 1993. Evaluation of a hydroponic screening methods for the determination of zinc deficiency in rice. *Agron. Abst.* 1993:267.
- Liu, Y. P., D. L. Allan and P. R. Bloom. A resin based system to measure bioavailability soil organic phosphorus. *Agron. Abst.* 1993:277.

Other Presentations:

- Summer 1993. Talked at Metro Community College.

Undergraduate Advising

5 Advisees

Attended Advising workshop. Feb. 16, 1993.

Graduate Advisees:

Calvin Trostle, Ph.D.

Eyasu Mekonnen, Ph.D.

Yanping Liu (with Deborah Allan)

Graduating advising and examining committee assignments: 10

Research Grants:

Bloom, P.R. and D.L. Allan. Organic phosphorus mineralization and bioavailability in soils. Tennessee Valley Authority. October 1991-September 1993. \$12,000/yr.

Bloom, P.R., B. Cook, and T. Halbach. Fate of AGM during MSW composting. Procter and Gamble. October 1991-September 1993. \$120,000.

Nater, E.A. and P. R. Bloom. Collaborative research: The role of exsolution lamellae in the rates and mechanisms of dissolution of feldspar. NSF. July 1992-June 1994. \$95,000.

Bloom, P. R., B. Cook, H. H. Cheng, and T. R. Halbach. Fate of herbicides during composting. USDA-CSRS. Sept. 1993-Sept. 1995. \$128,000.

Bloom, P. R., E. A. Oelke, and Ray Porter. Refining nitrogen fertilizer management on wild rice. Minnesota Cultivated Wild Rice Council. 1992-93. \$14,800.

Experiment Station Projects:

45, Leader - P. R. Bloom. Kinetics of Mineral Dissolution.

48, Leader - P. R. Bloom. Soil Fertility and Chemistry Aspects of Wild Rice Production.

D. SERVICE:

National: Chair S-2 Equilibrium Working Group Subcommittee on Speciation Modeling.
CSRS program review of the Department of Soil and Water Science at University of Arizona. Feb. 8-11, 1993.
Distinguished Faculty Mentor - Distinguished Faculty Mentor Program for high potential minority students.

University: Fulbright Scholarship Screening Committee, October 1993.
Member of Henry Luce Foundation Internship Screening Committee
Member of the Faculty Senate

College: Chair: Tri-State Initiative on Waste Management

Department: Graduate Advisory
International Agriculture
Grievance Officer
Library (Chair)
Endowed Chair Hiring Committee

Other: Co-Chair: Central High School Science Curriculum Review Committee

ABBREVIATED RESUME

PATRICK LEE BREZONIK

Director, Water Resources Research Center
and Director of Graduate Studies, Water
Resources Graduate Minor
University of Minnesota
Suite 302, 1518 Cleveland Ave.
St. Paul, Minnesota 55108
Phone (612) 624-9282; FAX 625-1263
E-Mail: brezo001@maroon.tc.umn.edu

Professor of Environmental Engineering
Department of Civil & Mineral Engineering
University of Minnesota
500 Pillsbury Dr. SE
Minneapolis, Minnesota 55455
(612) 625-0866

PERSONAL RECORD

Date and place of Birth: July 17, 1941; Sheboygan, Wisconsin
Marital Status: Married, wife's first name, Carol; children: Craig (27) and Nicholas (24)

EDUCATION

1963 Marquette University, Milwaukee, Wisconsin, B.S., Chemistry
1965 University of Wisconsin, Madison, Wisconsin, M.S., Water Chemistry
1968 University of Wisconsin, Madison, Wisconsin, Ph.D., Water Chemistry

EMPLOYMENT

1966-1981 Asst., Assoc., Full Professor, Dept. Environ. Engrg. Sci. Univ. of Florida.
1971-1972 NSF Faculty Fellow and Guest Professor, EAWAG-ETH, Zurich, Switzerland
1981- Professor, Dept. of Civil and Mineral Engineering; member of graduate
faculty in Dept. of Ecology, Evolution, and Behavior, Univ. of Minnesota
1985- Director, Water Resources Research Center, Univ. of Minnesota

PROFESSIONAL ORGANIZATIONS

American Association for the Advancement of Science; American Society of Limnology and
Oceanography; Association of Environmental Engineering Professors

PROFESSIONAL ACTIVITIES

Amer. Chem. Soc.: *Environmental Science and Technology*, editorial board, 1973-1978.
Amer. Soc. Civil Engrs.: co-chair, 2nd Env. Eng. Div. Conf.; Gainesville Fla., 1975.
Amer. Soc. Limnol. Oceanogr.: *Limnology and Oceanography*, editorial board, 1975-1976;
chair of organizing committee for 1985 annual meeting in Minneapolis.
International Arctic Science Committee: member of audit group for the Arctic Monitoring
and Assessment Program (AMAP) of the eight circumpolar nations, 1993.
National Academy of Science-National Research Council: chair, *Committee on Nitrates in the
Environment*, 1975-1978; member, *Committee on Restoration of Aquatic Systems*, 1989-91;
member, *Committee to Review the EPA's Environmental Monitoring and Assessment Program*,
1991-; member, **Water Science and Technology Board**, 1993-; chair, *Committee on the
Future of the Science of Inland Aquatic Ecosystems*, 1994-.
National Association of Water Institute Directors: member of *Council of Representatives*,
1986-91; **Chair**, 1988-1990.
Universities Council on Water Resources: member *Board of Directors*, 1988-93, re-elected 1993-
96; **President**, 1991-92.
Water Pollution Control Federation: *Research Committee*, 1973-1977; *Standard Methods
Committee*, 1974-1980; *Chair, Joint Task Groups on Nitrate and Nitrite*, 1976-1980.
Water Environment Research Foundation: member, **Research Advisory Council**, 1992-.

RESEARCH INTERESTS

Water chemistry and quality; limnology; acid precipitation and its ecological effects on lakes; in-
lake alkalinity generation processes; biogeochemical cycling of mercury; heavy metal reactivity
and speciation; organic matter in natural waters; atmospheric deposition of contaminants;

aquatic photochemistry; kinetics of chemical processes in aquatic systems; eutrophication; nutrient cycling; lake restoration methods; water quality models.

REPRESENTATIVE RESEARCH GRANTS

- U.S. EPA. Responses of Little Rock Lake to artificial acidification: water chemistry and nutrient cycling. 1983-1991 (Co-PI; three multi-university cooperative agreements).
- U.S. EPA. Role of sulfate reduction in alkalinity generation in acid-sensitive lakes. 1983-86.
- U.S. EPA. Long-term monitoring for acid precipitation effects on lakes in the Upper Great Lakes region. 1983-1992; four successive cooperative agreements.
- S. Florida Water Manage. Distr. 1988-1991. Historical trends in phosphorus loading and accumulation in Lake Okeechobee sediments (Co-PI).
- Legisl. Comm. on Minnesota Resources/MN Poll. Contr. Agency. Historical trends and sources of mercury in NE Minnesota lakes. 1986-1993; three successive grants (Co-PI).
- LCMR/MPCA. Factors affecting treatment effectiveness of waste stabilization ponds: water chemistry, mass balances, toxicity factors. 1989-1991 (CoPI).
- Minneapolis Park Board. Clean Water Partnership study on Minneapolis lakes. 1991-. (Co-PI).

REPRESENTATIVE PUBLICATIONS (from past 10 years)

- Baker, L.A. and P.L. Brezonik. 1988. Dynamic model of internal alkalinity generation: calibration and application to precipitation-dominated lakes, *Water Resources Res.* 24: 65-74.
- Baker, L.A., P.L. Brezonik, and N. Urban. 1989. The biogeochemistry of sulfur in a dilute, acidic seepage lake, in: *Biogenic Sulfur in the Environment*, Symp. Ser. 393, Am. Chem. Soc., Washington.
- Brezonik, P.L. 1990. Principles of linear free energy and structure-activity relationships and their applications to the fate of chemicals in aquatic systems, in: *Aquatic Chemical Kinetics*, W. Stumm (Ed.), Wiley, New York.
- Brezonik, P.L., C.E. Mach, G. Downing, N. Richardson, and M. Brigham. 1990. Effects of acidification on minor and trace metal chemistry in Little Rock Lake, Wisconsin. *Env. Tox. Chem.* 9: 871-885.
- Webster, K.E., A. Newell, L.A. Baker, and P.L. Brezonik. 1990. Climatically induced rapid acidification of a softwater seepage lake. *Nature* 347: 374-376.
- Detenbeck, N.E. and P.L. Brezonik. 1991. Phosphorus sorption by lake sediments. 1. Comparison of equilibrium models; 2. Effects of pH and other solution variables. *Env. Sci. Technol.* 25: 395-409.
- Brezonik, P.L., C.E. Mach, and S. King. 1991. The influence of water chemistry on metal bioaccumulation and toxicity, pp. 1-29 in: *Ecotoxicology of Metals: Current Concepts and Applications*, Lewis Publ., Chelsea, MI.
- King, S.O., C.E. Mach, and P.L. Brezonik. 1992. Changes in trace metal concentrations in lakewater and biota during experimental acidification of Little Rock Lake, Wisconsin. *Env. Poll.* 78: 9-18.
- Swain, E.B., D.R. Engstrom, M.E. Brigham, T.A. Henning, and P.L. Brezonik. 1992. Increasing rates of atmospheric mercury deposition in midcontinental North America. *Science* 257: 784-7.
- Baker, L.A., D.R. Engstrom, and P.L. Brezonik. 1992. Recent sulfur enrichment in the sediments of Little Rock Lake, Wisconsin. *Limnol. Oceanogr.* 37: 689-702.
- Brezonik, P.L. *et al.* 1993. Experimental acidification of Little Rock Lake, Wisconsin: chemical and biological changes over the pH range 6.1 to 4.7. *Canad. J. Fish. Aquat. Sci.* 50: 1101-21.
- Engstrom, D.R., E.B. Swain, T.A. Henning, M.E. Brigham, and P.L. Brezonik. 1993. Atmospheric mercury deposition to lakes and watersheds: a quantitative reconstruction from multiple sediment cores, in: *Environmental Chemistry of Lakes and Reservoirs*, Am. Chem. Soc., Wash., D.C.
- Brezonik, P.L. 1994. *Chemical Kinetics and Process Dynamics in Aquatic Systems*. Lewis Publ., Chelsea, MI, 754 p.
- Brezonik, P.L. and D.H. Moreau (Eds.). 1994. The Clean Water Act Revisited. Special issue of *Water Resources Update*, Issue No. 94, Winter, 1994.

March 1994

ABBREVIATED VITAE

Kenneth N. Brooks
Professor and Director of Graduate Studies in Forestry,
College of Natural Resources, University of Minnesota

HIGHEST DEGREE: Ph.D., Watershed Management & Hydrology,
University of Arizona, 1970

KEY QUALIFICATIONS:

Dr. Brooks is a professional hydrologist (certified by the American Institute of Hydrology, AIH No. 118) and has been working in the field of hydrology and watershed management for over 20 years. He worked as a hydrologist for the U.S. Army Corps of Engineers for 4.5 years. At the University of Minnesota, he has taught courses in Forest Hydrology, Field Hydrology, Range Management and Watershed Management - Agroforestry Practices. Research has focused on wetlands hydrology, hydrologic modeling of forested watersheds and methods of evaluating/appraising watershed management practices. Dr. Brooks has served as a consultant to the Food and Agricultural Organization of the United Nations, the World Bank, and USAID. He served as a Fellow, East-West Center, Honolulu, Hawaii, as part of a sabbatical leave during 1984-1985. He has authored and co-authored over 75 publications, books and chapters in books on watershed management. He has been an instructor in over 20 international training courses on watershed management and has worked in several countries including People's Republic of China, Nepal, Indonesia, Jordan, Mexico, Pakistan, the Philippines, Thailand, Lesotho, and has been involved in a research strengthening project in Morocco since 1978.

EXAMPLES OF RECENT PUBLICATIONS:

- Brooks, K.N. 1992. Surface Hydrology. Chapter 10 in The Patterned Peatlands of Minnesota. H.E. Wright, B.A. Coffin, and N.E. Aaseng (eds.). University of Minnesota Press, Minneapolis. pp. 153-162.
- Brooks, K. N., H. M. Gregersen, P. F. Ffolliott and K. G. Tejwani. 1992. Watershed management: a key to sustainability. Chapter 17 in Managing The World's Forests. N.P. Sharma (ed.). Kendall/Hunt Publ., Dubuque, Iowa. pp. 455-487.
- Brooks, K. N., P. F. Ffolliott, H. M. Gregersen, and J. L. Thames. 1991. Hydrology and the Management of Watersheds. Iowa State Press, Ames, Iowa, 392 pp.
- McAdams, T.V., K.N. Brooks and E.S. Verry. 1993. Modeling water table response to climatic change in a northern Minnesota peatland. In: Management of Irrigation and Drainage Systems. ASCE, pp.358-365.

Short VITA March 8, 1994

DWIGHT ALAN BROWN

Department of Geography,
University of Minnesota,
Minneapolis, MN 55455

PHONE: 612-625-9097 (Office), 612-645-2556 (Home) 612 624-1044 (Fax)

INTERNET: dbrown@atlas.socsci.umn.edu

Degrees: B.S., 1963 Western Illinois University, M.A., 1965 Ph.D., 1968 The University of Kansas
Academic Experience:

1966 - 71 Assistant Prof.; 1971 - 85 Associate Prof. 1985 - Professor of Geography, U. of Minn.

1978 - 81 Chairman, Department of Geography, Univ. of Minnesota

1985 Acting Dir., Water Resources Research Center, U. of MN

Selected Water Resources Related Publications: (* indicates invited or peer reviewed papers)

4. D. S. Simonett, and D. Brown, 1969, Possible Uses of Radar on Spacecraft in Contributing to Antarctic Mapping, Crevasses, Sea Ice, and Mass Budget Studies, *Proceedings, 7th Congress International Association Quaternary Research*, Vol. 16, 1969.*
6. D. Brown, 1971, Stream Channels and Flow Relations, *Water Resources Research*, 7:304-310.*
13. D. Brown, (with Skaggs, Smiley, and Stern) Monitoring Surface Water Dynamics in Minnesota, M.L.M.I.S. Report 5014, 1975, 46 pp. plus folded map.
19. D. Brown, R. Warwick, L. Cavalier, and M. Roller, 1977, The Persistence and Condition of Douglas County, Minnesota Lakes, *M.L.M.I.S. Rep. 5021*, 43p.
20. D. Brown, R. Warwick and R. Skaggs, 1977, Reconnaissance Analysis of Lake Condition in East Central Minnesota, *M.L.M.I.S. Report 5022*, 17 pp. plus folded color map.
27. C. Gersmehl, J. Drake, and D. Brown, 1986, *Minnesota Water: A Geographical Perspective*, WRRC Public Report #4.
29. E. Garvey, P. Gersmehl, and D. Brown, 1986, *Minnesota Water Rights and Regulation*, WRRC Public Report #5.*
31. D. Brown, C. Gersmehl, J. Drake, and R. Skaggs, 1987, *Crop Production Response to Moisture Supply in Minnesota*, Water Resources Research Center, Special Report 9.
32. D. Brown and P. Gersmehl, Editors. 1987. *File structure design and data specifications for water resources geographic information systems*, Water Resources Research Center, Special Report 10, 404pp (with 15 separately authored chapters, co-author of 5)
38. R. Skaggs, and D. Brown, 1987, *Relationship Between Climate and the Mean Annual Flow of the Mississippi River at Saint Paul, Minnesota*, Water Res. Research Ctr., Special Report 11.
40. D. Brown and P. Gersmehl, 1987, Maintaining Relational Accuracy of Geocoded Data in Environmental Modeling, *GIS '87 - San Francisco*, the Second Annual International Conference, Vol. 1:266-275. D.
43. R. Skaggs and D. Brown, 1989, Climate and Flow of the Mississippi River at St. Paul, p.19-26 in P. Brezonik Ed., *Proceedings of Workshop on Drought*, Nov. 1988, Water Resources Res. Center, Univ of Minn., St. Paul.*
44. P. Gersmehl, B. Baker, and D. Brown, 1989, Land management effects on innate soil erodibility: A potential complication for compliance planning, *Journal of Soil and Water Conservation*, 44:417-420.*
45. D. Brown and P. Gersmehl, 1989, Geographic Information Systems, Data, and Water Resources, *Jour. Minn. Acad. Sci.*, 55:14-17. Special Issue on Minnesota Water Resources.*
46. P. Gersmehl, and D. Brown, 1991, Regional differences in the usefulness of a soil productivity index, *Jour. Soil and Water Conservation*. 379-382.*
47. P. Gersmehl, and D. Brown, 1992, Observation, in R. Abler, M. Marcus, and J. Olson, Eds., *Geography's Inner Worlds*, pp 77-98, Rutgers Univ. Press, New Brunswick, pp 77-98.*
48. D. Brown, 1993, Early Nineteenth-Century Grasslands of the Midcontinent Plains, *Annals of the Association of American Geographers*. 83:589-612.*

H. H. Cheng

Institution: University of Minnesota
Department: Soil Science
Title: Professor and Head

Education

Berea College, Berea, KY B.A. 1956. Agricultural Science
University of Illinois, Urbana, IL M.S. 1958. Agronomy
University of Illinois, Urbana, IL Ph. D. 1961. Soil Science

Employment History

At University of Minnesota: Professor and Head, Department of Soil Science, 1989-present
At Washington State University: Professor, Department of Agronomy and Soils, 1977-89, Interim Chair 1986-87, Associate Professor 1971-77, Assistant Professor 1965-71; Chair, Program in Environmental Science and Regional Planning, 1988-89, 1977-79; Associate Dean, Graduate School, 1982-86.
At Iowa State University: Assistant Professor, Department of Agronomy, 1964-65; Research Associate 1962-64.

Professional Activities and Recognitions

Fellow, Soil Science Society of America (elected 1983); Fellow, American Society of Agronomy (elected 1983); Fellow, American Association for the Advancement of Science (elected 1990); Who's Who in America ((1992); Sigma Xi, Phi Kappa Phi, Gamma Sigma Delta; Fulbright Research Scholar, State Agricultural University, Ghent, Belgium (1963-64); Guest Scientist, Jülich Nuclear Research Center, Federal Republic of Germany, 1972-73, 1979-80; Guest Scientist, Federal Agricultural Research Center, Braunschweig, FRG (1980); Associate Editor, Journal of Environmental Quality (1983-88); Member, 1st Science Advisory Board, Washington Department of Ecology Hazardous Waste Management Division (1988-89); Member, Boards of Directors, American Society of Agronomy and Soil Science Society of America (1990-93); Member: American Chemical Society, International Society of Chemical Ecology, Society of Environmental Toxicology and Chemistry, AAAS, ASA, SSSA, ISSS.

Specialization and Research Interest

Soil biochemistry and soil analytical chemistry; transformation and transport of nitrogen, pesticides, allelochemicals, and organic matter in the soil environment; development and application of ^{14}C and ^{15}N tracer methodology for soils research; residue management and soil nitrogen availability; nitrogen use efficiency and ground water quality; climatic effects on carbon and nitrogen cycling.

Sources of Funding Support:

NSF, NASA, USDA-CSRS, EPA, World Bank, MN-LCMR, WA-Potato Commission

Recent Publications (Total publications: 90+. Major publications for the last 5 years are listed below)

- Lehmann, R. G., and H. H. Cheng. 1988. Reactivity of phenolic acids in soil and formation of oxidation products. *Soil Sci. Soc. Am. J.* 52:1304-1309.
- Roberts, S., and H. H. Cheng. 1988. Estimation of critical nutrient range of petiole nitrate for sprinkler-irrigated potatoes. *Am. Potato J.* 65:119-124.
- Cheng, H. H. 1989. Assessment of the fate and transport of allelochemicals in the soil. p. 209-216. In C. H. Chou and G. R. Waller, eds. *Phytochemical Ecology: Allelochemicals, Mycotoxins, and Insect Pheromones and allomones*. Institute of Botany, Academia Sinica Monogr. Ser. No. 9, Taipei.
- Roberts, S., H. H. Cheng, and F. O. Farrow. 1989. Nitrate concentration in potato petioles from periodic applications of ¹⁵N-labeled ammonium nitrate fertilizer. *Agron. J.* 81:271-274.
- Mulla, D. J., H. H. Cheng, G. Tuxhorn, and R. Sounhein. 1989. Management of ground water contamination in Washington's Columbia Basin. State of Washington Water Research Center Report No. 72. 29 p.
- Cheng, H. H. 1990. Organic residues in soils: Mechanisms of retention and extractability. *Intern. J. Environ. Anal. Chem.* 39:165-171.
- Cheng, H. H. 1990. Pesticides in the soil environment: An overview. p. 1-5. In: H. H. Cheng, ed. *Pesticides in the soil environment: Processes, impacts, and modeling*. SSSA Book Ser. No. 2. Soil Science Society of America, Madison, WI.
- Cheng, H. H., ed. 1990. *Pesticides in the soil environment: Processes, impacts, and modeling*. SSSA Book Ser. No. 2. Soil Science Society of America, Madison, WI. 530 p.
- Cheng, H. H., and D. J. Mulla. 1990. Sample analyses for groundwater studies. p. 90-96. In: D. W. Nelson and R. H. Dowdy, ed. *Methods for Ground Water Quality Studies*. Proceedings of a National Workshop, Arlington, Virginia, November 1988. University of Nebraska, Lincoln. Nor, Y. M., and H. H. Cheng. 1990. Characterization of H⁺ and Cu²⁺ binding to humic and fulvic acids. *Chem. Speciat. Bioavail.* 2:93-101.
- Roberts, S., H. H. Cheng, and F. O. Farrow. 1991. Potato uptake and recovery of nitrogen-15-enriched ammonium nitrate from periodic applications. *Agron. J.* 83:378-381.
- Cheng, H. H., S. E. Swanson, and T. E. McKone. 1991. Fate and transport of dioxins and furans in soil. p. 21-28. In J. W. Gillett et al. *Peer Review of "Land Application of Sludge from Pulp and Paper Mills Using Chlorine and Chlorine-Derivative Bleaching Processes: Proposed Rule" for Human Dietary and Ecotoxicological Risks*. U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C.
- Cheng, H. H. 1992. A conceptual framework for assessing allelochemicals in the soil environment. p. 21-29. In: S. J. H. Rizvi and V. Rizvi, eds. *Allelopathy: Basic and Applied Aspects*. Chapman & Hall, London.
- Roberts, S., H. H. Cheng, and I. W. Buttler. 1992. Recovery of starter nitrogen-15 fertilizer with supplementarily applied ammonium nitrate on irrigated potato. *Am. Potato J.* 69:309-314.
- Larson, W. E., and H. H. Cheng. 1992. Information systems for soil management. p. 131-141. In: V. W. Ruttan, ed. *Sustainable Agriculture and the Environment*. Westview Press, Boulder CO.

CHARLES J. CLANTON

Room 230 Agricultural Engineering Building
University of Minnesota
St. Paul, MN 55108
612/625-9218

23005 Lewiston Blvd.
Hampton, MN 55031
612/437-4992

Professional Goals

Research, teaching and/or extension in animal agriculture

Education

B.S. Agricultural Engineering, 1976, University of Nebraska
B.S. Animal Science, 1977, University of Nebraska
M.S. Agricultural Engineering, 1979, University of Nebraska
Ph.D. Agricultural Engineering, 1985, University of Minnesota

Professional Experience

Research and Teaching: 1980-present

Presently employed by the University of Minnesota, Department of Agricultural Engineering; responsibilities in research and teaching in agricultural structures, animal environment and waste management. Specific research projects conducted include assessing water quality problems associated with livestock wastes and analyzing factors involved with animal feet and leg problems.

Design and Marketing: 1977-1978

Employed as Waste Application Engineer, Lindsay Manufacturing Company, Columbus, Nebraska; to design and marketing of center pivot irrigation equipment for land application of wastewater.

Professional Activities

Registered Professional Engineer in Minnesota
American Society of Agricultural Engineers
International Symposium on Agriculture and Food Processing Wastes -- 1995 - Finance Chairman
Environmental Quality Coordinating Committee - Vice Chairman
Food Processing Waste Management and Utilization Committee
Beef Housing Committee - Chairman
Land Application of Wastes Committee
Refereed Publications Committee
Agricultural Sanitation and Waste Management Committee
National Society of Professional Engineers
American Society of Animal Science
Council on Agricultural Science and Technology
National Association of Colleges and Teachers of Agriculture
National Frame Builders Association

Papers, Publications and Related Activities

Refereed publications	18
ASAE papers	22
ASAE symposium papers	6
Other symposium and invited papers	42
Video tapes	3
Popular press	27

BRIEF VITA
Dianne Dorland

EDUCATION

Ph.D. Chemical Engineering 1985, Minor area: Environmental Engineering, West Virginia University, Morgantown, WV

M.S. Chemical Engineering 1970, South Dakota School of Mines and Technology, Rapid City, SD

B.S. Chemical Engineering 1969, South Dakota School of Mines and Technology, Rapid City, SD

PROFESSIONAL EXPERIENCE

Department Head (6/90-present), and Associate Professor, Chemical Engineering, College of Science and Engineering, University of Minnesota, Duluth (9/86-present)

Special Projects Associate to the Vice Chancellor for Academic Administration (Winter Quarter 1993), University of Minnesota, Duluth

Sea Grant Extension Specialist in Environment Engineering (1986-1989), Sea Grant Extension Program, University of Minnesota, Duluth

Assistant Professor, Chemical Engineering Department (1981-1982), West Virginia Institute of Technology, Montgomery, West Virginia

Chemical Process Engineer (1972-1975), E.I. duPont deNemours Company, Inc., Belle, West Virginia

Research and Development Engineer (1970-1971), Union Carbide Corporation, South Charleston, West Virginia

RECENT GRANTS

Dorland D., "Abatement of NO_x During Iron Oxide Pellet Firing," contract pending funding by the Department of Natural Resources, \$8,500, 12/1/93 to 11/30/94.

Dorland, D., "Pollution Prevention Opportunity Assessment and Data Base Needs Assessment," pending funding by the Minnesota Pollution Control Agency, \$45,000, 3/1/94 to 12/31/94.

Thompson, F., D. Peterson, and D. Dorland, "Lake Superior Basin Hazardous Waste Initiative," funded by the Minnesota Pollution Control Agency, Grant No. MNPCA/32400-35182, \$75,000, 5/28/93 to 12/31/93.

RECENT PRESENTATIONS

Baria, D. N., D. Dorland, and J. T. Bergeron, "Waste Minimization in an Autobody Repair Shop,"

Baria, D. N., D. Dorland, J. Mortensen, and L. Welsh, "Waste Assessment and Waste

Minimization in Small Printing Shops," Baria, D. N., D. Dorland, and K. Miller, "Hazardous Waste Assessment and Reduction Options in an Auto Service Station," Presented at the Federal Environmental Restoration III & Waste Minimization II Conference and Exhibition, April 27-29, 1994.

Dorland, D., D. N. Baria, J. Bergeron, K. C. Miller, J. Mortensen, L. M. Welsh, "Pollution Prevention Interns Linking Industry and Engineering Education," Presentation at the ASEE North Midwest Section Meeting, October 1, 1993.

Dorland, D., "Engineering Approaches to Environmental Problems: Strengths and Weaknesses" Presentation for Envirovet, July 25-August 20, 1993, Program in Aquatic Animal Health & Environmental Toxicology, August 11, 1993.

Baria, D. N., and D. Dorland, "Hazardous Waste Management for Practicing Engineers," Co-Presenter, CEE Short Course, Minneapolis, MN, April 28-30, 1993

STEVEN J. EISENREICH

Professor of Environmental Chemistry
Department of Civil Engineering
and

Director, Gray Freshwater Biological Institute
University of Minnesota, Navarre, MN 55392

(612)471-8476; FAX (612)471-9070; E-mail: sje@maroon.tc.umn.edu

EDUCATION

B.S. (Chemistry), 1969, University of Wisconsin - Eau Claire

M.S. (Analytical Chemistry), 1973, University of Wisconsin - Milwaukee

Ph.D (Water Chemistry), 1975, University of Wisconsin - Madison

POSITIONS

* Director, Gray Freshwater Biological Institute, 1992 - present

* Interim Director, Gray Freshwater Biological Institute, 1990-1992

* Professor, 1983- present; Associate Professor, 1979-83; Assistant Professor, 1975-1979; All
in Dept. of Civil Engineering, University of Minnesota - Twin Cities.

RESEARCH INTERESTS

Environmental Chemistry; Transformations, transport, dynamics, and fate of organic chemical pollutants in the atmosphere and surface and subsurface aquatic environments; chemical limnology of large lakes;

Selected Awards

1991 Chandler-Misener Award for outstanding contribution to Vol. 16 of the *Journal for Great Lakes Research* (with Paul D. Capel) for paper titled "Relationship Between Chlorinated Hydrocarbons and Organic Carbon in Sediment and Porewater." International Association for Great Lakes Research.

1994 American Chemical Society Award for Creative Advances in Environmental Science and Technology sponsored by Air Products and Chemicals, Inc. This is the highest award given by the American Chemical Society in Environmental Chemistry.

SELECTED PUBLICATIONS ~ 100

Schottler, S.; S.J. Eisenreich, 1994. Atrazine in the Great Lakes. *Nature*, **In Review**.

Schottler, S.; P.D. Capel; S.J. Eisenreich. 1994 Transport, mobility, persistence, and fluxes of atrazine, alachlor and cyanazine in a large agricultural river system. *Environ. Sci. Tech.*, **28**, xxx.

Jeremiason, J.D.; Hornbuckle, K.; S.J. Eisenreich. 1994 Polychlorinated biphenyls (PCBs) in Lake Superior, 1978-1992: Decreases in water concentrations reflect loss by volatilization. *Environ. Sci. Tech.*, **28**(5), xxx.

Lipiatou, E.; Hecky, R.E.; Eisenreich, S.J.; Lockhart, L.; Muir, D.; Wilkinson, P. 1994 Recent ecosystem changes in Lake Victoria reflected in sedimentary natural and anthropogenic organic compounds. In The Limnology, Climatology and Paleoclimatology of the East African Lakes. T.C. Johnson and E. Odada (Eds.). **In Press**.

Golden, K.A.; C.S. Wong; J.D. Jeremiason; S.J. Eisenreich; G. Sanders; D.L. Swackhamer; D.R. Engstrom; D.T. Long. 1994 Accumulation and Preliminary Inventory of PCBs and DDT in the Great Lakes. *Water Science and Technology*, **In Press**.

Turpin, B.J.; S.P. Liu; K. Podolske; M.S.P. Gomes; P.H. McMurry; S.J. Eisenreich. Design and evaluation of a novel diffusion separator for measuring gas/particle distributions of semivolatile organic compounds. *Environmental Science and Technology*, 1993, **27**(11), 2441-2449.

Muir, D.C.G.; Segstro, M.D.; Welbourn, P.M.; Toom, D.; Eisenreich, S.J.; Macdonald, C.M.; Whelpdale, D.M. Patterns of airborne organochlorine accumulation in Ontario, Canada lichens. *Environ. Sci. Tech.*, 1993, **27**, 1201-1210.

Perlanger J.A.; S.J. Eisenreich; P.D. Capel. Application of headspace analysis to the sorption of alkylbenzenes to α -Al₂O₃. *Environ. Sci. Tech.* 1993, **27**(5), 928-937.

Achman, D.A.; Hornbuckle, K.C.; Eisenreich, S.J. Volatilization of PCBs from Green Bay, Lake Michigan. *Environ. Sci. Tech.*, 1993, **27**, 75-87.

Hornbuckle, K.C.; Achman, D.A.; Eisenreich, S.J. Over-water and over-land concentrations of PCBs in Green Bay, Lake Michigan. *Environ. Sci. Tech.*, 1993, **27**, 87-98.

Baker, J.E., Eisenreich, S.J.; Eadie, B.J. Sediment trap fluxes and benthic recycling of OC, PAHs, and PCB congeners in Lake Superior. *Environ. Sci. Tech.*, 1991, **25**, 500-509.

Urban, N.R.; Eisenreich, S.J.; Grigal, D. Mobility of Pb and Pb-210 in peat sediments. *Geochim. Cosmochim. Acta*, 1990, **54**, 3329-46.

Baker, J.E.; Eisenreich, S.J. Concentrations and air-water fluxes of PCBs and PAHs in Lake Superior. *Environ. Sci. Tech.*, 1990, **24**, 342-352.

Baker, J.E.; Eisenreich, S.J. PCBs and PAHs as tracers of particle dynamics in large lakes. *J. Great Lakes Res.*, 1989, **15** (1), 84-103.

Eisenreich, S.J.; Capel, P.D.; Robbins, J.A.; Bourbonniere, R.A. Accumulation and diagenesis of chlorinated hydrocarbons in lake sediments. *Environ. Sci. Tech.*, 1989, **23**, 1116-1126.

Eisenreich, S.J. "Chemical limnology of nonpolar organic contaminants in large lakes: PCBs in Lake Superior." In *Sources and Fates of Aquatic Pollutants*. R.A. Hites and S.J. Eisenreich (Eds.), Advances in Chemistry Series, # 216, American Chemical Society: Washington, D.C., 1987, pp. 394-469.

CURRENT GRANTS AND CONTRACTS

1. Atmospheric Deposition of Toxic Contaminants to the Great Lakes: Assessment and Importance (with D. Swackhamer and D. Long), \$ 460.3K, 1990-94.
2. Herbicides in the Great Lakes, \$100K, Great Lakes National Program Office, US EPA, 1991-94.
3. Organic and Inorganic Contaminants in lakes Michigan and Ontario, \$525K, 1991-94, Great Lakes National Program Office, US EPA (with D. Swackhamer and D. Long).
4. Organic Carbon and Organic Contaminant Cycling in Lake Superior, \$80K, MN Sea Grant College, NOAA, 1992-94.
5. Sorption of Hydrophobic Organic Chemicals to Inorganic Surfaces, \$275K, Exploratory Research Program, US EPA, 10/93-10/95.
6. Urban Contamination of the Great Waters: Atmospheric Deposition of Toxic Substances. [with collaborators T. Church and J. Scudlark (U of Delaware), J. Baker and J. Ondov (U of Maryland), J. Keeler (U of Michigan), and T. Holson (Illinois (5)), US Environmental Protection Agency, \$2,526 K, Sept. 1993-96.
7. Air-Water Exchange of Organic Contaminants in Lakes: Implications to Mass Balance and Biological Cycling. MN Sea Grant/NOAA, \$80 K, 1994-96.
8. Hydrophobic Organic Chemicals in Great Lakes Waters. GLNPO/USEPA. \$160 K, 1994-95.

Efi Foufoula-Georgiou

Department of Civil and Mineral Engineering
St. Anthony Falls Hydraulic Laboratory
University of Minnesota
Minneapolis, MN 55414

(612) 627-4595
efi@mykonos.sadll.umn.edu

Education

- May 1985 *University of Florida*
Doctor of Philosophy in Environmental Engineering
- Dec. 1982 *University of Florida*
Master of Engineering
- July 1979 *National Technical University of Athens, Greece*
Diploma in Civil Engineering

Work Experience

- 1989-present *ASSOCIATE PROFESSOR. Department of Civil and Mineral Engineering.*
St. Anthony Falls Hydraulic Laboratory.
University of Minnesota, Minneapolis, MN.
- 1986-1989 *ASSISTANT PROFESSOR. Department of Civil and Construction Engineering.*
Iowa State University, Ames, IA.
- 1985-1986 *RESEARCH ASSOCIATE. Department of Civil and Mineral Engineering.*
St. Anthony Falls Hydraulic Laboratory.
University of Minnesota, Minneapolis, MN.
- 1984-1985 *GRADUATE RESEARCH ASSISTANT. Department of Civil Engineering.*
University of Washington, Seattle, WA.
- 1980-1984 *GRADUATE RESEARCH ASSISTANT. Dept. of Environmental Engineering.*
University of Florida, Gainesville, FL.
- 1979-1980 *ENGINEER. River Management and Urban Planning Division.*
Ministry of Public Works, Athens, Greece.

Honors and Awards

- 1989-1994 *Presidential Young Investigator Award, National Science Foundation*
- 1989 *Editor's Citation for Excellence in Refereeing, Water Resources Research*
- 1989 *Certificate of Commendation for Contributions in Water Resources, National Association of Water Institute Directors and National Association of State Universities*
- 1988 *Travel award from NATO (to present two lectures at the NATO Advanced Study Institute on Recent Advances in the Modelling of Hydrological Systems, Sintra, Portugal)*
- 1986 *National Science Foundation Engineering Initiation Award*
- 1985 *Travel award from American Geophysical Union (to present a paper at the Conference on Precipitation Modeling, Estimation, and Prediction, Caracas, Venezuela)*
- 1974-1976 *Outstanding Student Fellowship, National Technical University of Athens, Greece*
- 1973 *Second Honor, Hellenic Mathematical Society*

Major Professional Activities

1992-	Associate Editor, <i>Water Resources Research</i>
1992-1994	Chair, Precipitation Committee, Hydrology Section of the American Geophysical Union
1989-1992	Member, American Meteorology Society Committee on Hydrology
1989-	Panelist, National Research Council
1990	Member, Technical Organizing Committee, ASCE Water Resources Conference, Minneapolis
1990	Member, STORM Hydrology Working Group, National Center for Atmospheric Research
1990-1992	Member, Large-scale Field Experimentation Committee, American Geophysical Union
1990-	Member, NASA Earth Observing System Climate and Hydrology Panel

Journal Publications in the Last Three Years

1. Foufoula-Georgiou, E. and L. L. Wilson, "In search of similarities in extreme rainstorms," *J. Geoph. Res.*, 95(D3), 2061-2072, 1990.
2. Wilson, L. L. and E. Foufoula-Georgiou, "Regional rainfall frequency analysis via stochastic storm transposition," *J. Hydr. Engr., ASCE*, 116(7), 859-880, 1990.
3. Kumar, P. and E. Foufoula-Georgiou, "Fourier domain shape analysis methods: A brief review and an illustrative application to rainfall area evolution," *Water Resour. Res.*, 26(9), 2219-2227, 1990.
4. Foufoula-Georgiou, E., "Convex interpolation for gradient dynamic programming," *Water Resour. Res.*, 27(1), 31-36, 1991.
5. Andricevic, R. and E. Foufoula-Georgiou, "Modeling kinetic non-equilibrium using the first two moments of the residence time distribution," *J. Stoch. Hydrol. Hydraul.*, 5, 155-171, June, 1991.
6. Andricevic, R. and E. Foufoula-Georgiou, "A transfer function approach to sampling network design for groundwater contamination," *Water Resour. Res.*, 27(10), 2759-2769, 1991.
7. Kumar, P. and E. Foufoula-Georgiou, "A new look at rainfall fluctuations and scaling properties of spatial rainfall", *J. Appl. Meteor.*, 32(2), 209-222, 1993.
8. Stedinger, J., R. Vogel and E. Foufoula-Georgiou, "Frequency analysis of extreme events," Chapter 18 in *Handbook of Hydrology*, McGraw Hill, 1993.
9. Kumar P., and E. Foufoula-Georgiou, A multicomponent decomposition of spatial rainfall fields: 1. segregation of large and small scale features using wavelet transforms, *Water Resources Res.*, ~~to appear~~, 1993.
29(8), 2515-2532
10. Kumar P., and E. Foufoula-Georgiou, A multicomponent decomposition of spatial rainfall fields: 2. self-similarity in fluctuations, *Water Resources Res.*, ~~to appear~~, 1993.
29(9), 2533-2544
11. Helmlinger, K., P. Kumar and E. Foufoula-Georgiou, On the use of DEM data for Hortonian and fractal analyses of channel networks, *Water Resources Res.*, ~~to appear~~, 1993.
29(8), 2599-2613
12. Koutsoyiannis, D., and E. Foufoula-Georgiou, A scaling model of storm hyetograph, *Water Resources Res.*, ~~to appear~~, 1993.
29(7), 2345-2361
13. Franchini, M., K. R. Helmlinger, E. Foufoula-Georgiou, and E. Todini, Stochastic storm transposition coupled with rainfall/runoff modeling for estimation of exceedance probabilities of design floods, *J. of Hydrology*, ~~to appear~~, 1993.

LUTHER P GERLACH

Professor of Anthropology
and Adjunct Professor of Public Affairs
University of Minnesota
Minneapolis, Minnesota 55455

Office Phone: 625-5542 (625-3340)
Area Code: 612
Soc. Secur. No.: 177-24-4781

EDUCATION

Ph.D. Social/Cultural Anthropology, University of London, December 1960.
Certificates in African and Islamic Law, School of African and Oriental Studies,
University of London, June 1958.

ACADEMIC POSITION

September 1971-Present, Professor, Anthropology; Adjunct Prof Public Affairs

RESEARCH FUNDING (Sources other than Fellowships)

Blandin Foundation, Northwest Area Foundation, Weyerhaeuser Family Foundation, Rockefeller Foundation, National Oceanic and Atmospheric Administration/Sea Grant, U.S. Dept of the Interior, Solar Energy Research Institute, Legislative Commission on Minnesota Resources, U of Minnesota.

SELECTED PUBLICATIONS

- 1994 "Innovations in Cooperation: The North American Waterfowl Management Plan," in E. Loehman, A. Dinar, eds., *Conflict and Cooperation in Managing Water Resources*, Greenwood Publications, in press.
- 1994 "If Ecosystem Management is the Solution, What's the Problem? Challenges for Ecosystem Management," with David N. Bengston, *Journal of Forestry*, in press.
- 1993 "Negotiating Ecological Interdependence Through Societal Debate" in R.D. Lipschutz and K Conca, eds. *The State and Social Power in Global Environmental Politics*, New York, Columbia University Press, 185-220.
- 1993 "Crises are For Using: The 1988 Drought in Minnesota." A. Wolfe and E. Liebow, eds., *The Environmental Professional* Vol 15(3): 237-350, special issue *Communities at Risk*.
- 1992 "Opportunity, Liberty, Ecology: Challenges of the Post-Cold War Future," in Robert B. Textor, ed., *The Peace Dividend as a Cultural Concept: anticipating the possible benefits to American life from human efforts released by the end of the Cold War*, (a dual issue of *Human Peace*, an organ of the Peace Commission of the International Union of Anthropological and Ethnological Science).
- 1991 "Global Thinking, Local Acting: Movements to Save the Planet." *Evaluation Review*, 15 (1: February), 120-148.
- 1991 "The Problems and Prospects of Institutionalizing Ecological Interdependence in a World of Local Dependence," in *Ecological Economics: Its Implications for Forest Management and Research*. Proceedings: April 2-6, Swedish University of Agricultural Science, Faculty of Forestry. Research Notes, 206-223.
- 1990 "Cultural Construction of the Global Commons," in R.H. Winthrop ed., *Culture and the Anthropological Tradition*, New York and London University Press of America. 319-342.

- 1989 "When the Land of Lakes went Dry: Social and Cultural Responses to the Drought of 1988," with E. Whitaker. *Natural History*, January, 63-64.
- 1988 "Culture and the Common Management of Global Risks." with S. Rayner, *Practicing Anthropology*, 10 (3/4):15-19.
- 1988 "Egalitarianism, collectivism and individualism: the Digo of Kenya," in J. Flanagan and S. Rayner eds., *Rules, Decisions and Inequality*. Aldershot, Avebury/Gower, 113-144.
- 1987 "Protest Movements and the Construction of Risk," in B.B. Johnson and V.T. Covello, eds., *The Social Construction of Risk*, Holland: D. Reidel.
- 1981 "Adaptation through Evolving Interdependence." with G.B. Palmer, in P.C. Nystrom and W. Starbuck eds., *Handbook of Organizational Design*. Vol. 1. New York: Oxford, 323-381.
- 1973 *Lifeway Leap: The Dynamics of Change in America*. Mpls: University of Minnesota Press.
- 1970 *People, Power, Change: Movements of Social Transformation*. Indianapolis: BobbsMerrill.

Curriculum Vitae of Sagar M. Goyal

EDUCATION: Ph.D., Veterinary Virology
Minor = Biochemistry, July 1972
Haryana Agricultural University, Hissar, India

M.S., Veterinary Bacteriology
Minor = Veterinary Medicine, November 1968
Panjab Agricultural University, Hissar, India

B.V.Sc. & A.H. (equivalent to D.V.M.), April 1966
College of Veterinary Medicine
Panjab Agricultural University, Hissar, India

BOARD CERTIFICATION: Specialist Microbiologist (Industrial Microbiology),
American Academy of Microbiology, Washington, D.C.

LIST OF PUBLICATIONS:

1. Goyal, S.M. and Singh, I.P. 1970. Probable sources of salmonellae on a poultry farm. *Brit. Vet. J.* 126:180-184.
2. Goyal, S.M., Gerba, C.P. and Melnick, J.L. 1979. Human enteroviruses in oysters and their overlying waters. *Appl. Environ. Microbiol.* 37:572-581.
3. Goyal, S.M. and Gerba, C.P. 1982. Occurrence of endotoxins in groundwater during the land application of wastewater. *J. Environ. Sci. Hlth.* A17:187-196.
4. Goyal, S.M. and Gerba, C.P. 1983. Viradel method for detection of rotavirus from seawater. *J. Virol. Methods.* 7:279-285.
5. Goyal, S.M. 1984. Viral pollution of marine environment. *CRC Crit. Rev. Environ. Control.* 14:1-32.
6. Goyal, S.M. and Adams, W.N. 1984. Drug resistant bacteria in continental shelf sediments. *Appl. Environ. Microbiol.* 48:861-862.
7. Goyal, S.M., Adams, W.N., O'Malley, M.L. and Lear, D.W.. 1984. Human pathogenic viruses at sewage sludge disposal sites in the Middle Atlantic Region. *Appl. Environ. Microbiol.* 48:758-763.

Books:

1. Gerba, C.P. and Goyal, S.M. (Eds). 1982. Methods in Environmental Virology. Marcel Dekker, New York, NY, 378 pp.
2. Goyal, S.M., Gerba, C.P. and Bitton, G. (Eds). 1987. Phage Ecology. John Wiley Publishers, New York, NY, 321 pp.

CURRICULUM VITAE

Eville Gorham

Education

- B.Sc. with Distinction 1945, M.Sc. 1947, Dalhousie University, Halifax, Nova Scotia.
- Ph.D. 1951, University of London, England.
- Research fellowship at Swedish State Forest Research Institute and University of Uppsala.

Employment

- Lecturer, University of London, 1950-54.
- Senior Scientific Officer, Freshwater Biological Association, UK, 1954-58.
- Lecturer and Asst. Professor of Botany, University of Toronto, 1958-62.
- Professor (Head of Biology), University of Calgary, 1965-66.
- Associate Professor to Professor, Botany and Ecology, University of Minnesota, 1962-present (Head of Botany, 1967-71), appointed as one of the University's 20 Regents' Professors, 1984-present.

Awards and Honors

- Five scholarships at Dalhousie and London; Royal Society of Canada Research Fellowship, Sweden.
- Who's Who in America, Who's Who in Science and Engineering.
- Fellow, Scientists' Institute for Public Information.
- Fellow, American Association for the Advancement of Science.
- Fellow, Royal Society of Canada (Academy of Science).
- Honorary Member, Swedish Phytogeographical Society.
- Regents' Medal, University of Minnesota.
- G. Evelyn Hutchinson Medal, American Society of Limnology and Oceanography.
- Sigurd Olson Award as Environmentalist of the Year, Sierra Club (North Star Chapter).
- Doctor of Laws degree, *honoris causa*, Dalhousie University, Halifax, Canada.
- Doctor of Science degree, *honoris causa*, McGill University, Montreal, Canada.

Service to Professional Organizations

- Member for Canada, International Commission on Atmospheric Chemistry and Radioactivity, 1959-62.
- Member, Committee on Geochemistry of Water, American Geophysical Union, 1965-67.
- Editorial Boards of Ecology, 1965-67, Limnology and Oceanography, 1970-72, Conservation Biology, 1987-1988, Ecological Applications 1989-92, Environmental Reviews, 1992-present.
- Member, Health and Environmental Research Advisory Committee, U.S. Department of Energy, 1992-present.
- Six NAS/NRC committees, 1974-84.
- Five Royal Society of Canada panels, 1982-92.

- American Institute of Biological Sciences, Environmental Protection Agency, Department of Agriculture, Department of Energy, Council on Environmental Quality, National Science Foundation, National Aeronautic and Space Administration, North Atlantic Treaty Organization, Environment Canada, Canada Department of Fisheries and Oceans, and other committees and workshops on acid deposition, global change, peatlands, etc.

Research Interests

Ecology, biogeochemistry and paleoecology of peatlands; inorganic and organic chemistry of rain and snow, lake waters and sediments; paleolimnology; acid deposition; history of ecology and biogeochemistry.

Sources of Research Fund Support (past and present)

- Ontario Research Foundation
- National Research Council of Canada
- National Science Foundation (major source)
- Atomic Energy Commission, Energy Research and Development Administration, Department of Energy
- Office of Water Resources Research (Department of Interior)
- National Institutes of Health
- National Aeronautic and Space Administration
- Andrew W. Mellon Foundation

Major Addresses in Recent Years

- 1983 Oosting Memorial Lecture, Duke University -- the ecology and biogeochemistry of peatlands.
- 1990 Closing speaker to sum up the 5-year Surface Water Acidification Program of the Royal Society of London, the Royal Swedish Academy of Sciences, and the Norwegian Academy of Sciences and Letters, at its final meeting in London.
- 1991 Keynote lecture, International Symposium, Impacts of Salinization and Acidification on the Terrestrial Ecosystem and Its Rehabilitation, Tokyo -- atmospheric deposition to lakes and its ecological effects: a retrospective and prospective view of research.
- 1992 Opening plenary address, Intecol's IV International Wetlands Conference, Columbus, Ohio -- the role of northern peatlands in the global ecosystem.

CURRICULUM VITAE - D. F. GRIGAL

ADDRESS:

Department of Soil Science (Adjunct Professor, Department of Forest Resources, College of Natural Resources)
University of Minnesota
St. Paul, MN 55108
Telephone: (612) 625-4232

EDUCATIONAL HISTORY:

University of Minnesota, St. Paul, 1963, B.S. Forestry
University of Minnesota, St. Paul, 1965, M.S. Forestry-Biostatistics
University of Minnesota, St. Paul, 1968, Ph.D. Soil Science-Forestry-
(Collateral field, ecology)

AWARDS, HONORS, AND NATIONAL SERVICE:

Northwest Paper Foundation Fellowship, 1963-64.
Atomic Energy Commission Postdoctoral Fellow, 1968-70.
Membership Committee, American Society of Agronomy, 1971-91.
North American Forest Soils Conference Committee, 1979-84.
Associate Editor, *Journal of Environmental Quality*, 1977-80.
Advisory Board (Associate Editor), *Forest Science*, 1986-88.
Associate Editor, *Soil Science Society America Journal*, 1992-95.

PROFESSIONAL APPOINTMENTS:

Northwest Paper Foundation, Fellow: College of Forestry University of Minnesota	1963-1965
Research Assistant, Department of Soil Science, University of Minnesota	1965-1968
AEC Postdoctoral Fellow Oak Ridge Associated Universities Assigned to Ecological Sciences Div., Oak Ridge National Laboratory, Tennessee	1968-1970
Research Associate, Oak Ridge National Laboratory	1970
Assistant to Full Professor, Dept. of Soil Science University of Minnesota	1970-

PROFESSIONAL AFFILIATIONS:

American Association for Advancement of Science
American Society of Agronomy
Ecological Society of America
Minnesota Association of Professional Soil Scientists
Society of Wetland Scientists

ACADEMIC LEAVES/SABBATICALS:

Single quarter leave, Summer 1975, to Institute of Northern Forestry
Fairbanks, Alaska
Single quarter leave, Spring 1981, to Dept. of Plant and Soil Biology
University of California, Berkeley, California.
Sabbatic leave, Calendar 1985



John S. Gulliver

Associate Professor

B.S., 1974, Chemical Engineering, University of California, Santa Barbara

M.S., 1977, Civil Engineering, University of Minnesota

Ph.D., 1980, Civil Engineering, University of Minnesota

Research

Major research interests are environmental fluid mechanics, mass transport in environmental systems, and flow and mass transport at hydraulic structures. Current research predominantly involves air-water mass transfer, which is crucial to the development of lake and wastewater aerators; the prediction of volatile toxic compound transfer from lakes and oceans; the prediction of stream reaeration; and the mitigation of groundwater pollution.

Specific research projects include the measurement of air-water mass transfer and near-surface turbulent transport in an open channel flow, the measurement and prediction of air-water mass transfer at hydraulic structures, the measurement of air-water mass transfer on Lake Superior, and the development of a bubbleless aerator using hollow microporous membranes.

Selected Publications

Wilhelms, S. C. and J. S. Gulliver, eds., *Air Water Mass Transfer*, ASCE, 1991.

Gulliver, J. S. and R. E. A. Arndt, eds., *Hydropower Engineering Handbook*, McGraw-Hill, 1991.

Daniil, E. I. and J. S. Gulliver, "The Influence of Waves on Air-Water Gas Transfer," *J Envir Eng* 117(5):522-540, 1991.

Daniil, E. I., J. S. Gulliver, and J. R. Thene, "Water Quality Impact Assessment for Hydropower," *J Envir Eng* 117(2):179-193, 1991.

Thene, J. R. and J. S. Gulliver, "Gas Transfer Measurements Using Headspace Analysis of Propane," *J Envir Eng* 116(6):1107-1124, 1990.

Gulliver, J. S., J. R. Thene, and A. J. Rindels, "Indexing Gas Transfer Measurements in Self-Aerated Flows," *J Envir Eng* 116(3):503-525, 1990.

CURRICULUM VITAE

Dr. Satish C. Gupta, Professor, University of Minnesota, St. Paul, MN. 55108.
Professional Specialization: Soil Physics, Soil and Water Management, Computer modeling. Education: Ph. D., Utah State University, Logan, UT, U. S. A.; M. Sc. and B. Sc., Punjab Agricultural University, India. Position Held: Professor, University of Minnesota, 1988-present; Associate Professor, University of Minnesota, 1985-1988; Soil Scientist, USDA-ARS, St. Paul, MN, 1977-85; Research Fellow, University of Minnesota, St. Paul, MN, 1972-77; Research Assistant, Utah State University, Logan, UT, 1969-72. Memberships: Soil Science Society of America, American Society of Agronomy, International Society of Soil Science, Soil and Tillage Research Organization, American Society of Agricultural Engineers, American Geophysical Union and American Association for Advancement of Science.

RESEARCH INTERESTS AND EXPERIENCE: Dr. Gupta's interests are in quantifying the effects of upper boundary condition on mass and energy fluxes in soils. Some of Dr. Gupta's earlier work involved modeling simultaneous flow of water and solutes through soil; availability of biomass for energy production; modeling tillage and compaction effects on soil physical properties; tillage and crop residue effects on soil temperature and corn emergence; and raindrop impact on soil detachment. Dr. Gupta's recent projects include tillage and manure interactions on surface and subsurface water quality; soil structure simulation using a 3-D network model and percolation theory; role of earthworm in preferential transport of water and contaminants in soil; earthworm macropores and surface seal interactions on water entry; modeling water and nitrate movement through outwash soils; and tillage and surface seal effects on water infiltration. Dr. Gupta teaches Fundamental and Advanced Soil Physics courses and a colloquium on "Modeling water and contaminant transport through soil" at the University of Minnesota. Dr. Gupta has served as an Associate Editor of the Soil Science Society of America Journal (1987-90) and is currently an Editor-in-Chief for the journal Soil and Tillage Research. Dr. Gupta has authored or coauthored over 80 research publications including 13 book chapters.

SELECTED RECENT PUBLICATIONS

- Munyankusi, E., S. C. Gupta, J. F. Moncrief, and E. C. Berry. 1994. Earthworm macropores and preferential transport in a long-term manure applied Typic Hapludalf. *J. Env. Qual.* (July-August).
- Ewing, R. P. and S. C. Gupta. 1994. Investigating mechanisms of surface sealing using pore scale network modeling. *Soil Sci. Soc. Am. J.* (May-June).
- Ewing, R. P. and S. C. Gupta. 1993. Modeling percolation properties of random porous media using domain network model. *Water Resour. Res.* 29: 3169-3178.
- Ewing, R. P. and S.C. Gupta. 1993. Percolation and permeability in partially structured networks. *Wat. Resour. Res.* 29: 3179-3188.
- Sharma, P. P., S. C. Gupta, and G. R. Foster. 1993. Predicting soil detachment by raindrops. *Soil Sci. Soc. Am. J.*, 57: 674-680.
- Ela, S. D. , S. C. Gupta, and W. J. Rawls. 1992. Macropore and surface seal interactions affecting water infiltration into soil. *Soil Sci. Soc. Am. J.* 56: 714-722.
- Xu Xia, J. L. Nieber, and S. C. Gupta. 1992. Compaction effects on gas diffusion coefficient of soils. *Soil Sci. Soc. Am. J.*, 56: 1743-1750.
- Gupta, S. C., Birl Lowery, J. F. Moncrief, and W. E. Larson. 1992. Modeling tillage effects on soil physical properties. *Soil Tillage Res.* 20: 293-318.

ANNE EVELYN HERSHEY

ADDRESS: Department of Biology, UMD, 10 University Dr., Duluth, MN 55812

PHONE: 218/726-8200 FAX: 218/726-8142

PRESENT POSITION:

Associate Professor, Department of Biology, University of Minnesota, Duluth.

Director of Graduate Studies, Biology Graduate Program, University of Minnesota, Duluth.

EDUCATION:

B.S. Biochemistry, East Carolina University, Greenville N.C. 1975.

M.S. Zoology, North Carolina State University, Raleigh, N.C. 1980.

Ph.D. Zoology, North Carolina State University, Raleigh, N.C. 1983.

CURRENT GRANTS AND CONTRACTS:

1987-1994: Evaluation of the effects of methoprene and Bti (*Bacillus thuringiensis israelensis*) on non-target species and communities in metropolitan mosquito control district wetlands.

Minnesota Metropolitan Mosquito Control District. G. Niemi, A. Hershey, L. Shannon, J. Hanowski, R. Axler. Hershey \$340,000.

1992-1997: The arctic LTER project: Terrestrial and freshwater research on ecological controls. NSF.

J. E. Hobbie, G. Shaver, B. J. Peterson, W. B. Bowden, L. A. Deegan, B. Fry, A. E. Giblin, A. E. Hershey, G. W. Kipphut, G. W. Kling, M. E. McDonald, M. C. Miller, K. J. Nadelhoffer, W. J. O'Brien, E. B. Rastetter, and D. Schell. \$3,913,750.

1992-1995: The effect of anadromous salmon on North Shore stream ecosystems. NSF. A. E. Hershey. \$376,000.

SELECTED RECENT REFEREED PUBLICATIONS

Hershey, A. E., A. L. Hiltner, M. A. J. Hullar, M. C. Miller, J. R. Vestal, M. A. Lock, S. Rundle, and B. J. Peterson. 1988. Nutrient influence on a stream grazer: *Orthocladus* microcommunities track nutrient input. *Ecology* 69:1383-1392.

Hershey, A. E. and A. L. Hiltner. 1988. Effects of caddisfly activity on black fly density: Interspecific interactions outweigh food limitation. *Journal of the North American Benthological Society* 7:188-196.

Hershey, A. E. 1990. Snail populations in arctic lakes: competition mediated by predation? *Oecologia* 82:26-32.

Merrick, G. W., A. E. Hershey, and M. E. McDonald. 1991. Lake trout (*Salvelinus namaycush*) control of snail density and size distribution in an arctic lake. *Can. J. Fish. Aqu. Sci.* 48:498-502.

Hershey, A. E. 1992. Effects of experimental fertilization on the benthic macroinvertebrate community of an arctic lake. *J. North Amer. Benthol. Soc.* 11:204-217.

Hinterleitner-Anderson, D., A. E. Hershey, and J. A. Schuldt. 1992. The effects of river fertilization on mayfly (*Baetis* sp.) drift patterns and population density in an arctic river. *Hydrobiologia* 240:247-258.

Merrick, G. W., A. E. Hershey, and M. E. McDonald. 1992. Salmonid diet and the size, distribution, and density of benthic invertebrates in an arctic lake. *Hydrobiologia* 240:225-234.

Hiltner, A. L., and A. E. Hershey. 1992. The effect of phosphorus enrichment on black fly density, growth, and production in an arctic river. *Hydrobiologia* 240:259-266.

Goyke, A. P., and A. E. Hershey. 1992. Effects of fish predation on larval chironomid (Diptera: Chironomidae) communities in an arctic ecosystem. *Hydrobiologia* 240:203-211.

Peterson, B. J., B. Fry, L. Deegan, and A. Hershey. 1993. The trophic significance of epilithic algal production in a fertilized tundra river ecosystem. *Limnology and Oceanography* 38:872-878.

Hershey, A. E., J. Pastor, B. J. Peterson, and G. W. Kling. 1993. Stable isotopes resolve the drift paradox for *Baetis* mayflies in an arctic river. *Ecology* 74:2315-2325.

Hershey, A. E., W. B. Bowden, L. A. Deegan, J. E. Hobbie, B. J. Peterson, G. W. Kipphut, G. W. Kling, M. A. Lock, R. W. Merritt, M. C. Miller, J. R. Vestal, and J. A. Schuldt. The Kuparuk River: A long term study of biological and chemical processes in an arctic river. In Milner, A., and M. Oswald, eds., *Alaskan Freshwaters*. Springer-Verlag Publishers, New York. (Accepted for publication).

RANDALL E. HICKS

Department of Biology
University of Minnesota-Duluth
Duluth, Minnesota 55812

Office Phone: 726-8134
Area Code: 218
Soc. Sec. No.: 443-58-3806

EDUCATION

B.S. (Honors in Zoology) 1977, University of Oklahoma, Norman, Oklahoma.
Ph.D. (Ecology) 1983, University of Georgia, Athens, Georgia.

POSITIONS

Associate Professor (1993-Present), Assistant Professor (1986-1993), Department of Biology, University of Minnesota-Duluth; Assistant Professional Scientist (1985-1986), Illinois Natural History Survey; Postdoctoral Scholar (1983-1985), Woods Hole Oceanographic Institution; Graduate Research Assistant (1980-1983), Marine Science Institute, University of Georgia; Graduate Teaching Assistant (1977-1980), University of Georgia.

RESEARCH INTERESTS

Aquatic microbial ecology, organic geochemistry, extracellular polymers, biogeochemistry, detrital dynamics

CURRENT GRANTS AND CONTRACTS

Predicting the Survival and Effects of Introduced Microorganisms: An Evaluation of Three Aquatic Microcosm Protocols. U.S. EPA Competitive Research Grant. 1992-95 \$433,672 (with Lyle J. Shannon)
Community Development and PCB-Induced Alterations in the Bacterial Assemblages of Benthic Nepheloid Layers. Minnesota Sea Grant College Program. 1994-96 \$87,814

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Society for Microbiology, American Society of Limnology and Oceanography, Ecological Society of America, International Association of Great Lakes Research, Societas Internationalis Limnologie, A.A.A.S., Sigma Xi

SELECTED PUBLICATIONS

- Newell, S. Y., and R. E. Hicks. 1982. Direct-count estimates of fungal and bacterial biovolume in dead leaves of smooth cordgrass (*Spartina alterniflora*). *Estuaries* 5:246-260.
- Hicks, R. E., and S. Y. Newell. 1983. An improved gas chromatographic method for measuring glucosamine and muramic acid concentrations. *Anal. Biochem.* 128:438-445.
- Hicks, R. E., and S. Y. Newell. 1984. Comparison of glucosamine and biovolume conversion factors for estimating fungal biomass. *Oikos* 42:355-360.
- Hicks, R. E., and S. Y. Newell. 1984. The growth of bacteria and the fungus *Phaeosphaeria typharum* (Desm.) Holm (Eumycota: Ascomycotina) in salt-marsh microcosms in the presence and absence of mercury. *J. Exp. Mar. Biol. Ecol.* 78:143-155.
- Hicks, R. E., C. Lee, and A. C. Marinucci. 1991. Loss and recycling of amino acids and protein from smooth cordgrass (*Spartina alterniflora*) litter. *Estuaries* 14:430-439.
- Hicks, R. E., and C. J. Owen. 1991. Bacterial density and activity in benthic nepheloid layers of Lake Michigan and Lake Superior. *Can. J. Fish. Aquat. Sci.* 48:923-932.
- Hicks, R. E., R. I. Amann, and D. A. Stahl. 1992. Dual staining of natural bacterioplankton with DAPI and fluorescent oligonucleotide probes targeting kingdom-level 16S rRNA sequences. *Appl. Environ. Microbiol.* 58:2158-2163.
- Aas, P., and R. E. Hicks. 1993. Biodegradation of organic particles by surface and benthic nepheloid layer microbes from Lake Superior. *J. Great Lakes Res.* 19:310-321.
- Hicks, R. E., C. J. Owen, and P. Aas. 1994. Deposition, resuspension, and decomposition of particulate organic matter in the sediments of Lake Itasca, Minnesota, U.S.A. *Hydrobiologia*: in press.
- Hicks, R. E., P. Aas, and C. Jankovich. Bacterioplankton production in the western arm of Lake Superior. *J. Great Lakes Res.*: in revision.

CAROL A. JOHNSTON**OFFICE**

Natural Resources Research Institute
University of Minnesota
5013 Miller Trunk Highway
Duluth, MN 55811

Phone: 218/ 720-4269
FAX: 218/ 720-4219
Internet:
cjohnsto@sparkie.nrrl.umn.edu

INTERESTS

Landscape ecology, wetlands, soil/water interactions, nonpoint-source pollution, geographic information systems

EDUCATION

1982 Ph.D., Soil Science, University of Wisconsin.
1977 M.S., Soil Science & Land Resources, University of Wisconsin.
1974 B.S., with Honors and Distinction, Natural Resources, Cornell University.

PROFESSIONAL EXPERIENCE

1993-pres. Senior Research Associate, Natural Resources Research Institute, Duluth, Minnesota.
1986-1993 Research Associate, Natural Resources Research Institute, Duluth, MN.
1984-1985 Environmental Consultant, Oak Ridge National Lab, Oak Ridge, TN.
1978-1983 Natural Resource Supervisor and Planning Analyst, Wisconsin Department of Natural Resources, Madison.

SELECTED PROFESSIONAL ACTIVITIES

1993-pres. National Acad. of Sciences, Committee on Wetlands Characterization
1992-pres. Minnesota Governor's Council on Geographic Information
1992-1993 National President of the Society of Wetland Scientists

SELECTED GRANTS AND CONTRACTS

National Science Foundation. 1992-1995. "Beaver, succession, and nutrient cycling in boreal landscapes." \$660,000. Principal Investigator
U.S. Department of Agriculture. 1992-1994. "Spatial dynamics of nutrient and sediment removal processes in riverine wetlands." \$200,000. Co-P.I.
National Science Foundation. 1988-1991. "A cooperative facility for research on the ecology of spatial heterogeneity." \$354,342. Principal Investigator.

SELECTED PUBLICATIONS

Johnston, C.A. 1993. Material fluxes across wetland ecotones in northern landscapes. *Ecological Applications* 3:424-440.
Johnston, C.A. 1991. Sediment and nutrient retention by freshwater wetlands: effects on surface water quality. *Critical Reviews in Environmental Control* 21:491-565.
Johnston, C.A. 1991. GIS Technology in Ecological Research. pp. 329-346. *In Encyclopedia of Earth System Science, Vol. 2.* Academic Press, San Diego, CA.
Johnston, C.A., N.E. Detenbeck, and G.J. Niemi. 1990. The cumulative effect of wetlands on stream water quality and quantity: a landscape approach. *Biogeochemistry* 10:105-141.
Johnston, C.A., and R.J. Naiman. 1990. Aquatic patch creation in relation to beaver population trends. *Ecology* 71:1617-1621.

Michael E. McDonald

Department of Chemical Engineering, UMD, &
University of Minnesota Sea Grant Program
Duluth, MN 55812

SS#: 494-54-5020
Phone: 218/726-6306
FAX: 218/726-6360

EDUCATION

B.S. Environmental Engineering, University of Michigan, 1973
B.S. Oceanography, University of Michigan, 1973
M.S. Zoology, North Carolina State University, 1978
Ph.D. Civil Engineering and Zoology, North Carolina State University, 1984

CURRENT POSITION

Director, University of Minnesota Sea Grant Program (1994-present)
Associate Professor, Department of Chemical Engineering, UMD (1990 - present)
Adjunct Research Associate, Center for Water & Environment, NRRI, UMD (1988 - present)

RESEARCH INTERESTS

Simulation modeling, hazardous waste management, contaminant fate, water and wastewater treatment, environmental engineering, aquacultural engineering, aquatic ecology

SELECTED RECENT PUBLICATIONS (total=36)

- McDonald, M.E. and A.E. Hershey. 1992. Shifts in abundance and growth of slimy scuplin in response to changes in the predator population in an arctic Alaskan lake. *Hydrobiologia* 240:219-223.
- McDonald, M.E., A.E. Hershey, and W.J. O'Brien. 1992. Cost of predation avoidance in young-of-year lake trout (*Salvelinus namaycush*): Growth differential in sub-optimal habitats. *Hydrobiologia* 240:213-218.
- McDonald, M.E. 1993. Ecological engineering for wastewater treatment (book review). *Environ. Engin.* 2:171-172.
- McDonald, M.E. 1993. *Deformable Body Mechanics: A Study Guide*. University of Minnesota, Minneapolis, MN. 92 pp.
- McDonald, M.E., C.A. Tikkanen, R.P. Axler, C.P. Larsen, and G. Host. in press. Fish simulation culture model (FIS-C): A bioenergetics based model for aquacultural wasteload application. *Aquac. Engin.*
- Lichty, R., F.C. Lamphear, and M.E. McDonald. (accepted). Modeling sustainable development: The GLEAM simulation system. *Mid-Amer. J. Business.*

SELECTED CURRENT FUNDING

- 1992-1997. The Arctic LTER Project: Terrestrial and Freshwater Research on Ecological Controls. NSF. J.E. Hobbie, et al. \$3,913,750.
- 1993-1995. Constructed Wetlands in Northern Minnesota. MTI and IRRRB. R.P. Axler, M.E. McDonald, and S. Bridgham. \$249,919.
- 1993-1995. Extraction and Characterization of Fish Attractants from Crayfish. MTI. C. Richards, M.E. McDonald, and J. Gunderson. \$114,347.
- 1994-1997. Structure and function of arctic freshwater ecosystems. NSF. J.E. Hobbie et al. \$2,648,000.

VITAE
DONALD C. MCNAUGHT

Professor: Department of Ecology,
Evolution and Behavior
Office Phone: 625-1706
Area Code: 612
Soc. Secur. No. 384-32-9806

EDUCATION

B.S. (Fisheries) 1956, University of Michigan, Ann Arbor
M.S. (Fisheries) 1957, University of Michigan, Ann Arbor
Ph.D. (Limnology) 1965, University of Wisconsin, Madison.

POSITIONS

- Professor and Director (1980-present), University of Minnesota
- Director, (1980-1992) Minnesota Sea Grant College Program
- CILER Fellow, (1991-1992) University of Michigan
- Associate Professor (1968-1980), State University of New York at Albany
- Assistant Professor (1965-1968), Michigan State University

PROFESSIONAL ORGANIZATIONS

American Society of Limnology and Oceanography, International Association for Great Lakes Research, International Association of Theoretical and Applied Limnology, Ecological Society of America, American Fisheries Society, American Association for the Advancement of Science, American Institute of Biological Sciences.

SELECTED PUBLICATIONS: 1988-94

- Drake, D. and D.C. McNaught. 1994. Behavioral assays employing *Daphnia* for detection of sublethal effects: responses to ALD. Verh. Int. Limnol. (in press).
- McNaught, D.C. 1992. Zooplankters as indicators of ecosystem health: past findings and future directions. J. Aquatic Ecosystem Health 1:271 - 281.
- Chen, Tian-yi and D.C. McNaught. 1992. Toxicity of methylmercury to *Daphnia pulex*. Bull. Envir. Contam. Toxicol. 49:606-612.
- McNaught, D.C. 1989. Fisheries and environmental research by the Minnesota Sea Grant College Program. J. Minn. Acad. Sci. 55(1):110-112.

McNaught, D.C. 1989. Functional bioassays utilizing zooplankton: a comparison. *Hydrobiologia*, 188-189: 117-121. (Same article in: *Environmental Bioassay Techniques and their application*. Ed. by M. Munawar, G. Dixon, C.I. Mayfield, T. Reynoldson and M.H. Sador. Kluwer Academic Publishers, Dordrecht. pp. 117-121.

Evans, M.S. and D.C. McNaught. 1988. The effects of toxic substances on the structural and functional characteristics of zooplankton populations: a Great Lakes perspective. *In Toxic contaminants and ecosystem health: a Great Lakes focus*. Wiley, New York. pp. 53-76.

Hallett, D.J. and D.C. McNaught. 1988. Chronic effects of toxic contaminants in large lakes. Ch. I in *Toxic Contamination in Large Lakes, Vol. I. Chronic Effects of Toxic Contaminants in Large Lakes*. Ed., by N.W. Schmidtke. Lewis Press, Chelsea, MI. pp. 1-4.

McNaught, D.C., S.D. Bridgham and C. Meadows. 1988. Effects of complex effluents from the River Raisin on zooplankton grazing in Lake Erie. *In Functions Testing of Aquatic Biota for Hazard Estimation*. ASTM STP 988. Edited by J. Cairns. Amer. Soc. Testing Mat., Philadelphia. Pp. 128-136.

Bridgham, S.D., D.C. McNaught and C. Meadows. 1988. The effects on photosynthesis in two Great Lakes of complex effluents from the River Raisin. *In Functional Testing of Aquatic Biota for Hazard Estimation*. ASTM STP 988. Edited by J. Cairns. Amer. Soc. Testing Mat., Philadelphia. Pp. 34-85.

Curriculum Vitae
Howard D. Mooers, Associate Professor
Department of Geology, University of Minnesota - Duluth

Education

Ph.D., Geology, University of Minnesota, Minneapolis, 1988.

Professional Summary

Heller Professor of Geology and Associate Professor, Department of Geology, University of Minnesota - Duluth, September 1991 - present.

Research Fellow, Institute for Minnesota Archaeology, 1990 - present.

Assistant Professor, Department of Geology, University of Iowa, 1991

Research Interests

Major research interests focus on landscape genesis and the resultant hydrogeological character of glaciated terrain, including the dynamics of groundwater flow and the characteristic scales of variability in glacial sedimentary sequences; processes of aquifer recharge during glacial stades; glacial dynamics and Quaternary history of the southern margin of the Laurentide Ice Sheet; subglacial groundwater flow and its role in controlling glacial dynamics; computer reconstruction of Pleistocene ice sheets and modeling of subglacial groundwater systems; geoarchaeology and early human settlement in the Midwestern United States; and periglacial environments and processes.

Courses Taught

Hydrogeology, applied hydrogeology, clastic sediment analysis, introduction to environmental science. environmental geology, glacial geology, numerical modeling of stream-network hydrology, honors Earth science, and physical geology.

Selected Graduate Student Theses

Quantitative paleohydrology of the Portage and Brule outlets of Glacial Lake Duluth, S. Carney, M.S., co-advising with C.L. Matsch.

Regional groundwater flow and recharge on the Sheyenne delta, eastern North Dakota, K. Knoke, M.S.

Groundwater recharge, residence time, and the regional influence of the Itasca moraine, northcentral Minnesota, S. Kanuit, M.S.

A landform-based approach to the quantification of recharge in a complex glacial sedimentary setting: the Itasca moraine, northwestern Minnesota, L. St. George, M.S.

Intrinsic susceptibility of natural sediments and the development of a groundwater sensitivity strategy for the Nemadji River watershed, Carlton Co., Minnesota, E. Bacig, M.S., January 1994.

Groundwater mapping and the determination of the optimum level of information for the assessment of groundwater sensitivity to contamination in complex glacial drift aquifers, J.J. Quinn, M.S., co-advising with H.O. Pfannkuch, March 1992.

Recent Research Proposals and Contracts

Hydrogeology of the Itasca moraine, northcentral Minnesota: spatial distribution of recharge, groundwater residence time, flow system dynamics, and regional influence. Water Resources Research Center, \$41,244.98, July 1993 through June 1995.

Topographic control of regional groundwater hydrology and implications on surface water quality and supply, Itasca moraine, northwestern Minnesota. Mississippi Headwaters Board through the Legislative Commission on Minnesota Resources, \$35,273, July 1993 through June 1995.

A landform-based approach to the determination of groundwater vulnerability to contamination, Nemadji River watershed, Carlton Co., Minnesota. Carlton County Soil and Water Conservation District, \$9600.00; Center for Community and Regional Research, \$5000.00, May 1992 to December 1993.

Paleoenvironmental setting and human interaction during Archaic through Late Woodland time in eastern Michigan. Institute for Minnesota Archaeology, \$36,000, Sept. 1991 through May 1993.

Selected Peer Reviewed Publications

Mooers, H.D. and Alexander, E.C., in press, Contribution of spray irrigation of wastewater to groundwater contamination in the karst of southeastern Minnesota, U.S.A.: *Applied Hydrogeology*.

Mooers, H.D. and Dobbs, C.A., 1993, Holocene landscape evolution and the development of models for human interaction with the environment: An example from the Mississippi Headwaters region: *Geoarchaeology*, v. 8, no. 6, p. 475-492.

Mooers, H. D., 1990, A glacial-process model: the role of spatial and temporal variations in glacial thermal regime: *Geological Society of America Bulletin*, v. 102, no. 2, p. 243-251.

Mooers, H. D., 1990. Discriminating texturally-similar glacial tills in central Minnesota with graphical and multivariate techniques: *Quaternary Research* v. 34, no. 2, 133-147.

Mooers, H. D., 1990, Ice marginal thrusting of drift and bedrock: Thermal regime, subglacial aquifers, and glacial surges: *Canadian Journal of Earth Sciences*, v. 27, p. 849-862.

EDWARD A. NATER

EDUCATION

- Ph.D., Soil Science, University of California, Davis, July, 1987.
M.S., Natural Resources, University of Wisconsin - Stevens Point, December, 1982.
B.S., Botany, Western Illinois University, Macomb, December, 1973.

EMPLOYMENT HISTORY

- 1993-present Associate Professor, Soil Science Department, University of Minnesota.
1987 - 1993 Assistant Professor, Soil Science Department, University of Minnesota.
1986 - 1987 Post Doctoral Fellow, Department of Soil Science, University of Saskatchewan.

SELECTED PUBLICATIONS

Refereed Journal

- Nater, E.A., and D.F. Grigal. 1992. Regional trends in mercury distribution across the Great Lakes States, north central U.S.A. *Nature* 358:139-141.
Mason, J.A., E.A. Nater, and H.C. Hobbs. 1994. Transport direction of Wisconsinan loess in southeastern Minnesota. *Quaternary Research* 41(1): 44-51.
Laird, D.A., and E.A. Nater. 1993. Nature of the illitic phase associated with randomly interstratified smectite/illite in soils. *Clays and Clay Minerals* 41(3):280-287.
Zhang, H., P.R. Bloom, and E.A. Nater. 1993. Change in surface area and dissolution rates during hornblende dissolution at pH 4.0. *Geochimica et Cosmochimica Acta* 57:1681-1691.
Laird, D.A., P. Barak, E.A. Nater, and R.H. Dowdy. 1991. Chemistry of smectitic and illitic phases in interstratified soil smectite. *Soil Science Society of America Journal* 55:1499-1504.
Inskeep, W.P., E.A. Nater, P.R. Bloom, D. Vandervoort, and M.S. Erich. 1991. Characterization of laboratory weathered labradorite surfaces using x-ray photoelectron spectroscopy and transmission electron microscopy. *Geochimica et Cosmochimica Acta* 55:787-800.
Nater, E.A., and R. Bouabid. 1990. Micromorphology of the initial weathering products of feldspars. In: L. Douglas (ed.), *Soil Micromorphology: A Basic and Applied Science*. Vol. 19, Developments in Soil Science. Elsevier, New York. p. 525-530.

In Press

- D.F. Grigal, E.A. Nater, and P.A. Homann. 199_. Spatial distribution patterns of mercury in an east-central Minnesota landscape. Proceedings, International Conference on Mercury as a Global Pollutant, Monterey, California, May 31-June 4, 1992.
Nater, E.A. 199_. Aluminium. *The Encyclopedia of Analytical Science*, Academic Press. Invited chapter. In press.

PROFESSIONAL AND HONORARY SOCIETIES

- Soil Science Society of America
The Geochemical Society
The Clay Minerals Society
Minnesota Electron Microscopy Society
Sigma Xi

4. Vita

Raymond M. Newman
Fisheries and Wildlife
University of Minnesota
St. Paul, MN 55108

Office phone: (612) 625-5704
Internet: rmn@finsandfur.fw.umn.edu
Soc. Secur. No.: 176-48-3836

EDUCATION:

Ph.D (Fisheries) 1985, University of Minnesota, St. Paul, MN
M.S. (Fisheries) 1982, University of Minnesota, St. Paul, MN
B.S. (Biology) 1978, Slippery Rock University, Slippery Rock, PA

POSITIONS

Assistant Professor, Fisheries (1988-present), University of Minnesota;
Investigator (Summer 1987, 1988), University of Michigan Biological Station;
Postdoctoral Fellow, Renewable Natural Resources (1986-1988), University of
Connecticut; Research Specialist, Forest Resources (1985-1986), University of
Minnesota; Research Assistant (1979-1984), Teaching Assistant (1985; 1979-1980),
Instructor (1984), Fisheries & Wildlife, University of Minnesota

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society; American Institute of Biological Sciences; American
Institute of Fishery Research Biologists (Member); Aquatic Plant Management
Society; Ecological Society of America; North American Benthological Society;
Sigma Xi

SELECTED GRANTS AND CONTRACTS

Effects of beaver on trout and trout streams in Minnesota, funded by Minnesota
DNR, 1989-1993

Trophic relations of the exotic ruffe (*Gymnocephalus cernuus*) in the St. Louis
River Estuary, funded by Minnesota Sea Grant 1990-1991, PI (M.G. Henry, Co-PI)

COMPMECH Stream systems project, funded by Electric Power Research Institute/SFI
1991-1995, Co-PI; I.R. Adelman, PI

The potential for biological control of Eurasian watermilfoil with native and
naturalized invertebrates, funded by Legislative Commission on MN Resources,
1992-1994 PI; J. Perry, Co-PI

The secondary metabolites of Eurasian watermilfoil and their relation to
potential control agents, funded by Minnesota Sea Grant 1992-1994, Co-PI (F.
Gleason, PI)

PRIMARY COURSES:

Fishery and Wildlife Management, FW 5604 (4 cr)
Stream and River Ecology, FW 8459 (4 cr)
Exotic Plants and Animals: impacts and control, NRES 3001

SELECTED PUBLICATIONS

Newman, R.M. 1993. A conceptual model for examining density dependence in the
growth of stream trout. *Ecology of Freshwater Fish* 2: 121-131.

Newman, R.M., Z. Hanscom and W.C. Kerfoot. 1992. The watercress
glucosinolate-myrosinase system: a feeding deterrent to caddisflies, snails and
amphipods. *Oecologia* 92:1-7.

Newman, R.M. 1991. Herbivory and detritivory on freshwater macrophytes by
invertebrates: a review. *J. No. Am. Benthol. Soc.* 10: 89-114.

Newman, R. M. 1990. Effects of shredding amphipod density on watercress
Nasturtium officinale breakdown. *Holarctic Ecology* 13: 293-299.

Newman, R.M., W.C. Kerfoot, and Z. Hanscom. 1990. Watercress and amphipods:
potential chemical defense in a spring-stream macrophyte. *J. Chem. Ecol.* 16:
245-259

Newman, R.M. and J.A. Perry. 1989. The combined effects of chlorine and ammonia
on litter breakdown in outdoor experimental streams. *Hydrobiologia* 184: 69-78.

Newman, R.M. and T.F. Waters. 1989. Differences in brown trout (*Salmo trutta*)
production among contiguous sections of an entire stream. *Can. J. Fish. Aquat.
Sci.* 46: 203-213.

Newman, R.M. 1987. Comparison of encounter model predictions with observed
size-selectivity by stream trout. *J. N. Am. Benthol. Soc.* 6: 56-64.

Dr. James Perry
Professor and Program Leader
University of Minnesota, Forest Water Quality Program

Jim Perry is Professor, Departments of Forest Resources and Botany and Deputy Director of the US/AID Environmental Training Project for Central and Eastern Europe. He has served for several years as Director of the University's Center for Natural Resource Policy and Management. He served for four years as Director of Graduate Studies for Water Resources at the University. He also has held appointments as Visiting Scholar at Oxford Forestry Institute and Green College, Oxford University, England; Senior Fellow, U.S. National Academy of Sciences, Lodz, Poland and Senior Fellow, American Institute of Indian Studies, Delhi and Madras. Dr. Perry holds a Ph.D. in biology from Idaho State University and has more than 20 years experience in water quality and environmental management. He teaches classes in *Water quality in natural resource management*, *Water quality: the international dimension* and *Meteorology and climatology for resource managers*. In addition to service at the University of Minnesota (since 1982), Dr. Perry has served as Senior Water Quality Specialist (State of Idaho), Area Manager of an environmental engineering firm, Assistant Manager of a computer center and Ichthyologist for a Peace Corps-United Nations/FAO project in Central America. He routinely serves as consultant and/or advisor with groups such as the US Agency for International Development, the U.S. Environmental Protection Agency and university consortia and private international consulting firms. Examples of recent consulting activities include "Team Leader" for Water Resources and Fisheries on the 2-year Minnesota Forest Harvest Generic Environmental Impact Statement and "Natural Resources Expert" for the team which developed the US AID Agricultural and Natural Resources Strategy for Jamaica.

Dr. Perry has authored more than 85 technical and lay publications on water quality, aquatic ecology and environmental monitoring. He lectures at numerous locations around the world; his lecture topics include water quality assessment and management, aquatic biology, monitoring system design, the effects of various stressors on ecosystems and environmental management in Central and Eastern Europe. He has collaborated with colleagues and presented lectures in over 40 countries in Asia, East and West Africa, Latin America, the Caribbean and Western, Central and Eastern Europe.

Research in Dr. Perry's Forest Water Quality Program has two components: 1. *The science-policy linkage in natural resource management* (e.g., the role of water quality information in allocation of program resources) and 2. *Applied aquatic ecology* (i.e., the quantitative aquatic science which influences those decisions). In the former component, the Program addresses water quality policy, monitoring design and decision making in environmental management. In this work, the focus is on optimal use of scientific information in order to establish the most defensible policies. This includes the role of water quality issues in integrated watershed management, establishment of water quality policy and legislation and the role of ecological issues in such policies. It also addresses the current and future role of forest water quality in educational institutions and management organizations worldwide.

In the *applied ecology* component the Program addresses the ways in which aquatic ecosystems respond to various stressors. For example, both "direct" and "indirect" effects are being addressed in a series of major studies of land use impacts on springs and streams in karst and sandstone watersheds in Southeastern Minnesota. Other ongoing or recently concluded studies include a variety of large and medium-scale whole ecosystem experimental manipulations. Stressors have included stressors such as acid, chlorine, ammonia, lime, and physical disturbance. Scientists in the program examine all levels of the aquatic system from riparian dynamics to physico-chemical properties; from microbes and fish to functional properties. Many recent studies have involved decomposition and other measures of ecosystem integrity in order to improve our understanding of ecosystem-level effects of stresses.

LLOYD PAUL QUEEN
8465 135th Street West
Apple Valley, Minnesota, USA 55124
612-432-0596(H) 612-624-9271(W)

SKILLS

- Research focus on applications of GIS and remote sensing to resource assessment and inventory.
- Primary technologies are GIS, digital remote sensing, and image processing.
- Systematic research in data calibration, terrain and watershed modeling, hydrologic applications of GIS, and integrated resource management.
- Administrative experience in supervising staff, budget management, program planning and maintenance and extensive interaction with program clientele.

EDUCATION

- Ph.D., M.A., Geography, Water Resources Program, Universities of Nebraska-Lincoln and Omaha.
- B.S., Geography, Geology minor, Mankato State University, Minnesota.
- Maintained 4.0/4.0 GPA in all 3 degree programs: Presidential Fellow at University of Nebraska.

EXPERIENCE

- Post-doctoral Research Associate. Remote Sensing Laboratory, Department of Forest Resources, University of Minnesota. 9/88 to present.
- Staff Researcher. Center for Advanced Land Management and Information Technologies, University of Nebraska-Lincoln. 6/83-8/88.
- Instructor, Teaching and Lab Assistant. Geography Departments, Universities of Nebraska-Lincoln and Omaha. 8/81-12/83 and 1/86-5/86.

PUBLICATIONS AND PRESENTATIONS

- Published twelve research articles in peer-reviewed scientific journals.
- Completed thirty technical publications; including proceedings and departmental reports.
- Presented papers at twenty national, international, and regional professional meetings, including three invited papers. GIS '90 paper selected as an outstanding contribution.

RESEARCH GRANTS AND CONTRACTS

- Obtained outside funding totaling \$1,200,000 for research proposals from local, regional, state, and federal sources.

TEACHING, ADVISING, AND COMMITTEE WORK

- Developed four University courses in remote sensing and geographic information systems.
- Extensive experience in continuing and extension education; shortcourses and workshops.
- Associate member of graduate faculty; advisor for 15 graduate students.
- Service on Departmental and College Committees; including Teaching, Development, Computer, and Administrative Review Committees.

PROFESSIONAL ACTIVITIES

- Past Chapter President of American Society of Photogrammetry and Remote Sensing.
- Member Minnesota Governor's Council on Geographic Information, and Database Subcommittee.
- Member MN GIS/LIS Consortium Steering and Executive Committees, State Mapping Advisory, Minnesota Land-use Update, and Great Lakes GIS Coordinating Committees.
- Served on conference committees for three state and regional GIS meetings.
- Active private consultant in GIS and resource assessment and monitoring.

Carl Richards

Center for Water and the Environment
 Natural Resources Research Institute
 University of Minnesota
 5013 Miller Trunk Highway
 Duluth, MN 55811

Phone: (218) 720-4332
 FAX: (218) 720-4219
 e-mail: crichard@ua.d.umn.edu

Education:

Ph.D. Aquatic Ecology, Idaho State University - 1986
 M.S. Biology, California State University-Los Angeles - 1978
 B.S. Biology, University of Southern Mississippi - 1975

Professional:

1989 - Present Aquatic Ecologist/Research Associate, Natural Resources Research Institute, University of Minnesota-Duluth.
Graduate Faculty Member, Department of Fisheries and Wildlife, University of Minnesota, St. Paul.
Graduate Faculty Member, Department of Biology, University of Minnesota-Duluth.
 1989 Visiting Assistant Professor, Idaho State University.
 1986 - 1989 Program Director/Fisheries Biologist, Shosone-Bannock Tribes, Fort Hall, ID.

Research Interests:

stream ecology, landscape ecology, community ecology, nonpoint source pollutants, risk analysis

Selected Grants:

\$499,000 - Principal Investigator, Development of Ecological Criteria in Midwestern Watersheds, 1993-1996, US Environmental Protection Agency
 \$1,816,034 - Co-principal Investigator, Influence of Inorganic Sediments on Stream Ecosystems, 1992-1994, US Environmental Protection Agency
 \$19,648 - Co-principal Investigator, Analysing the Role of Forested Wetlands in Mitigating Effects of Forest Harvest on Water Quality, 1992-1993, US Forest Service
 \$248,000 - Principal Investigator, Development of Biocriteria for Regional Watersheds through Integrated Watershed and Reach-Scale Analyses, 1991-1994, US Environmental Protection Agency
 \$32,748 - Principal Investigator, The Influence of Physical and Chemical Habitat on Algal Communities in the Minnesota River Watershed, 1991-1993, Legislative Commission on Minnesota Resources

Recent Publications:

Richards, C., G. E. Host, and J.W. Arthur. 1993. Identification of predominant environmental factors structuring stream macroinvertebrate communities within a large agricultural catchment. *Freshwater Biology* 29: 285-294.
 Richards, Carl and G. W. Minshall. 1992. Spatial and temporal trends in stream macroinvertebrate species assemblages: the influence of watershed disturbance. *Hydrobiologia* 241: 173-184.
 Richards, C., P. J. Cernera, M. P. Ramey, and D. W. Reiser. 1992. Development of off-channel habitats for use by juvenile chinook salmon. *North American Journal of Fisheries Management* 12:721-727.
 Johnson, L., and Carl Richards. 1992. Investigating landscape influences on stream macroinvertebrate communities. *Water Resources Update* 87:41-48.

JOSEPH P. SCHUBAUER-BERIGAN

EDUCATION

Ph.D. University of Georgia, Athens (Microbiology/Biogeochemistry/Modelling) 1988.
M.A. (Ecology/Physiology) 1981 , B.A. (Biology/Chemistry) 1976, SUNY, College at Buffalo.

RESEARCH INTERESTS

Aquatic Microbiology/Geochemistry, Environmental Microbiology, Pollutant Biodegradation, Groundwater Microbiology, Coastal Oceanography/Limnology, Modeling.

RECENT PROFESSIONAL EXPERIENCE

1992-present Member Graduate Faculty, Department of Biology, University of Minnesota-Duluth.
1991-present Research Associate, Center for Water and the Environment, Duluth, MN.
1990-91 Postdoctoral Associate, Chesapeake Biological Lab., Solomons, MD.
1988-90 Postdoctoral Associate, Marine Sciences Research Ctr, SUNY Stony Brook, NY.

RECENT GRANTS AND CONTRACTS

1994-97 USAF, Predicting Toxicity and Degradability of Quadricyclane and Fluorocarbon Ethers and Their Analogs. 661K. Recommended for funding. Subhash C. Basak, Keith B. Lodge, and Joseph P. Schubauer-Berigan.
1992-94 USDA, Spatial dynamics of nutrient and sediment removal processes in riverine wetlands. \$200K. Funded. Joseph P. Schubauer-Berigan, Carol A. Johnston and Scott D. Bridgham.
1992-95 US EPA, Microbial regulation of sediment toxicity: Interactions between sediment contaminants and bacterial processes. \$207K. Funded (1/92- 2/95). Joseph P. Schubauer-Berigan.

SELECTED PUBLICATION LIST

Hopkinson, C.S. and J.P. Schubauer. 1984. Static and dynamic aspects of nitrogen cycling in the salt marsh graminoid, Spartina alterniflora. Ecology 65:961-969.
Schubauer, J.P. and C.S. Hopkinson. 1984. Above- and below-ground emergent macrophyte production and turnover in a coastal marsh ecosystem, Georgia. Limnology and Oceanography 29(5):1052-1065.
Carpenter, E.J., J. Chang, M. Cottrell, J.P. Schubauer, H.W. Pearl, B.M. Bebout, and D.G. Capone. 1990. Reevaluation of nitrogenase oxygen protection mechanisms in the planktonic marine cyanobacterium Trichodesmium. Mar. Ecol. Prog. Ser. 65:151-158.
Hopkinson, C.S., R.D. Fallon, B.O. Jansson, and J.P. Schubauer. 1991. Community metabolism on a "live" bottom in the Georgia Bight. Mar. Ecol. Prog. Ser. 73: 105-120.
Schubauer-Berigan, J.P., D.G. Capone, K. Cochran, J. Kazumi, and N. Epler. 1991. Bacterial transformations of nitrate and aldicarb (TEMIK) in anoxic groundwaters of Long Island.

Final Report to USGS. 78 pp.

Schubauer-Berigan, J. P. 1993. In situ measurements of nitrogen and phosphorus release by tropical marine sponges in Jamaica. Submitted.

Schubauer-Berigan, J.P., J.L. Meyer, and H.K. Austin. 1993. Phosphorus sorption by stream sediments: The importance of biotic vs. abiotic processes. Submitted.

SELECTED ABSTRACTS/PRESENTATIONS

Aquifer denitrification. International Conference on Denitrification in Soil and Sediment. 1989. Aarhus, Denmark. Invited

Acid Volatile Sulfide: What is it, where does it come from, and how useful is it in predicting the toxicity of metals in sediments? 1991. SETAC. Seattle. Contributed

Studies of submarine discharge and sediment processes in a large coastal Long Island bay. ASLO. 1992. Santa Fe. Contributed

Microbial regulation of sediment ammonia toxicity: interactions between sediment contaminants and bacterial processes. 1992. Lake Superior Research Symposium. Duluth. Contributed

Microbial transformations of nutrients and contaminants in aquatic ecosystems. 1993. South Florida Water Management District. Invited

Spatial and temporal dynamics of nutrient and sediment removal in wetlands. 1993 Soil Sci. Soc. Amer. Wetlands Symposium, Cincinnati. Invited

PROFESSIONAL MEMBERSHIPS

American Association for the Advancement of Science, American Chemical Society, American Society of Limnologists and Oceanographers, American Society for Microbiology, Ecological Society of America, Sigma Xi, Society for Environmental Toxicology and Chemistry.

Curriculum Vitae

Richard H. Skaggs
Department of Geography
University of Minnesota
Minneapolis, MN 55455
612-625-6643
skaggs@atlas.socsci.umn.edu

Degrees Awarded

A.A.	1959	Long Beach City College
A.B.	1961	University of California at Los Angeles
M.A.	1963	University of Kansas
Ph.D.	1967	University of Kansas

Academic Positions

1967 - 1970 Assistant Professor, University of Minnesota
1970 - 1979 Associate Professor, University of Minnesota
1979 - Professor, University of Minnesota
1974 - 1977 Chairman, Department of Geography, University of Minnesota
Fall, 1982 Visiting Professor, University of Wisconsin
1982 - Adjunct Professor, Department of Soil Science, University of Minnesota
1984 - 1990 Chairman, Department of Geography, University of Minnesota
Fall, 1989 Exchange Professor, University College London
1992 - Associate Vice President for Arts, Sciences and Engineering

Recent Publications of Relevance to Water Resources

- (with D. Brown, C. Gersmehl, and J. Drake) "Crop Production Response to Moisture Supply in Minnesota", Special Report No. 9, Water Resources Research Center, Univ. of Minnesota, June, 1987, 13pp.
- (with D. Brown) "Relationship between Climate and the Mean Annual Flow of the Mississippi River at St. Paul," Special Report No. 11, Water Resources Research Center, Univ. of Minnesota, June, 1987, 13pp.
- (with R. Swerman and D. Baker) "Minnesota Drought", Special Report No. 15, Water Resources Research Center, Univ. of Minnesota, June, 1987, 28pp.
- (with Janet Drake) "Climatic Network Density Analysis", in: File Structure Design and Data Specifications for Water Resources Geographic Information Systems, D. Brown and P. Gersmehl, Eds., Special Report No. 10, Water Resources Research Center, University of Minnesota, June, 1987, pp. 4-1 to 4-26.
- "Drought in the North Central United States," in: Identifying and Coping with Extreme Meteorological Events, E. Antal and M. H. Glantz, eds., Budapest: Hungarian Meteorological Service, 1988, 111 - 137.
- (with D. Brown), "Climate and the Flow of the Mississippi River at St. Paul," in: P. Brezonik, Ed., Water Supply Issues in the Metropolitan Twin Cities Area: Planning for Future Droughts and Population Growth, Special Report No. 18, Minnesota Water Resources Research Center, 1989, 19 - 26.
- "Drought in the North Central United States," Idojaras, 93, 1989, 181 - 195.
- (with L. Newman and D. Baker) The Effects of Climate Variability and "Greenhouse Effect" -- Scenarios on Minnesota's Water Resources, Technical Report No. 135, Water Resources Research Center, University of Minnesota, June, 1992, 47 pp.
- (with D. Baker and D. Ruschy) "Agriculture and the Recent 'Benign Climate' in Minnesota," Bulletin American Meteorological Society, 74, 1993, 1035 - 1040.



Heinz G. Stefan

Professor and Associate Director
University of Minnesota
St. Anthony Falls Hydraulic Laboratory
Department of Civil & Mineral Engineering
Mississippi River at 3rd Ave. S.E.
Minneapolis, Minnesota 55414
Phone: (612) 627-4585

EDUCATION:

Dipl.-Ing- 1959 Tech. University of Stuttgart
and Munich, Germany
Ing.-Hydr. 1960 University of Toulouse, France
Dr.-Ing. 1963 University of Toulouse, France

EXPERIENCE:

1967- Present Professor of Water Resources
Engineering and Hydromechanic
(since 1977); Associate Professor
(1972-1977); and Assistant
Professor (1967-1972),
Department of Civil and Mineral
Engineering, University of
Minnesota
1974- Present Associate Director, St. Anthony
Falls Hydraulic Laboratory
1965-67 Chief Engineer and Lecturer,
Institute for Hydraulic Research
and Water Resources, Tech.
Univ., Berlin, Germany
1963-65 Post-Doctoral Research Fellow,
St. Anthony Falls Hydraulic
Laboratory, Univ. of Minnesota
1960-63 Laboratory Engineer, Hydraulic
and Fluid Mechanics Laboratory
University of Toulouse, France

As Associate Director of the St. Anthony Falls Hydraulic Laboratory, Dr. Stefan guides and coordinates the undergraduate and graduate water resources engineering program.

Dr. Stefan's current research activities are mostly in the areas of hydrodynamics and water quality dynamics. His research experience includes physical and mathematical modeling of temperature regimes and heat budgets of lakes and rivers, dispersion of effluents, density currents, stratification and mixing in reservoirs and near water outlets, dissolved oxygen and productivity modeling, ice formation, and suspended sediment transport. He has provided professional services and consulting on the design of major hydraulic structures, specifically intake and outlet structures for very large flow rates, storm water handling facilities, and lakes and reservoir water quality management problems for both government and private enterprises. Dr. Stefan is the co-author of over 80 journal articles and book chapters, and 80 project reports, and editor of the book, *Surface Water Impoundments*. He has given numerous invited lectures and presentations in the U.S. and abroad.

In addition to his research activities, Dr. Stefan has taught courses in fluid mechanics; water resources engineering; hydraulic analysis, lake, reservoir hydromechanics; hydrology; analysis and modeling of aquatic environments; and groundwater flow. He has taught short courses on cooling water disposal from electric power generation for the U.N. Development Program and the Indian Government, and on Models of aquatic environments in Peking, China, and Sao Paulo, Brazil. He has been adviser to more than 60 master's and doctoral candidates.

Dr. Stefan is a member of the American Society of Civil Engineers, American Geophysical Union, Int'l. Water Resources Association, Int'l. Association for Hydraulic Research, and the Int'l. Society of Limnology. He has served as a member or chairman of the AGU, Water Quality Committee; the ASCE, Hydraulics Division, Committee on Research, and Executive Committee; Energy Policy Committee; and the IAHR Work Group on Lacustrine Hydraulics. He has served on technical committees for the National Research Council and the Office of Technology Assessment and was elected to the University Senate in 1985. He has been a technical advisor to industry and agencies on numerous engineering design and water quality problems.

Curriculum Vita

DEBORAH L. SWACKHAMER

Associate Professor
Environmental and Occupational Health
School of Public Health
University of Minnesota
Minneapolis, MN 55455
(612) 626-0435

EDUCATION

- 1976 A.B. in Chemistry, Grinnell College, Grinnell, Iowa.
1981 M.S. in Water Chemistry, University of Wisconsin, Madison, Wisconsin.
1985 Ph.D. in Oceanography and Limnology, University of Wisconsin, Madison, Wisconsin.

POSITIONS HELD

- 5-74 to 12-74 Research Assistant, Grinnell College, Grinnell, Iowa.
5-75 to 8-75 Summer Laboratory Assistant, Union Carbide Corporation, Bound Brook, New Jersey.
9-76 to 8-78 Research Technician III, Immunology Program, University of Texas Health Science Center, Dallas, Texas.
8-78 to 2-85 Research Assistant, Water Chemistry Program, University of Wisconsin, Madison, Wisconsin.
3-85 to 11-86 Postdoctoral Research Associate, School of Public and Environmental Affairs and Department of Chemistry, Indiana University, Bloomington, Indiana.
12-86 to 6-92 Assistant Professor, Environmental and Occupational Health, School of Public Health, University of Minnesota, Minneapolis, Minnesota.
7-92 to present Associate Professor, Environmental and Occupational Health, School of Public Health, University of Minnesota, Minneapolis, Minnesota.

SELECTED PUBLICATIONS

- Swackhamer, D.L. and J.P. Hassett. 1992. Partitioning of chemicals in the water column. In: Great Lakes Mass Balance Workshop Proceedings, D. Mackay and M. Diamond, ed. University of Toronto, Ontario, Canada.
- Gobas, F.A.P.C., M. Servos, D.L. Swackhamer, and D. Mackay. 1992. A Steady State Mass Balance Model for the management of toxic organic chemicals in aquatic foodchains. In: Great Lakes Mass Balance Workshop Proceedings, D. Mackay and M. Diamond, ed. University of Toronto, Ontario, Canada.
- Swain, W.R., T. Colborn, C. Bason, R. Howarth, L. Lamey, B. Palmer, and D.L. Swackhamer. 1992. Exposure and Effects of Airborne Contamination of the Great Waters of the U.S. Technical Support Document for Report to Congress, U.S. EPA, Office of Air Quality Planning and Standards.
- Swackhamer, D.L. and J.P. Hassett. 1992. Partitioning of chemicals in the water column. In: Great Lakes Mass Balance Workshop Proceedings, D. Mackay and M. Diamond, ed. University of Toronto, Ontario, Canada.
- Swackhamer, D.L., L.L. McConnell, and D.J. Gregor. 1993. Workgroup report on Environmental Transport and Fate of Toxaphene. *Chemosphere*. 27, 1835-1840.
- Swackhamer, D.L. and Skoglund, R.S. 1993. Bioaccumulation of PCBs by phytoplankton: kinetics vs. equilibrium. *Environ. Toxicol. Chem.* 12, 831-838.
- Skoglund, R.S. and D.L. Swackhamer. 1994. Processes affecting the uptake and fate of hydrophobic organic contaminants by phytoplankton. In: Environmental Chemistry of Lakes and Reservoirs. L.A. Baker, ed., Advances in Chemistry Series, American Chemical Society, Washington, D.C.
- Golden, K.A., C.S. Wong, J.D. Jeremiason, S.J. Eisenreich, G. Sanders, D.L. Swackhamer, D. R. Engstrom, D.T. Long. Accumulation and preliminary inventory of organic contaminants in Great Lakes sediment. *Water Sci. Technol.*, In press.

VITA

NAME: Melbourne C. Whiteside

RANK & POSITION: Professor of Biology, UMD

COURSES CURRENTLY TAUGHT:

Ecology, Ecology Laboratory, Aquatic Ecology, Coral Reef
Field Studies, Plankton Ecology, Biology and Society

SELECTED PUBLICATIONS:

- Whiteside, M. C. 1970. Danish Chydorid Cladocera: Modern ecology and core studies. *Ecological Monographs* 40(1):79-118.
- Whiteside, M. C. 1974. Chydorid (Cladocera) Ecology: Seasonal patterns and abundance of populations in Elk Lake, Minnesota. *Ecology* 55:538-550.
- Whiteside, M. C., J. E. Williams, and C. P. White. 1978. Seasonal abundance and pattern of Chydorid, Cladocera in mud and vegetative habitats. *Ecology* 59:1177-1188.
- Whiteside, M. C. and J. P. Bradbury, and S. Tarapchak. 1980. The limnology of the Klutian area lakes. *Quaternary Research*. 14:130-148.
- Whiteside, M. C. and C. Lindegaard. 1980. Complementary procedures for sampling small benthic invertebrates. *Oikos*. 35:317-320.
- Whiteside, M. C., and C. Lindegaard. 1982. Summer distribution of zoobenthos in Grane Langsø, Denmark. *Freshwat. Invertebr. Biol.* 1:2-16.
- Whiteside, M. C. 1983. The mythical concept of eutrophication. *Hydrobiologia* 103:107-111.
- Whiteside, M. C., Swindoll, C. M. and W. L. Doolittle. 1985. Factors affecting the early life history of yellow perch *Perca flavescens* (Mitchill). *Env. Biol. Fish.* 12(1):47-56.
- Whiteside, M. C. and M. R. Swindoll. 1988. Guidelines and limitations to cladoceran paleoecological interpretations. *Palaeography, Palaeoclimatology Palaeoecology*. 60:405-412.
- Whiteside, M. C. 1983. 0+ fish as major factors affecting abundance patterns of littoral zooplankton. *Verh. Internat. Verien. Limnol.* 23:1710-1714.
- Whiteside, M. C. 1989. Natural and anthropogenic forces acting on a forest lake. Invited paper for special edition of *J. Minn. Acad. Sci.* 55:81-85.
- Whiteside, M. C. 1992. A tribute to David Frey. *Hydrobiologia* 246:1-8.

NAME POSITION TITLE BIRTH DATE (Mo., Day, Yr.)
 Wilson, Bruce Nord Assistant Professor 10/4/54

EDUCATION (Begin with baccalaureate and include postdoctoral training)
 INSTITUTION AND LOCATION DEGREE YEAR FIELD
 University of Minnesota, St. Paul B.S. 1976 Agricultural Engineering
 University of Minnesota, St. Paul M.S. 1979 Agricultural Engineering
 University of Kentucky, Lexington Ph.D. 1984 Agricultural Engineering

PROFESSIONAL EXPERIENCE (Beginning with present position, list employment by title, affiliation and dates)

1991-Present Agricultural Engineering Department Assistant Professor
 University of Minnesota
 1987-1991 Agricultural Engineering Department Associate Professor
 Oklahoma State University
 1983-1987 Agricultural Engineering Department Assistant Professor
 Oklahoma State University
 1979-1983 Agricultural Engineering Department Research Specialist
 University of Kentucky

PROFESSIONAL HONORS

1981 Outstanding Sedimentology Technical Paper presented at the 1981 National Symposium on Surface Mining Hydrology, Sedimentology and Reclamation
 1989 Technical Paper Award by the American Society of Agricultural Engineerin
 1987, 1991 Honorable Mention Technical Paper Awards by the American Society Agricultural Engineering
 1990, 1991 Outstanding Technical reviewer for the American Society of Agricultural Engineering

PUBLICATIONS (Five recent relevant publications)

Wilson, B.N. and D. Storm. 1993. Fractal analysis of surface drainage networks for small upland areas. Transactions of the ASAE, 36(5):1319-1326.
 Wilson, B.N. Small-scale link characteristics and applications to erosion modeling. Transactions of the ASAE, 36(6):1761-1770.
 Wilson, B.N. 1993. Development of a fundamentally based detachment model. Transactions of the ASAE, 36(4):1105-1114.
 Rice, C.T., B.N. Wilson and M. Appleman. 1988. Soil topography measurements using image processing techniques. Computer and Electronics in Agriculture, 3:97-107.
 Couger, G., B.N. Wilson and C.T. Rice. 1992. Determination of drainage networks from plot-size and basin-size areas. Applied Engineering in Agriculture, 8(2):185-189.

 Bruce N. Wilson
 Department of Agricultural Engineering
 205 Agricultural Engineering Building
 139 Eckles Avenue
 University of Minnesota
 St. Paul, MN 55108
 E-mail: wilson@gaia.ageng.umn.edu
 Voice: (612)-625-6770
 FAX: (612)-624-3005

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Department of Fisheries and Wildlife
College of Natural Resources*

*200 Hodson Hall
1980 Folwell Avenue
St. Paul, MN 55108-6124
612-624-3600
Fax: 612-625-5299*

April 5, 1994

Dr. Patrick Brezonik
Water Resources Research Center
1518 Cleveland Ave.
St. Paul Campus

Dear Pat:

I am writing in support of the proposed graduate major in Water Resources Science. This program should serve the needs of an increasing number of students who are seeking education and careers in water resources.

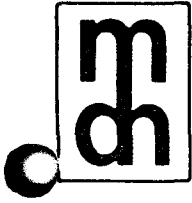
Although we have many water related graduate programs at the University, none provides the broad interdisciplinary education that will be offered by the proposed new major. This interdisciplinary education is increasingly important to professionals dealing with complex research, management, and policy issues surrounding comprehensive water resources problems. Increasing demands for water for recreation, industry, agriculture and a host of other uses, and increasing degradation or shortages of the water resource, require highly knowledgeable graduates, capable of dealing with these demands and problems in an interdisciplinary framework.

The fisheries graduate program is likely to play a supporting role in the water resources science major. We occasionally have applicants to fisheries who would be better served by a water resources major and some of the courses taught in fisheries and wildlife will likely be selected by water resources science majors. I look forward to continued cooperation and interaction with the proposed new major.

Sincerely,



Ira R. Adelman
Professor and Head
DGS Fisheries



Minnesota Department of Health

Division of Environmental Health
925 Delaware Street Southeast
P.O. Box 59040
Minneapolis, MN 55459-0040
(612) 627-5100

April 6, 1994

Mr. Patrick L. Brezonik
Professor and Director
Water Resources Research Center
College of Natural Resources
1518 Cleveland Avenue, Suite 302
St. Paul, Minnesota 55108

Dear Mr. Brezonik:

I am writing to support the efforts of the University of Minnesota to develop an interdisciplinary program in water resources science. This is a program that will greatly benefit the citizens of Minnesota and is long overdue. Minnesota has a national reputation for taking an active and innovative approach to understanding and wisely using its water and other natural resources. Those of us involved with the regulatory aspects of water resources management have long noted the need for the type of multi-faceted water resources education program that the university is proposing. Over the past several decades, higher education has not kept pace with advances in the technical, legal, and social aspects of water resources and public health protection. Although departments, such as geology, soil science, and biology, have prepared students to function within these disciplines, the "real world" demands that the jobs they fill take a more holistic approach to understanding and managing water resources.

I feel that the water resources program that you are proposing is well thought out and should go a long way toward meeting the educational needs of water resource professionals. However, I suggest that an internship program with either the public or private sector be incorporated to help round out classroom experience. A quarter or semester internship functioning as a staff member would give students valuable experience with understanding the legal, technical, resource, and social implications of water resources management. Other disciplines, such as medicine, business, and education, require that students gain actual job experience before they graduate. The same requirement should hold for graduates of the proposed interdisciplinary water resources program.

In closing, I wish you success with the proposed water resources education program and encourage the Graduate School review committee to support it. If you have any questions regarding my comments, please feel free to contact me at (612) 627-5035.

Sincerely,

Patricia A. Bloomgren
Director

PAB:tvS

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Soil Science Department

*Borlaug Hall
1991 Upper Buford Circle
St. Paul, MN 55108
612-625-1244
Fax: 612-625-2208*

6 April 1994

Dr. Patrick L. Brezonik, Director
Water Resources Research Center
University of Minnesota
St. Paul, MN 55108

Dear Dr. Brezonik,

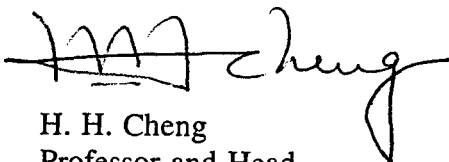
I am pleased that you have taken the leadership in developing a proposal for establishing an interdisciplinary graduate major program in Water Resources Science at the University of Minnesota. Minnesota is so richly endowed with water resources that it is imperative for us also to assume the intellectual leadership in developing the knowledge base for understanding and managing these resources.

The faculty in Soil Science are especially interested in participating in this interdisciplinary graduate program because of the close linkage between soil and water. As you know, many of our faculty members have been active in the Water Resources Minor program. In recent years, several new additions to our faculty have strengthened our expertise in the area of soil and water resources. We have also created an Endowed Chair in Soil and Water Resources and are in the process of filling this position at present. Therefore, we see the establishment of the interdisciplinary Water Resources Science Major program as a most timely development. We look forward to this opportunity in working together with our colleagues across the campuses.

We are prepared to make available our extensive research facilities for soil and water research to students in the Water Resources Science Major program. There will also be opportunities for them to work on a variety of research projects supported by grants. Specialized facilities in Soil Science include the Water Quality Research Laboratory, Soil Characterization Laboratory, Landscape Analysis Laboratory, Research Analytical and Soil Testing Laboratory, Climate Information and Soil Survey Information Systems and Computerized Database, St. Paul Climatological Observatory, and the Earl Kuehnast Memorial Climatological Library which holds the historical records on Minnesota climate dating back to mid 19th century.

I was inspired last week to hear a talk by Mr. Paul Johnson, newly appointed Chief of the Soil Conservation Service, who was invited to speak at the International Conference on Site-Specific Management of Agricultural Systems in Minneapolis. He quoted Norman McLean: "Eventually all things merge into one and the river runs through it" and suggested that water is a resource which everyone can tie into. His talk has elegantly and succinctly expressed the essence of a graduate program in Water Resources Science. I wish you success in establishing this graduate major program.

Sincerely,



H. H. Cheng
Professor and Head

UNIVERSITY OF MINNESOTA

Duluth Campus

Department of Biology

211 Life Science Building

10 University Drive

Duluth, Minnesota 55812-2496

College of Science and Engineering

218-726-6262

Fax: 218-726-8142

21 March 1994

Dr. Anne C. Petersen, Dean
The Graduate School
321 Johnston Hall
101 Pleasant St. S.E.
Minneapolis, MN 55455

Dear Dean Petersen:

I wish to express my strong and enthusiastic support for the proposed graduate program in Water Resources Sciences. It is my understanding that the current formulation of this program includes the following elements: an interdisciplinary, all-university program without a specific departmental home; programs leading to both M.S. and Ph.D. degrees; required core courses available to students on all campuses, either through direct instruction or via interactive video; numerical tallies of graduate student rolls and thesis credit hours accrue to the departmental home of the major advisor.

There clearly is substantial strength in aquatic sciences at the University of Minnesota, both in terms of research programs and graduate education. However, resources and faculty expertise in this broad area are scattered among all campuses and several research institutes of the university. There are obvious advantages to a formalized graduate program that would capitalize on current strengths throughout the university and that would foster interdisciplinary collaboration. A major recent area of emphasis in the UMD Biology Department and the Duluth Biology Graduate Program is aquatic ecology. Several departmental and graduate program faculty have interests and expertise in this area, and a large number of students entering both our undergraduate and graduate programs have interests in aquatic ecology. We would welcome the opportunity to contribute to a new graduate program in aquatic sciences, and to have additional avenues of study available to University of Minnesota students.

The UMD Biology Department would consider Water Resources Sciences graduate students as candidates for departmental teaching assistantships, if the student's advisor is a departmental faculty member. This would need to be done in a balanced way that did not seriously compromise the strength of the existing Biology Graduate Program by fundamentally reducing opportunities for supporting students in that program. Most departmental faculty who would advise in the water resources program do not envision large increases in the numbers of graduate students working in our department through the addition of the new program. Thus, the issue of conflicts between these two programs probably is not serious. We would not normally consider awarding assistantships to students whose advisor is in another department; this policy parallels that currently in use with graduate students in the Biology Graduate Program.

D. Christian to A. Petersen
3/21/94, p. 2

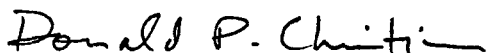
The department would welcome the additional experience that doctoral students in the Water Resources Program would bring to the department, not only with respect to their formal participation in teaching undergraduate laboratories but also through their informal interactions with undergraduate students and with M.S. students in the Biology Graduate Program. We would work with these students to optimize the professional development experiences they would gain as teaching assistants in the department. The department would be willing to work closely with a Biology Department major advisor to construct support packages of blended research and teaching assistantships that work to the benefit of the student's professional development, the student's and advisor's research needs, and the department's undergraduate teaching mission. We normally would limit students to six quarters (two academic years) of departmental teaching assistantship support, as is the current policy for graduate students enrolled in the Biology Graduate Program.

Most of the research-related space for Water Resources graduate students advised by biology department faculty would be provided by the advisor. We would work with the advisor to address these needs, as well as attempting to provide office space. The department routinely provides desk/office space for graduate students employed as teaching assistants in the department.

A large number of 5000-level courses in aquatic ecology, all available for graduate credit in Biology are taught in the department. Many of these would be highly suitable for inclusion in programs of students in the water resources program. Although the department currently is facing serious problems of insufficient course access, we would try to assure that students in the new program could gain access to these courses. We would be willing to work with other units to assure optimal delivery of courses through interactive video. We would hope that, as appropriate, students enrolled in the Biology Graduate Program would have access to some of the additional coursework opportunities provided by the development of the water resources program.

Again, I highly endorse this new program. I believe it will be a major asset to graduate education and research programs in the aquatic sciences at the University of Minnesota. I hope that it is established successfully, and that it thrives alongside existing, successful programs in related areas. Please contact me if you have questions or if I can provide further information (218/726-7263).

Sincerely,



Donald P. Christian
Professor and Head

UNIVERSITY OF MINNESOTA

Gray Freshwater Biological Institute
Box 100, Cty. Highways 15 & 19, Navarre, MN 55392

Steven J. Eisenreich
Professor and Director

email: sje@maroon.tc.umn.edu
(612)471-8476; Fax (612)471-9070

April 14, 1994

Professor Patrick Brezonik
Department of Civil Engineering
University of Minnesota
Minneapolis, MN 55455

Dear Patrick:

The Strategic Planning Committee on Water Programs (SPCOW), as part of its review and planning efforts to forge a coherent University of Minnesota COMMUNITY in Water Science, Technology, Education and Research (WATER) has adopted the following recommendation as one of its primary goals:

* **To Establish Graduate Programs in Water Sciences and Technology.**

The committee recommends that UMN System curricula in water sciences and technology leading to the award of M.S. and Ph.D. degrees be established. Program-specific graduate degrees anchored in academic departments have historically provided the means for education and training of graduate students in water-related disciplines. In an increasingly interdisciplinary world, these graduate programs no longer adequately serve the needs of the students or water sciences. Also, the faculty and students at the UMD campus do not have sufficient access to graduate curricula to achieve their potential in water sciences. New graduate curricula will focus and strengthen the water sciences COMMUNITY at the UMN.

We strongly endorse the efforts of UMN faculty (ad hoc committee chaired by Professor P. Brezonik) who have proposed a graduate program in Water Resources Science for adoption by the UMN and the Higher Education Coordinating Board. The committee recognizes that other curricula may also be proposed in the future (e.g., Limnology; Environmental Engineering & Sciences) as well as modifications of the Water Resources Science major.

With best wishes.

Sincerely,



Steven J. Eisenreich
SPCOW Chair

cc: SPCOW Members

UNIVERSITY OF MINNESOTA

Duluth Campus

Vice Chancellor for
Academic Administration

420 Darland Administration Building
10 University Drive
Duluth, MN 55812-2496

218-726-7103
Fax: 218-726-6254

March 24, 1994

Dr. Anne Petersen, Dean
The Graduate School
321 Johnston Hall
University of Minnesota
101 Pleasant Street SE
Minneapolis, MN 55455

Dear  Dean Petersen:

I would like to express very strong support for the proposed graduate program in Water Resources Sciences. I understand that this has been proposed as a university-wide program with participation by qualified faculty throughout the university system. This is a most appropriate program for the university to support and I believe that our campus has significant strengths to contribute in terms of water resources sciences.

At UMD, we presently have water researchers in Biology, Chemistry, Chemical Engineering, Geology, and Geography. In addition, we have researchers working at NRRI, with the Sea Grant program, and the Large Lake Observatory. Faculty on our campus with whom I have spoken are very excited about the opportunities to participate in a Water Resource Sciences graduate program. They have developed a set of curriculum offerings, which utilize courses already offered on this campus. The use of ITV would allow students on the UMD campus to take courses offered by distance education from Twin Cities faculty and would also allow students in other parts of the university to take courses through ITV from UMD faculty.

Since I believe that Water Resources Sciences is one of the strongest areas of concentration that we could put together at UMD, I find it especially appropriate for us to join a system-wide effort for a graduate program in this area. We look forward to participation in this program.

Sincerely,



Sandra Featherman
Vice Chancellor for Academic Administration

mjk

UNIVERSITY OF MINNESOTA

Duluth Campus

Department of Geology
College of Science and Engineering

229 Heller Hall
10 University Drive
Duluth, MN 55812-2496

218-726-7238
Fax: 218-726-8275

23 March, 1994

Dr Pat Brezonik
Water Resources Research Center
Suite 302
1518 Cleveland Avenue
St. Paul, MN 55108

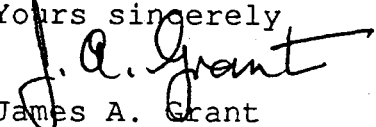
Dear Dr. Brezonik:

I am writing to support your efforts in developing a graduate major in hydrologic sciences. As I am sure you are aware, we are in the throes of developing the Large Lakes Observatory, with Tom Johnson as its director. This will involve at least three positions split between the Observatory and our Department within the next year. This will have a major impact on our graduate programs, which have included Master's programs in hydrogeology since Howard Mooers joined us in 1991. I am sure that Howard and the faculty of the Observatory will be most interested in being part of the development of a PhD interdepartmental program in hydrologic sciences.

Our Department does not have the resources to support a free-standing PhD program, rather students wanting to do PhD research with our faculty do so on a case-by-case basis through the program housed in Geology and Geophysics. (Our first PhD finished last year, and three others are en route.) However, with the added expertise of the new faculty and the facilities of the Observatory, we will have the resources to participate in a PhD program such as that envisaged by your committee. At present the Department offers at least five relevant 5000-level courses (Hydrogeology, Applied Hydrogeology, Contaminant Hydrogeology, Geology of Waste Management and Aqueous Geochemistry. Tom will add Global Climatic Changes and possibly Geological Limnology, and the other new faculty will similarly broaden the scope of our course offerings in this direction.

So you are assured of the support of our Department in your efforts, and I would hope that in the near future appropriate faculty and courses from the Duluth campus can be integrated into this exciting new program.

Yours sincerely


James A. Grant
Professor and Head

Received: from [198.4.9.2] by maroon0.tc.umn.edu id SMTP-0012d8ecd80a19530; Tue, 22 Mar 94 04:50:41 -0600

Received: from localhost by dub-img-2.compuserve.com (8.6.4/5.930129sam) id FAA09466; Tue, 22 Mar 1994 05:50:39 -0500

Date: 22 Mar 94 05:48:11 EST

From: "Thomas C. Johnson" <100332.2171@CompuServe.COM>

To: Pat Brezonik <brezo001@maroon.tc.umn.edu>

Cc: Steve Eisenreich <sje@maroon.tc.umn.edu>, Howard Mooers <hmooers@ua.d.umn.edu>

Subject: Water Resources

Message-ID: <940322104810_100332.2171_BHB36-4@CompuServe.COM>

Dear Pat,

You probably have heard that I have accepted the position of Director of the Large Lakes Observatory (LLO) in Duluth. I will be very interested in maintaining strong ties to the aquatic sciences community in the Twin Cities, and to this end, strongly support your efforts to bring together the various disciplinary groups in water resources, and to establish an interdisciplinary graduate program in water resources. If there is anything I can do to further the cause of cooperation, please let me know.

Tom

UNIVERSITY OF MINNESOTA

*Minnesota Sea Grant College Program
Director's Office
Graduate School*

*2305 East 5th Street
Duluth, MN 55812-1445
218-726-8106
Fax: 218-726-6556*

29 March 1994

Dr. Anne C. Petersen
Vice President and Dean
322 Johnston Hall
University of Minnesota
101 Pleasant Street S.E.
Minneapolis, MN 55455-0421

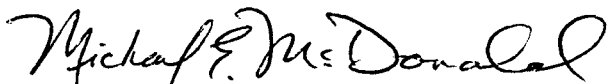
Dear Dr. Petersen:

I strongly support establishing a graduate major program in Water Resources Science. With the increasing emphasis on water related research at the University of Minnesota, the recent move of Minnesota Sea Grant to Duluth and the establishment of the Large Lakes Observatory at UMD, the development of a multi-disciplinary, inter-campus graduate program in the area of water resources/aquatic science becomes even more important. One of the missions of the Minnesota Sea Grant Program is to foster graduate education in the aquatic sciences, and the proposed graduate program would help to do this throughout the University of Minnesota System.

I personally believe that the development of this program would be a good use of the research and teaching talent we have on the campuses of the University of Minnesota. I think the possibilities are very exciting and I would be very interested in participating in the proposed M.S. and Ph.D. programs.

If I can be of any further assistance please do not hesitate to contact me.

Sincerely,



Michael E. McDonald
Director

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Department of Agricultural Engineering
College of Agriculture

Agricultural Engineering Building
1390 Eckles Avenue
St. Paul, MN 55108-6005
612-625-7733
Fax: 612-624-3005

April 1, 1994

TO: Dr. Pat Brezonik, Director
Water Resources Research Center

FROM: Vance Morey, Head *Vance Morey*
Agricultural Engineering Department

SUBJECT: Support for Graduate Program in Water Resources Science

I would like to indicate my support for the proposed graduate program in water resources science. The Department of Agricultural Engineering has strong programs in water resources and a long history of participation in multi-disciplinary water related activities involving teaching, research and outreach.

The proposed program provides another opportunity for several of our faculty to participate in an important multi-disciplinary experience. The program provides an important education and research opportunity for students of diverse academic backgrounds. I believe this new opportunity will complement rather than compete with our existing graduate program.

Thus, I support the proposed graduate program in water resources science and look forward to the active participation of several of our faculty in its activities.

RVM/cmc



Minnesota Department of Natural Resources

OFFICE OF THE COMMISSIONER

500 Lafayette Road

St. Paul, Minnesota 55155-4037

April 7, 1994

Patrick L. Brezonik
University of Minnesota
Water Resources Research Center
1518 Cleveland Avenue
St. Paul, Minnesota 55108

Dear Pat:

This letter is written to indicate Department of Natural Resources support for the proposed graduate degree program in Water Resources at the University of Minnesota. The DNR interest in such a program is both as a prospective employer of graduates of the program and as a resource for continuing education of current employees. An additional aspect that would benefit the department is the potential for interdisciplinary studies of aspects of Minnesota's water resources which would provide understanding of issues and recommendations for better management for the future.

As with the University, the DNR is currently organized and tends to think about resources along traditional discipline lines. The segregation of professional employees into divisions that deal with only one aspect of the natural resources leads to fragmented approaches to management and protection.

At DNR we are attempting to begin a process within the department to integrate resource management and use a team of staff from various disciplines to address management issues. Your degree program proposal has the potential to produce graduates with the ability to integrate and analyze water resources problems from a broader perspective. It will also produce research that will further our knowledge of the relationships between impacts of human activity on all aspects of water including biota, quality and availability of resources to support future demand.

In view of the significance of water to human endeavor, whether it be economic, recreational or community growth, it seems appropriate to focus on this resource from all perspectives to assure its continued availability and quality for generations to come. The scientific disciplines need to be tempered by information from social and economic forces to address the issues that are emerging today.

Therefore I encourage the formation of the degree program in water resources and hope that the interdisciplinary option might in future be extended to undergraduates as well. I wish you success in this venture.

Sincerely,


Ron Nargang
Deputy Commissioner

cc: Kent Lokkesmoe

DNR Information: 612-296-6157, 1-800-766-6000 • TTY: 612-296-5484, 1-800-657-3929 • FAX: 612-296-4799





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL RESEARCH LABORATORY
6201 CONGDON BOULEVARD
DULUTH, MINNESOTA 55804

March 29, 1994

Patrick C. Brezonik, Chair
Water Resources Research Center
Suite 302
1518 Cleveland Ave.
University of Minnesota
St. Paul, MN 55108

Dear Dr. Brezonik:

I am writing to you in support of the proposed graduate program in water resources sciences at the University of Minnesota. As you know, our laboratory is a research organization within the U.S. Environmental Protection Agency with primary responsibilities for freshwater ecosystems. We are very aware of the need for programs that both conduct research and prepare future scientists to play an important role in managing our water resources. Because water is an important resource for the state of Minnesota as well as the Nation, the need for well-trained experts is vital to assuring the sustainability of our economy, society, and natural heritage.

In my opinion, you have correctly identified this as a multidisciplinary program that requires training and study in many areas. I commend your efforts and hope that you are successful in making this an integral part of your University.

As in the past, we welcome the opportunity to work with your students and hope that the collaborative possibilities offered by this new program will benefit us all.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Gilman D. Veith".

Gilman D. Veith
Director

UNIVERSITY OF MINNESOTA*Duluth Campus**Graduate School**431 Farland Administration Building
10 University Drive
Duluth, MN 55812-2496**218 726 7523
FAX: 218-726-6360*

May 9, 1994

TO: Associate Dean Steve Hedman

FROM: Jim Kluog, Chair, UMD Graduate Council



At our May 6 meeting, the Council voted its unanimous endorsement of the proposed interdisciplinary graduate major in water resources science. The members were impressed by the interdisciplinary scope of the program, and remarked favorably on its implications as a model for future joint-campus programs. It would make excellent use of faculty expertise across the Twin Cities and Duluth campuses.

The Council wholeheartedly recommends its approval.

*Twin Cities Campus**Department of Architecture
College of Architecture and
Landscape Architecture**110 Architecture
89 Church Street S.E.
Minneapolis, MN 55455
612-624-7866
Fax: 612-624-5743*

April 27, 1994

Anne C. Petersen
Vice President & Dean
Graduate School
322 Johnston Hall
University of Minnesota

Dear Vice President Petersen:

The Department of Architecture has finalized its plans for the revised Master of Architecture degree curriculum and seeks Graduate School approval to change the program credits from 78 to 126 (including thesis credits). The Department of Architecture Faculty has met on this issue and voted unanimously in favor of the revised curriculum.

You may remember that we have eliminated our 5-year undergraduate professional curriculum (the last class will graduate in June 1997) and our 2-year graduate program (the last class will graduate in 1996) in favor of a 3-year graduate program. We continue to offer undergraduates a Bachelor of Arts with a major in Architecture that prepares students for admission to the graduate program, and we require a year of preparatory work for holders of other baccalaureate degrees.

There are many reasons for the change in the program. In designing the new program we sought to build upon the strengths of the two existing programs and to eliminate their disadvantages, considering the following factors:

- University encouragement to reduce the number of professional programs in architecture from two to one.
- The inefficient functioning of the Bachelor of Architecture as an undergraduate degree, since few of the students in the 5-year program finished their degrees in less than six years, not having become competitive for admission until their junior year.
- The financial hardship on prospective graduate students of requiring 2 years of undergraduate preparatory work. They were often unable to get economic support for extended undergraduate study.
- The strength of having a substantial residency for the program - 4 years in the prior program. This provided a group coherence among the students and a bond and identity with the school that were important to maintain. The faculty did not want to have a 2-year program, but was willing to compromise on three years.
- Having two admissions points to the program, one at the entry into the major, and one into the Graduate Program was a burden on faculty time, and even for entry into the undergraduate program required that students had to make a commitment to working toward a professional degree. We, therefore, eliminated admission procedures for entry to the undergraduate program requiring a GPA of 2.8 instead, providing a way that students could take design courses without having to be part of the professional program.

Anne C. Petersen, Vice President and Dean
April 27, 1994
Page 2

The solution that we propose is based upon a new model for architectural education that has been developed in several schools in the United States that are eliminating the Bachelor of Architecture in favor of the Master of Architecture as the exclusive professional degree (for example, the University of Illinois at Chicago and the University of Kansas, although we would be the first to fully implement the model). In 1992, the National Architectural Accreditation Board accredited the Master of Architecture degree as a first professional degree for five years (the longest period of accreditation that they give). We presented the model to them, and they gave us accreditation with the understanding that we would be implementing the new program during that five year period.

The program we propose to implement is a three-year Master of Architecture curriculum that builds upon an undergraduate degree with a year of preparatory work either as an architecture major, or as supplemental study. For those who require supplemental study, the preparatory program is structured to permit them to complete their year of study program through the Continuing Education and Extension Program. This has the advantage of allowing students to complete their preparatory work without having to gain admission to the University, and once admitted, to participate in the professional program as graduate students for three years rather than two as at present.

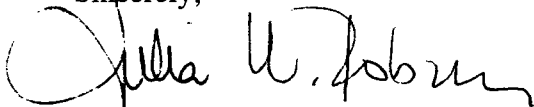
The change in the number of credits in the graduate program from 78 to 126 thus does not involve any significant change in the coursework that a student must take to receive the professional degree, but rather a restructuring to enable a greater proportion of the study to be at the graduate level. Added to the graduate curriculum are 3 courses of additional design (18 credits) and 7 courses in technology (28 credits) with an addition of 2 credits that are part of a restructured curriculum. We have altered the program somewhat to develop more coherence and connection between the lecture and the studio courses, and to reflect a few new emphases in the field. Following the practice of a majority of other schools, and improvement in the way the subject is taught, we have reduced the structures course load from 12 to 9 credits. We altered the urban design course requirements, replacing a lecture course with new curriculum in the design studio. We have reduced the required history course electives by one, and have added two theory and criticism courses, one required and one elective (up to now all theory has been elective). Additionally we have added an elective advanced level representation course (either drawing or computer aided design).

The new program reflects a denser structure, but one that responds to the professional aspirations of students at the graduate level, with slightly more emphasis on theory and representation. Students will carry an average of 14 credits per quarter, and the thesis will continue to be required.

It should be added that for the short term we will continue to offer the MArch 2 program as a 44-credit post-professional degree, but that in the near future, we will propose a new program of advanced studies for post-professional students, or for students seeking to study architecture who do not seek a professional degree.

Please contact me for any questions or comments. Thank you.

Sincerely,



Julia W. Robinson
Associate Professor &
Director of Graduate Studies

cc: V. Field

APR 25 1994

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Department of Landscape Architecture
College of Architecture and
Landscape Architecture

125 Architecture
89 Church Street S.E.
Minneapolis, MN 55455
612-625-6860
Fax: 612-625-7525

April 21, 1994

Professor Edward Cushing, Chair
Vicki Field, Staff
Biological Sciences Policy and Review Committee

RE: Revision in Examining Committee Membership - M.L.A. Degree

Dear Professor Cushing:

The clarification of our M.L.A. offering, effective initially this academic year, has developed a small wrinkle in actual practice. This wrinkle, the membership of the examining committee, is traceable to our previous degree offering under the M.L.A. (pre-1993-1994). This previous incarnation of the M.L.A. was a Plan A degree offering; its scholarly mission is now supplanted by the new Plan A research degree, the M.S.

The current M.L.A. is a professional, accredited degree program. There is no thesis or Plan B project as such for the current M.L.A., and, therefore, no formal examining committee. Final studio projects are reviewed, or juried, (as in the Department of Architecture) largely within the faculty of this Department. Rarely are non-Department of Landscape Architecture faculty able to sustain a relationship with studio work of this type. In practice, we have had to ask Department of Architecture faculty sign off on projects about which they have had no knowledge, or for whom we have created special review submittal packages. These practices undermine our ability to serve our students with integrity and timeliness.

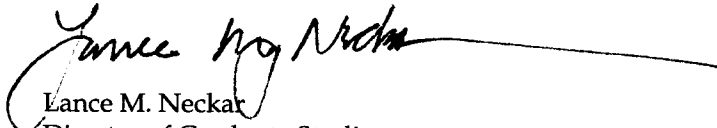
Accordingly, the Department ask that the Biological Sciences Policy and Review Committee approve the following change and forward said approval to the Executive Committee:

Proposed change:

M.L.A. students in the Department of Landscape Architecture may elect to have three graduate faculty from the Department of Landscape Architecture on examining committees for this degree program.

Thank you for your consideration.

Sincerely,


Lance M. Neckar
Director of Graduate Studies

cc.
Ken Zimmerman, Associate Dean, Graduate School
Karen Starry, Director, Graduate School

GRADUATE SCHOOL GOPHER OUTLINE (proposed)

- Welcome to the Graduate School Gopher
- Search the Graduate School Gopher
- Graduate School Directory
- Graduate School Bulletin (pointer to College Bulletins)
- Graduate Student Organizations

 - COGS

 - Others???

Governance

 - Constitution

 - Policy and Review Council

 - Meeting Schedule

 - Minutes

 - Issues

 - Executive Council

 - Meeting Schedule

 - Minutes

 - Issues

 - Research

 - GRAC

 - RAC

 - Faculty Roster (complete alpha listing)

Student Services Offices

 - Admission

 - Prospective Student

 - Student Services

 - Fellowship

 - Office of Equal Opportunity

Program listing (in alpha order)

 - Recruiting Materials

 - Manuals

 - Faculty Roster

 - Fellowships and Scholarships

 - Courses (pointer to catalog)

Director of Graduate Studies

 - Generic Email Office Addresses

 - DGS Roster

 - Others????

Research Office

 - Point to ORTTA

Welcome to the Graduate School Gopher. This is a new GOPHER and will be under construction for the next three to six months. It will eventually contain information of interest to students, faculty, and the Directors of Graduate Studies. For a tentative outline of what will be available see the listing under Graduate School Gopher proposed outline in the menu selection. If you have suggestions or questions concerning the Graduate School Gopher please send a message to Associate Dean Ted Labuza at:

email=tplabuza@epx.cis.umn.edu

fax= 612 626 7821

voice= 612 625 7368

snail mail=301 Johnston Hall

If you have specific questions in any of the following areas you may contact the area directly via email at the following addresses:

Admissions=gsadmit@maroon.tc.umn.edu

Visa Status=gsins@maroon.tc.umn.edu

Doctoral student progress=gsdoc@maroon.tc.umn.edu

Master student progress=gsmast@maroon.tc.umn.edu

Equal Opportunity/Affirmative Action=gsoeo@maroon.tc.umn.edu

Fellowship=gsfell@maroon.tc.umn.edu

Others will be set up as needed.

Other questions or concerns can be directed to Judy Howe at:

jjhowe@mailbox.mail.umn.edu

Again welcome and thank you for your patience.

Received: from hub2.tc.umn.edu by maroon0.tc.umn.edu id SMTP-0012dbfd933a05844
Received: from localhost by hub2.tc.umn.edu id SMTP-0012dbfd92e001748; Thu, 28
Originator: dgs-talk@hub2.tc.umn.edu
Errors-To: tplabuza@maroon.tc.umn.edu
Reply-To: dgs-talk@hub2.tc.umn.edu
Sender: dgs-talk@hub2.tc.umn.edu
Version: 5.5 -- Copyright (c) 1991/92, Anastasios Kotsikonas
From: "ted labuza" <tplabuza@epx.cis.umn.edu>
To: field001@maroon.tc.umn.edu
Subject: commencement
Date: Thu, 28 Apr 94 10:41:38 -0500

A question has been recently raised about the graduation ceremony. Some years ago the graduate school went to a monthly official graduation procedure and thus some changes were made in the requirements to participate in the commencement ceremony that may be having some unintended outcomes for Ph.D. students.

Prior to the changes, the degree clearance and the commencement ceremony were linked. Students had to complete all their requirements, including handing in their dissertations before they could go through the commencement ceremony. Since we actually gave the Ph.D. students the official diploma at the ceremony, we had to set deadlines for degree clearance well in advance of the ceremony in order to permit time for the printing of the diploma. This resulted in a lot of dissappointed students. It was also noted that attendance was poor..

When the GS went to monthly graduation, the degree clearance process was uncoupled from the commencement ceremony. This means that students may go through the ceremony without having completed all degree requirments. All they have to do is register their thesis title (using a title page only, which really means nothing) and pay the degree application fee. When the complete all degree requirements, they will get their degree transcripts and diplomas. The result of this is that many students, at various stages of degree completion, go through the ceremony, including not having taken their defense. There have been cases where the thesis completion takes 1 to 3 years beyond the and other cases where the student actually thought they graduated, got a job or got a promotion. There seems to be a lack ofg reading the requirements.

Do you and/or your faculty feel that this is latter is a problem? If so, what should be the requirements for going through the ceremony, e.g. scheduling the final oral, passing the final oral, permission of advisor and/or DGS? Should this aply to the MS as well.

I would appreciate hearing people's opinion and I will put this on the agenda for dicussion at the P&R councils..

Dr Ted Labuza, Assoc. Dean of the Graduate School
Professor of Food Science and Technology
University of Minnesota
301 Johnston Hall, Minneapolis MN 55455

Voice 612-625-7368
Fax 612-626-7431
tplabuza@maroon.tc.umn.edu

There is no such thing as a poverty of time, there is a poverty of being able say NO!!!

UNIVERSITY OF MINNESOTA

*Office of the Dean
Graduate School*

*322 Johnston Hall
101 Pleasant Street S.E.
Minneapolis, MN 55455-0421*

TO: Policy & Review Council Members
FROM: Associate Dean Ted Labuza, Graduate School
DATE: April 22, 1994
RE: Exit Survey (Draft)

Enclosed is the first draft of an exit survey the Graduate School plans to distribute to graduating master's and doctoral students. This draft is not in a "user-friendly" format; that will be designed once the relevant questions are determined. We are very interested in any thoughts you may have about the survey before we proceed.

The survey is designed to obtain from those completing advanced degrees an assessment of the quality of their experiences here, and information about their subsequent employment. (Please note: for post-graduation plans we will continue to use the "Survey of Earned Doctorates" for doctoral graduates and will use the same questions [adjusted as necessary] for master's graduates.) The data will be combined with that of other students and group averages or percentages reported to graduate programs. Answering any or all of the survey questions will be optional, and will have no bearing whatsoever on meeting degree requirements. We are hoping that obtaining more feedback from our graduates will further strengthen our graduate programs.

TPL/kks

Exit Survey Questions

I. Identifying Information

- 1) What is your major field of study:
- 2) What degree are you completing?
- 3) What is the quarter/year first enrolled in the U of M Graduate School?
- 4) Did you hold a master's degree before you enrolled at the UofM?
- 5) What is the quarter/year you expect to complete your current degree objective?
- 6) Is this your terminal degree?
- 7) What is your gender and ethnic background? (optional)
Female Male
International Student African American American Indian
Asian American Caucasian Hispanic
- 8) What is your cumulative grade point average while enrolled in the University of Minnesota Graduate School?

II. Choosing the University of Minnesota

How important were the following in your decision to enroll in a graduate program at the University of Minnesota?
(Ranked "Very Important", "Of Some Importance", or "Of No Importance")

- 1) Reputation of institution
- 2) Reputation of department (graduate program)
- 3) Reputation of certain faculty members
- 4) Opportunity for research experience
- 5) Opportunity for teaching experience
- 6) Offer of a scholarship/fellowship
- 7) Offer of a graduate assistantship
- 8) Availability of housing
- 9) Proximity to home or job
- 10) Others (please specify):

Which of the above was the most important factor in your choice of the University of Minnesota?

How do you now judge your decision to come to the University of Minnesota?

III. Length of program

- 1) Did any of the following cause major delays in completing your degree?

- a) availability of library resources
- b) adequacy of laboratory facilities
- c) absence for a period of major adviser
- d) getting appointments with major adviser
- e) availability of thesis reviewers/committee members
- f) availability of computer time
- g) foreign language requirements
- h) finding an acceptable thesis/Plan B topic
- i) getting approval of thesis/Plan B
- j) change of major
- k) change of adviser
- l) departmental requirements
- m) Graduate School requirements
- n) psychological/physical/family issues
- o) financial factors (eg, funding; assuming job for financial reasons)
- p) other (please specify)

Comments:

If completing a master's degree, how many quarters elapsed between your earliest coursework used to meet degree requirements and the quarter/year of degree completion?

If completing a doctoral degree, how many quarters elapsed between your preliminary written and your preliminary oral examination?

If completing a doctoral degree, how many quarters elapsed between your preliminary oral examination and your final oral examination?

IV. Evaluation of your Department

How do you rate the opportunities offered in your department for students who are interested in: (Rate as "Excellent", "Good", "Fair", "Poor", or "No Opinion")

- a) Teaching only
- b) Teaching and research
- c) Research only
- d) Applied areas of the field

How do you rate the faculty of the department? (same ratings as above)

- a) in ability to teach
- b) in knowledge of the field
- c) in interest in intellectual growth of students
- d) in quality of their research
- e) in their interest in students' research
- f) in sensitivity to new/developing areas in the field

g) in sensitivity to student needs and interests

How do you rate the performance of your major adviser? (same ratings as above)

Comments:

Did your department contribute to your professional growth (yes/no)

- a) by encouraging you to attend professional meetings?
- b) by encouraging you to write for publication?
- c) by encouraging you to present papers at professional meetings?
- d) by providing contacts with important scholars and researchers, outside your own department, in your field, or in related fields?

Comments:

To what extent are the following common criticisms of graduate education valid for your department? (ranked "valid", "somewhat valid", or "not valid")

- a) encourages overspecialization
- b) stifles student creativity
- c) sets up too many hurdles
- d) lacks enough qualified faculty for programs offered
- e) assigns to graduate courses faculty not qualified
- f) rewards conformity; punishes individual initiative
- g) sets admission standards too low
- h) lacks interest in placement of graduates
- i) exploits graduate students as cheap labor
- j) others (please specify):

V. Evaluation of the Graduate School

How would you rank the helpfulness of the following Graduate School offices (ratings same as for evaluation of department)

- a) Prospective Student Office
- b) Admissions Office
- c) Graduate Student Services and Progress Office
- d) Fellowship Office
- e) Equal Opportunity Office

The Graduate School offices provide and process student forms and establish/enforce policies that affect all graduate students. Please comment on any problems you have encountered with the Graduate School Offices (eg, policies, forms, procedures):

VI. Funding

Please indicate which of the following forms of financial support (and for how many quarters) you received while a graduate student at the University of Minnesota:

- a) fellowship
- b) graduate teaching assistantship
- c) graduate research assistantship
- d) other.....

VII. Miscellaneous

How would you rate the climate at the University of Minnesota for the following student groups:

- a) women
- b) minorities
- c) international students
- d) gay/lesbian/bisexual students

How would you rate the overall quality of graduate students in your major?

If you had it to do over, would you attend the University of Minnesota for your graduate degree?

Would you recommend the University of Minnesota and/or your graduate program to someone else?

VIII. Recommendations

Make any recommendations you think might help the University of Minnesota graduate programs, policies, and/or procedures.

Recommendations concerning:

- a) Admissions practices and policies
- b) orientation of graduate students by graduate programs and the Graduate School
- c) graduate course offerings
- d) academic facilities
- e) assignment of major professors, thesis reviewers, and committee members
- f) requirements for the master's degree
- g) requirements for the doctoral degree
- h) job placement for graduates
- i) ways to expedite degree completion without lowering quality
- j) ways to improve the quality of your graduate program, the Graduate School, and/or the University of Minnesota
- k) role of graduate students in university and department affairs
- l) other:

Survey of Earned Master's Degrees
Awarded in
1993-94

Congratulations on earning a master's degree! This is an important accomplishment for you.

We request your cooperation in completing this voluntary survey. We are asking all persons who have completed the requirements for a master's degree to complete this survey. Please complete and return this form to the Graduate Student Services and Progress Office, Room 316 Johnston Hall.

The confidentiality of information you provide is carefully protected.

Survey data will be used for statistical purposes only. Information will be reported only in aggregate form or in a manner that does not identify information about any individual. Information from your form may be used for a University of Minnesota Graduate School longitudinal survey of master's recipients.

Thank you for your participation in this survey.

Post-Graduation Plans

- 1) How definite are your immediate postgraduate plans?
 - 0 ___ Am returning to, or continuing in, pre-master's employment
 - 1 ___ Am continuing my graduate education
 - 2 ___ Have signed a contract or made definite commitment
 - 3 ___ Am negotiating with one or more specific organizations
 - 4 ___ Am seeking a position but have no specific prospects

- 2) What best describes your immediate postgraduate plans?
 - 0 ___ Study (go to item 3)
 - 1 ___ Employment (go to item 4)
 - 2 ___ Military Service (go to item 4)
 - 3 ___ Other (specify _____) (go to item 4)

- 3) If you plan to undertake further study,
 - A) What will be the field of your study? Please enter number from Specialties List _____
 - B) What degree will you be pursuing?
 - 1 ___ master's
 - 2 ___ specialist
 - 3 ___ doctoral

4 ___ other (specify _____)

Go to item 5

4) If you plan to be employed, enter military service, or other,

A) For what type of employer will you be working?

Education

a ___ US 4-yr college or university other than medical school

b ___ US medical school

c ___ US jr. or community college

d ___ Elementary or secondary school

e ___ Foreign institution

Government

f ___ Foreign government

g ___ US federal government

h ___ US state government

i ___ US local government

Private Sector

j ___ Nonprofit organization

k ___ Industry or business

l ___ Self-employed

Other

m ___ (specify _____)

B) Indicate what your primary and secondary work activities will be by entering "1" or "2" in the appropriate box.

1 ___ Research and development

2 ___ Teaching

3 ___ Administration

4 ___ Professional services to individuals

5 ___ Other (specify _____)

C) In what field will you be working? Please enter number from Specialities List _____

Go to item 5

5) Where do you intend to live/work/study after master's graduation?

1 ___ in US (state _____)

2 ___ not in US (country _____)

Name of organization, if known _____

SURVEY OF EARNED DOCTORATES 1993-94

Please return this form to the GRADUATE DEAN for forwarding to
The Office of Scientific and Engineering Personnel, National Research Council • 2101 Constitution Avenue, N.W., Washington, D.C. 20418

Please print or type.

1. Name in full: _____
Last Name First Name Middle Name
 Cross Reference: Maiden name or former name legally changed _____

2. Permanent address through which you could always be reached: (Care of, if applicable) _____

Number Street City

State Zip Code Or Country if not U.S.

3. U.S. Social Security Number: _____

4. Place of birth: _____ or Country if not U.S. _____
State Date of birth: _____
Month Day Year

5. Sex: 1 Male
 2 Female

6. Marital status: 0 Single, never married
 1 Married
 2 Separated, divorced, widowed

7. Citizenship:
 0 United States, native
 1 United States, naturalized
 Non-United States:
 2 Permanent Resident of United States (Immigrant visa)
 ↳ _____
(Country of present citizenship)
 3 Temporary Resident of United States (Non-immigrant visa)
 ↳ _____
(Country of present citizenship)

8. Are you a person with a disability? Yes No
 If yes, is it: 1 Visual 2 Orthopedic (mobility)
 3 Auditory (hearing) 4 Vocal
 5 Other (specify) _____

9. What is your racial background? 0 American Indian or Alaskan Native
 (Check only one.) 1 Asian or Pacific Islander
 2 Black
 3 White

10. Are you Hispanic? No Yes → 0 Mexican American
 1 Puerto Rican
 2 Other Hispanic

11. How many dependents do you have? _____ Do not include yourself.
 (Dependent = someone receiving at least one half of his or her support from you.)

EDUCATION

12. Location of high school/secondary school last attended: _____ Date of graduation _____
State or Country if not U.S. from high school: _____
Month/Year

13. List below, chronologically, all colleges (including 2-year) and graduate institutions you have attended and each degree earned (if any). Be sure to give the years attended for ALL institutions attended. Include your doctoral institution(s) (and degree) at the end.

Institution/Branch	State/Country	Years Attended		Field of Study		Degree (if any)		
		From	To	Use Specialties List		Title	Granted	
				Name	Number		Mo	Yr
<i>EXAMPLE</i> Genesee Community College	NY	79	81	Math	498	B.S.	6	83
SUNY/Bufalo	NY	81	83	Computer Science	400			

If a baccalaureate degree (or equivalent) was never received, please check box.

14. How many years were you a full-time student between receiving your first baccalaureate degree (or equivalent) and receiving your doctorate (include the period spent on your thesis and/or dissertation). _____ (whole numbers)

15. Identify the field of your dissertation research and enter below the title of your dissertation. If a project report or a musical or literary composition is a degree requirement in lieu of a dissertation, please check box Name of field _____ Number of field _____
(Use Specialties List)
 Title _____

16. Name the department (or interdisciplinary committee, center, institute, etc.) and school or college of the university which supervised your doctoral program.
 Department/Institute/Committee/Program _____ School _____

17. Indicate your **primary** and **secondary** sources of support during graduate school by entering "1" or "2" in the appropriate box. Check (✓) all other sources from which support was received, if any. (Enter only one source as "1" and one source as "2.")

- Own/Family Resources
 01 Own Earnings
 02 Spouse's Earnings
 03 Family Contributions

- Federal Research Assistant
 22 NIH
 32 NSF
 52 USDA
 62 Other Federal

- Other Federal Support (continued)
 49 Other Dept. Education
 60 Veterans Administration
 53 USDA Fellowship
 69 Other Federal

- Student Loans
 80 Guaranteed Student Loan (Stafford Loan)
 81 Perkins Loan — formerly National Direct Student Loan
 89 Other Loan

- University-Related
 10 Teaching Assistant
 11 Research Assistant
 12 University Fellow
 14 College Work-Study
 19 Other

Specify _____

- Specify
 Other Federal Support
 21 NIH Traineeship/Fellowship
 29 Other HHS
 33 NSF Fellowship
 40 Patricia Roberts-Harris Fellowship — formerly G*POP (Department of Education)
 44 Title VI Foreign Language

- Specify
 U.S. Nationally Competitive Fellowships (Non-Federal)
 70 Ford Foundation
 71 Rockefeller Foundation
 73 Mellon Foundation
 78 Other Fellowship

Specify _____

- Specify
 Other Sources
 90 Business/Employer
 91 Foreign (Non-U.S.) Government
 92 State Government
 99 Other

Specify _____

18. When you receive your doctorate degree, how much money will you owe that is directly related to your undergraduate and/or graduate education (tuition and fees, living expenses and supplies, transportation to and from school)?

- 0 None
 1 \$5,000 or less
 2 \$5,001-\$10,000
 3 \$10,001-\$15,000
 4 \$15,001-\$20,000
 5 \$20,001-\$25,000
 6 \$25,001-\$30,000
 7 \$30,001 or more

19A. Please check the category that most fully describes your status for employment or study during the year immediately preceding the award of the doctorate.

- 0 Full-time employed → Go to item 19B →
 1 Held fellowship
 2 Held assistantship
 3 Part-time employed
 4 Not employed
 5 Other (specify) _____

B. If full-time employed, what type of position did you hold?

- 6 College or university, faculty
 7 College or university, non-faculty
 8 Elementary or secondary school, teaching
 9 Elementary or secondary school, non-teaching
 (11) Industry or business
 (12) Other (specify) _____

POSTGRADUATION PLANS

20. How definite are your immediate postgraduate plans?

- 0 Am returning to, or continuing in, predoctoral employment
 1 Have signed contract or made definite commitment
 2 Am negotiating with one or more specific organizations
 3 Am seeking position but have no specific prospects
 4 Other (specify) _____

21. What best describes your immediate postgraduate plans?

- Study**
 0 Postdoctoral fellowship
 1 Postdoctoral research associateship
 2 Traineeship
 3 Other study (specify) _____
 4 **Employment** (other than 0, 1, 2, 3)
 5 **Military service**
 6 **Other** (specify) _____
- For study plans go to Item 22
 For employment plans go to Item 23

22. If you plan to have a postdoctoral fellowship, associateship, traineeship, or otherwise undertake further study,

- A. What will be the field of your postdoctoral study? Please enter number from **Specialties List**. _____
- B. What will be the main source of financial support for your study research?
 0 U.S. Government
 1 College or university
 2 Private foundation
 3 Nonprofit, other than private foundation
 4 Other (specify) _____
 6 Unknown

Go to Item 24

23. If you plan to be employed, enter military service or other:

A. For what type of employer will you be working?

- Education
 a U.S. 4-yr college or university other than medical school
 b U.S. medical school
 c U.S. jr. or community college
 d Elementary or secondary school
 e Foreign institution
- Government
 f Foreign government
 g U.S. federal government
 h U.S. state government
 i U.S. local government
- Private Sector
 j Nonprofit organization
 k Industry or business
 l Self-employed
- Other
 m Other (specify) _____

B. Indicate what your primary and secondary work activities will be by entering "1" or "2" in the appropriate box.

- 0 Research and development
 1 Teaching
 2 Administration
 3 Professional services to individuals
 5 Other (specify) _____

C. In what field will you be working? Please enter number from **Specialties List**. _____

Go to Item 24

24. Where do you intend to live/work/study after graduation? 0 in U.S. _____ State _____ 1 not in U.S. _____ Country _____

Name of Organization, if known _____

City of Organization, if known _____

25. What is the highest educational attainment of your mother and father? Please circle.

Father:	Less than high school	High school graduate	Some college	Bachelor's	Master's	Professional	Doctorate
Mother:	Less than high school	High school graduate	Some college	Bachelor's	Master's	Professional	Doctorate
Codes for office use	1	2	3	4	5	6	7

Signature _____ Date _____

If you would like a summary of the results of this survey, please check box. (Available as funding permits.)

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Department of Educational Policy and
Administration
College of Education

275 Peik Hall
159 Pillsbury Drive S.E.
Minneapolis, MN 55455-0208
612-624-1006
Fax: ~~612-624-7496~~ 612-624-3377

Anne Petersen
Dean of the Graduate School
University of Minnesota
322 Johnston Hall
Minneapolis Campus

April 18, 1994

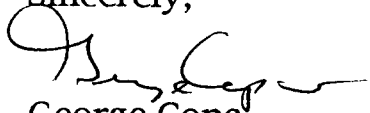
Dear Dean Petersen:


Your request for a report on the status of the Doctoral Program of the Leadership Academy comes an opportune time. In fact, we had been delaying our report until final admission decisions had been completed for our second cohort. Membership in this cohort is now firm and we can include this remarkable group of future leaders in our discussion of the Program.

We are very proud of our students and the work they have completed over the past year. And, we are sure that you will agree that we have an exciting model for professional graduate education that merits consideration across the University. If you would like to discuss the report, please call our offices at any time.

This letter would not be complete without a comment on the support you have given our efforts. Suffice it to say, you and the staff of the Graduate School have made this possible. Thank you very much.

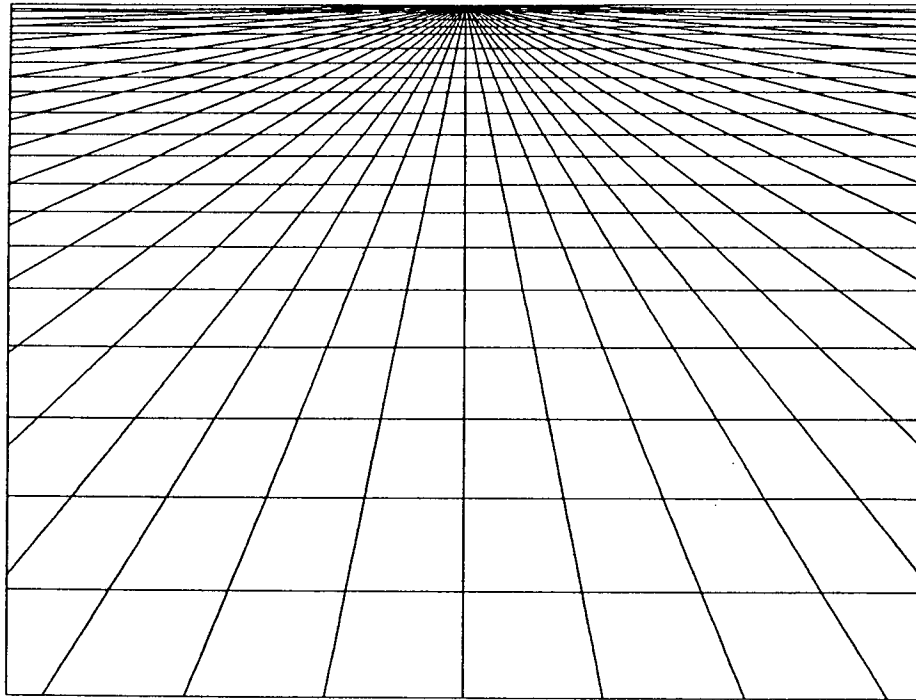
Sincerely,


George Copa
Dept. of Vocational and
Technical Education
420 VoTech
St. Paul Campus


William Ammentorp
Department of Educational
Policy and Administration
275 Peik
East Bank Campus

GC/WA:ths
Enc.

**ACCESS TO EXCELLENCE:
Restructuring the Graduate Experience**



A Status Report

Submitted by

THE LEADERSHIP ACADEMY

**on the Doctoral Studies in Administrative Leadership
for Two-Year Institutions of Higher Education**

*Presented by the
University of Minnesota Graduate School
and College of Education through the
Department of Educational Policy and Administration
and the Department of Vocational and Technical Education*

INTRODUCTION

The initial version of this report was prepared in the Spring of 1993 to summarize the development and implementation of a Doctoral Studies component by the Leadership Academy. This offering initially enrolled a cohort of Ed.D. candidates in the Winter of 1993, with a second cohort of students included in Winter, 1994. This report is offered as an addendum to the 1993 Access To Excellence document and should be read in the light of objectives set forth in the original Academy plan.

Since the preparation of the earlier report, the staff of the Leadership Academy has had the opportunity to explore many features of the Doctoral Studies component in depth. Students in the initial cohort have completed 26 graduate credits of work and have begun to identify their individual research interests. Faculty have had the opportunity to test interdisciplinary cooperation in all aspects of graduate education. Teaching, advising and student research development have drawn upon the contributions of the cooperating Departments and numerous other University resources. The success of these efforts is evident in the quality of instruction and the uniform high marks given in student evaluations. There is abundant evidence here that non-traditional approaches to graduate study can elicit enthusiastic student response while, at the same time, taking an uncompromising stance as to rigor and scope of instruction.

In the pages that follow, we revisit the questions raised in the 1993 report and add new evidence to support the conclusions we offer. Thus, the reader may wish to

examine the two reports at the same time to better determine what has been learned from this innovation.

REVISITING THE ISSUES

- 1) **Designing the Innovation:** How has the Academy accessed and used the suggestions of interested agencies and individuals in modifying the design for the Doctoral Studies component?

Four major groups have been involved in shaping the Doctoral Studies component during 1993-94. First and foremost, the Leadership Development Council has provided invaluable guidance which has resulted in a Development Plan. This Plan (Appendix 1) sets out specific objectives for the Academy, many of which have special significance for Doctoral Studies. As the membership of the Council has grown and diversified, new perspectives on higher education leadership in two-year colleges have emerged. These viewpoints are clearly visible in the content of courses and seminars and in the long-range goals of the Academy.

Of equal importance has been the relationship between the Academy and the leadership of higher education systems in Minnesota. Dr. Jay Noren, Chancellor of the newly-merged community and technical colleges and the state universities, has given enthusiastic support to the Academy. Dr. Carole Johnson, Chancellor of the Minnesota Technical Colleges, has extended her support by the loan of Dr. Jeanette Daines from her staff as the coordinator of the Academy. In these ways, the

Academy has gained in visibility and stature beyond what might be expected of a typical graduate program.

A third set of contributions has come from the faculty of the two Departments. In their planning efforts, the faculty has defined ways to integrate diverse requirements and to modify instructional content to meet the special needs of doctoral students with an interest in administrative leadership in two-year institutions of higher education. Faculty have also given freely of their time to evaluate applications and provide advice to students. They, too, are excited by the challenges and opportunities afforded by this innovation.

But the most important resource for modifying the design is the students who are enrolled in Doctoral Studies. Their open and creative evaluations have been the cause of many new features related to instructional purpose and method. They have also been sensitive to the nature of this innovation and have assisted in formulating policies and procedures which make Doctoral Studies 'user friendly.'

2) **Recruiting and Selecting Students:** How have admission standards and practices been applied in selecting the second cohort of students?

In the 1993 report, the point was made that the initial cohort was insufficiently diverse in its representation of both higher education systems (as participants were mainly from technical colleges) and cultural diversity. These shortcomings were given high priority in recruiting a second cohort (a listing of Cohort II participants is included in Appendix 2).

The second cohort is broadly representative of higher education systems (technical colleges and community colleges as well as those in high schools and four-year colleges and universities interested in the transitions to/from two-year institutions). Of the 24 students enrolled at the beginning of Winter Quarter, 1994, 7 were affiliated with community colleges, 12 with technical colleges, and 5 with other systems. Thirteen persons resided in the metropolitan area, 8 in outstate Minnesota and 2 in other states (North Dakota and Wisconsin). There were 15 women and 9 men. Diversity was also evident in the composition of the group with respect to work roles and titles: of the 24 participants, 6 reported their positions as teachers/instructors, 4 as deans, 3 as coordinators, 2 as vice provost/assistant superintendent, 2 as directors, 2 as specialists, 2 as managers, 1 as legislator, 1 as principal, and 1 as department chair.

Of greater significance is the cultural diversity of this group of students. With six minority students and one student from Taiwan enrolled, approximately one-third of this cohort is non-majority — a remarkable accomplishment for a Minnesota graduate program.

The cohort is also well qualified by traditional standards. Excluding students who were previously enrolled in the Graduate School and those affirmative actions taken by the Admission Committee, we find that the Undergraduate Grade Point average is 3.09, the Graduate Grade Point average is 3.67 and the Graduate Record Examination average is 1633.

3) **Access to Excellence:** What adaptations have been made to instructional content and delivery?

Academy staff have made changes almost too numerous to mention. There are, however, highlights which challenge many traditional practices.

- **Leadership Development Seminar:** Each quarter, students enroll in a two-credit experience designed to foster a critical examination of leadership challenges and practices, particularly as regards two-year institutions of higher education. The Seminar has become a forum for new perspectives on leadership — an opportunity for students to question existing paradigms and to engage in self-examination. The result is captured in the following quotations.

"The comments and insights were valuable. (The instructor) was able in a very short time to prepare much food for thought."

"(The instructor) was very stimulating and entertaining. The session was timely, well organized and visionary. The 'Lesson in Leadership' provided through the presentation of new designs (was) a fascinating concept. (Instructor) and (Instructor)'s session was exceptional!! Great discussion, 'thinking' environment. (Instructor) led the sessions particularly well. I appreciated the bibliography."

"(Instructor)'s presentation was outstanding and very useful in expanding my knowledge of intercultural study and comparative study cross-cultures."

"(Instructor) is a perfect model for me in getting myself to be more scholarly. (The instructor) is excellent at getting me to think."

- **Preliminary Examinations:** The traditional preliminary examination has been altered to focus on the student's research competence, knowledge of administration and development, and on her/his evaluation of personal leadership development. It has become a formative evaluation which makes it possible for

Academy staff to assist the student in creating a personal leadership development plan which integrates research, study and practice. It is important to note that the rigor of the examination has not been compromised. If anything, the examination is more demanding and relevant. The preliminary examination will consist of (a) one (1) four-hour written "sit-down" examination focused on organization/administration and leadership components of the program; (b) one (1) "take-home" examination focused on literature review for a research problem related to two-year institutions of higher education; (c) one (1) "take-home" examination targeted in relation to the specialization, and (d) a two-hour oral examination focused on the program of study and written examination responses.

- **Information Technology:** The focus on information resources and the use of Internet has paid unexpected dividends. Students have made this technology the centerpiece of their professional practice. The high quality of student research and writing shows that truly amazing gains can be made by integrating on-line access with bibliographic and word processing software. With the cooperation of University Libraries, the Academy has been able to ensure that students are not limited in their access to the knowledge base in their field of study.

- **Research Integration:** One of the major dilemmas of doctoral studies in the social sciences is the wide diversity of research methodology. The Academy has pursued development of an integrated, ongoing and individualized approach to teaching and learning in the research component of the program. Students begin by conceptualizing and designing models of systems and problems using software

developed by Dartmouth College and the Massachusetts Institute of Technology. The emerging research perspectives show that the doctoral students are aware of alternative research paradigms and engaged in developing skills appropriate to application in a professional leadership role.

- **Site Visits:** Academy staff have visited all students in the schools and colleges where they work. This has not only given the program a human touch, it has brought the issues of leadership 'home' to students. And, the Academy has gained a greater measure of understanding of the settings and problems experienced by students. These visits have focused on student research problems and have become a forum where students can engage in the discussions commonly experienced by those who are full-time on campus.

4) **Meeting Student Needs:** How have students evaluated their experiences?

As the above comments suggest, there has been a continuous and successful effort in soliciting and using the ideas and evaluations of students. But let them say this in their own words.

"I really appreciate the diversity, camaraderie, and openness of our cohort. We are stretching - truly!" (Cohort II student)

"My level of understanding issues in the state and nation is heightened. My 'view' of the profession is more optimistic. My sense of my ability to learn leadership is exciting." (Cohort II student)

"I'm sure mine will not be a new compliment considering all the students you have helped in the Leadership Academy; nevertheless, I'd like to add my compliment to your list. Your empathy and the Leadership Academy's extraordinary civility is a breath of fresh air in higher education." (Cohort II student)

"I can't believe we have one year of our program completed. I have learned so much in the past year; I must truly say I have never experienced better instruction at any level. I am 100% satisfied with Doctoral Studies."
(Cohort I student)

Another measure of Doctoral Studies is the performance of students in the courses they have taken within the program. In the work completed by Cohort I, we find that the average Grade Point is 3.66.

5) **Outreach:** How has the Academy made its work known to the field?

The conceptual foundations of the Academy have been shared with the field at several conferences. Papers have been presented at conferences of the Postsecondary International Network (of two-year institutions of higher education) held in London; the International Vocational Education and Training Association held in Bali, Indonesia; and the American Vocational Association (paper presentations and symposium) held in Nashville. The Academy is also an active participant in the University Council for Educational Administration Center for International Development in Education. This Center is located at Minnesota where it operates an information server on Internet.

At this writing, Academy staff are meeting with leaders in two-year colleges in Minnesota to identify training needs that the University might meet. It is anticipated that these meetings will result in a series of workshops and seminars of topical interest to Minnesota educators.

A "TOTAL QUALITY" DESIGN

In the initial stages of this project, Academy staff often referred to their efforts as an attempt to "make quality improvement work in instruction." This seemed at the time to be an ambitious goal, since most quality improvement efforts in education are found in support services and not in instruction. However, as experience with the cohort model has evolved, continuous improvement seems to be a fairly accurate description of the thrust of the Doctoral Studies component.

To be relevant, professional graduate education must be adaptive and innovative. It must deliver real value to students — ideas and practices which will enhance their professional performance. As a result, there is a transfer of the quality standards of the University to the field. There, the measure of a quality professional program is the extent to which it adds value to those whose practices are informed by its instructional activities.

This means that faculty, staff and students are engaged in a cooperative endeavor to make the very best use of knowledge. That is the foundation of academic quality improvement. But it's more than that. The cooperative spirit creates a true collegial relationship where new ideas can be proposed and tested against the challenges posed by the every-day world of practice. In a very real sense, a new partnership is formed where the spirit of inquiry is allowed to range across the human problems of our time.

VISION OF THE FUTURE

The Leadership Academy is envisioned as being respected—regionally, nationally, and internationally—as an exemplary center of administrative leadership development for two-year/postsecondary educational institutions throughout the world.

A fundamental premise of the Academy is that higher education is approaching a crisis brought about by heightened expectations, greater scarcity of resources, and unprecedented change. This is a crisis of global dimensions, for nations throughout the world are confronted with the challenge of improving educational systems.

The Academy is founded on the belief that, within the context of global challenge, two-year institutions of higher education hold great potential for providing the kind of education which will be most needed in the future. These institutions serve the most diverse populations, provide occupational and educational access of the broadest scope, and directly link educational programs to the economic and social development of a community and to further educational opportunities for individuals.

The vision evolving from this premise is one in which leadership is valued as a key prerequisite for designing and managing high quality educational systems.

As nations throughout the world seek to identify and develop leaders with the potential to design necessary educational improvements, the Academy will assist those interested in accessing emerging opportunities.

APPROACHES BEING USED

Study: Describe effective leadership and leaders in the context of two-year institutions of higher education

Educate: Provide opportunities whereby present and future leaders of two-year institutions of higher education can develop their interests, skills, knowledge, and abilities

Design: Create educational designs and development approaches that effectively address challenges inherent in administrative leadership of two-year institutions of higher education

Outreach: Develop and serve a worldwide network of individuals and organizations interested in leadership and design for two-year institutions of higher education

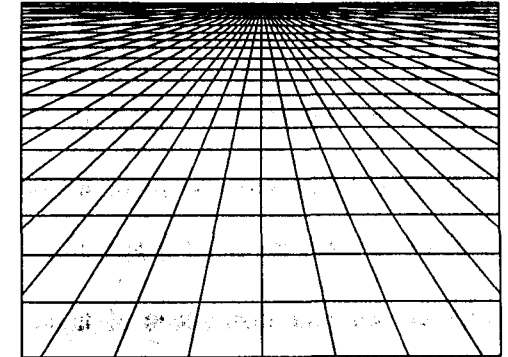
COMPONENTS being developed

Doctoral Studies through a cohort model

Leadership Institute through diverse strategies

Information WebWorks through interactive computer networks

DEVELOPMENT PLAN



of the
LEADERSHIP ACADEMY
for Administrative Leadership
in Two-Year Institutions
of Higher Education

A joint effort of the Department of Educational Policy and Administration and the Department of Vocational and Technical Education in the College of Education and the Graduate School of the University of Minnesota. (For further information, contact the Leadership Academy, 420B Vocational and Technical Education Building, 1954 Buford Avenue, St. Paul, MN 55108. (612/624-1740 or 612/624-1700)

The **MISSION** of the University of

Minnesota Leadership Academy is to (a) help persons interested in the administration of two-year institutions of higher education to further develop the advanced skills and knowledge needed to provide educational leadership in an increasingly complex environment, and (b) contribute to innovation and quality in the design of two-year institutions of higher education.

ACADEMIC STAFF

William Ammentorp

George Copa

Jeanette Daines

Charles Hopkins

Gary Leske

Darrell Lewis

Gary McLean

Marilyn Rossmann

Caroline Turner

VALUES OF THE ACADEMY

- Quality that exceeds expectations
- Diversity that reflects sensitivity toward all individuals and groups
- Equity in the treatment of participants and others
- Collaborative planning and working
- Appreciation for the contributions of others
- Creative design of programs and processes
- Openness in the consideration and resolution of problems
- Responsiveness to constituents
- Caring about those we serve, and those with whom we work
- "Cutting edge" thinking and planning for the present and future
- Knowledge founded in critical thinking and the examination of theory, practice, assumptions, and values.

The Leadership Academy and the University of Minnesota are committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

LEADERSHIP DEVELOPMENT COUNCIL

*Dr. Deena Allen, Associate Vice Chancellor
Minnesota Technical Colleges*

*Dr. William Ammentorp, Professor and Director
of Graduate Studies, Department of Educational
Policy and Administration, University of
Minnesota*

*Dr. Bernadine Bryant, Director of Human
Resources, Minnesota Community Colleges*

*Dr. Neil Christenson, Past President
Lakewood Community College*

*Dr. George Copa, Professor and Chair,
Department of Vocational and Technical
Education, University of Minnesota*

*Dr. Jeanette Daines, Senior Fellow and
Coordinator, The Leadership Academy,
University of Minnesota*

*Dr. Stanley Edin, President
Brainerd/Staples Regional Technical College*

*Dr. Cynthia M. Heelan, President
Colorado Mountain Community College*

*Dr. Gary Leske, Associate Professor and
Director of Graduate Studies, Department of
Vocational and Technical Education, University
of Minnesota*

*Dr. Kenneth Mills, President
South Central Technical College*

*Dr. John G. Red Horse, Dean
College of Liberal Arts
University of Minnesota-Duluth*

*Dr. Caroline Turner, Assistant Professor
Department of Educational Policy and
Administration, University of Minnesota*

*Dr. Steven R. Wallace, President
Inver Hills Community College*

WORK PLAN FOR 1993/94 . . .

The Doctoral Studies

- *Conduct a program of instruction for an initial cohort of doctoral students*
- *Prepare progress reports and design evaluation system*
- *Effect continuous improvements in the program content and delivery*
- *Continue to emphasize themes of continuous quality improvement, economic development, and international education*
- *Disseminate information concerning doctoral studies opportunities*
- *Establish membership of a second cohort to begin instruction in Winter Quarter, 1994*

The Leadership Institute

- *Design approaches for development of the Institute*
- *Initiate planning for a program of offerings in the summer of 1994*
- *Establish collaborative relationships in support of the Institute*
- *Seek additional development resources*

Information WebWorks

- *Establish collaborative relationships to design and implement the system*
- *Develop database resources through the doctoral studies cohort and other appropriate sources*
- *Pilot initial connections with doctoral studies cohort and an initial set of international sites*

For further information, contact 612/624-1740 or 612/624-1700; FAX 612/624-4720; E-mail: daine002@staff.tc.umn.edu

Leadership Seminar:

The Leadership Seminar will begin with an orientation session in January, 1994, and continue on a periodic basis throughout the academic year.

Coursework:

One core course will be offered during each Fall, Winter, and Spring Quarter, beginning with the Winter Quarter of the 1993-94 academic year. These courses will be delivered with flexible scheduling.

Two core courses will be offered during summer session.

Electives:

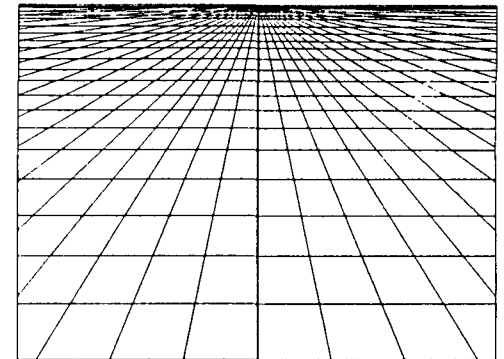
Electives will be scheduled and arranged by the individual student.

COSTS

Participants will be responsible for the associated costs of participation. These will include tuition for graduate credits (current resident tuition is \$174 per credit), related fees, travel expenses, and instructional materials.



*Doctoral Studies
in Administrative
Leadership for Two-Year
Institutions of Higher
Education*



*Presented by the
University of Minnesota
Graduate School and
College of Education
through the
Department of Educational
Policy and Administration
and the
Department of Vocational and
Technical Education*

DOCTORAL STUDIES

The doctoral studies component of the Leadership Academy is especially designed to help persons interested in the administration of two-year institutions of higher education further develop the advanced skills and knowledge needed to provide educational leadership in an increasingly complex environment.

In cooperation with the Leadership Academy, the Graduate School of the University of Minnesota offers an opportunity to earn the Ed.D. in either Educational Administration or Vocational Education through participation in cohort group instruction. This offering features a leadership development component that assists students in identifying and refining the leadership skills needed by administrators of two-year institutions of higher education. In the course of this experience, participants will be able to focus their leadership skills and plans, and explore their administrative interests and potentials.

REQUIREMENTS

The three-year plan of course work is designed on the assumption that, in order to meet credit requirements of the Ed.D., selected participants will register for one 3 credit course each quarter (9 credits per academic year), plus 6 credits of summer session and 6 credits of leadership seminar (which includes internship experiences) per year. Additional requirements are 36 credits of field study and 36 elective credits for a total of up to 127 credits. Individual programs will be planned based on previous graduate study.

LEADERSHIP DEVELOPMENT COUNCIL

The Leadership Academy will be guided by an advisory Leadership Development Council comprised of leaders in administrative roles who represent two-year institutions of higher education in Minnesota and University faculty. The Council will be instrumental in making this program an exemplary model for leadership development.

MAJOR FEATURES

- Leadership component where participants examine issues and problems to chart the future of two-year institutions of higher education.
- Cohort model of instruction where each newly admitted group of participants remains together for classes and seminars throughout the program.
- Innovative delivery systems including institutes, distance learning, and independent study.
- Field studies in which participants address current and emerging problems facing two-year institutions of higher education.

* * * * *

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APPLICATION PROCEDURES

Persons interested in participating in the doctoral studies component of the Leadership Academy should request application materials by contacting the Leadership Academy, 420B Vocational and Technical Education Building, University of Minnesota, 1954 Buford Avenue, St. Paul, MN 55108. The telephone number is 612/624-1740.

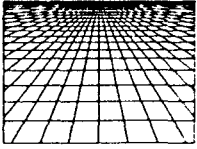
Application materials that must be submitted include the following:

- Graduate School Application with official transcripts of previous coursework (Due October 25, 1993)
- Supplemental Application Information with Resume (Due October 25, 1993)
- Letters of Recommendation (Due October 25, 1993)
- Results of Graduate Record Examination (Due October 25, 1993)

SELECTION PROCESSES & CRITERIA; NOTIFICATION

Selection criteria are developed by the Leadership Development Council, graduate faculty, and the Graduate School. Leadership Academy cohort participants are selected on the basis of (a) having career objectives in the administration of two-year institutions of higher education, (b) being academically qualified, and (c) being inclusive of under-represented populations.

Applications will be reviewed by the graduate faculty, and potential participants recommended to the Graduate School for admission. Selected participants will be notified during the month of December, 1993.



The Leadership Academy

DOCTORAL STUDIES PARTICIPANTS SPECIALIZING IN ADMINISTRATIVE LEADERSHIP FOR TWO-YEAR INSTITUTIONS OF HIGHER EDUCATION

A joint effort of the Department of Education Policy and Administration and the Department of Vocational and Technical Education in the College of Education, offered in cooperation with the Graduate School of the University of Minnesota

1994 Leadership Academy Participants: Cohort II January, 1994

Ms. JoAnne E. Coleman
Principal, Minneapolis Public Schools
2131 12th Avenue North
Minneapolis, MN 55411
(612) 627-2885

Mr. Michael T. Coleman
JTPA Coordinator
Minnesota Technical College System
50 Cedar Street
St. Paul, MN 55101
(612) 296-2256

Ms. Peggy J. DeVries
Teacher/Advisor
Anoka Ramsey Community College
200 Mississippi Blvd.
Coon Rapids, MN
(612) 422-3381

Ms. Penny L. Dickhudt
Telecommunications Manager
Minnesota Board of Technical Colleges
130 Capital Square Building
550 Cedar Street
St. Paul, MN 55101
(612) 296-0669

Mr. Jan E. Doebbert
Farm Business Management
Alexandria Technical College
1601 Jefferson Street
Alexandria, MN 56308
(612) 762-4504

Ms. Karen N. Gleason
Coordinator
Distance Learning Systems
Western Wisconsin Technical College
304 N. 6th Street
LaCrosse, WI 54602-0908
(608) 785-9133

Mr. Paul J. Gorman
Farm Business Management
South Central Technical College
1920 Lee Boulevard
North Mankato, MN 56002
(507) 625-3441 ext. 288

Ms. Karen J. Halvorson
Dean of Students
Dakota County Technical College
1300 145th Street East
Rosemount, MN 55068
(612) 423-8319

Mr. Kirby Kiefer
Fire Service Specialist
Minnesota Technical College System
550 Cedar Street
St. Paul, MN 55101
(612) 296-9452

Mr. Anthony G. Kinkel
State Legislator
453 State Office Building
St. Paul, MN 56155
(612) 296-2451

Ms. Marilyn Krasowski
Instructor and Coordinator
St. Paul Technical College
235 Marshall Avenue
St. Paul, MN 55102
(612) 221-1413

Mr. Kenneth E. Maddux, Jr.
Dean of the Center for Innovation
and Economic Development
St. Cloud Technical College
1540 Northway Drive
St. Cloud, MN 56303
(612) 654-5974

Ms. Esther Peralez
Director
Student Instructional Support
General College, University of Minnesota
128 Pleasant Street
Minneapolis, MN 55455
(612) 625-8087

Mr. Alan J. Peterson
Chair of the English Department
North Dakota State College of Science
800 6th Street North
Wahpeton, ND 58076-0002
(701) 671-2106

Ms. Yvonne Redmond-Brown
District Coordinator, Special Services
Richfield School District
7001 Harriet Avenue South
Richfield, MN 55423
(612) 861-8236

Ms. Josephine Reed-Taylor
Dean of Educational Services
Minneapolis Community College
1501 Hennepin Avenue
Minneapolis, MN 55403
(612) 341-7021

Ms. Rosa Rodriguez
Student Affairs Manager
St. Cloud Technical College
1540 Northway Drive
St. Cloud, MN 56303
(612) 654-5942

Mr. Lenee D. Ross
Dean of Student Services
Duluth Technical College
2101 Trinity Road
Duluth, MN 55811
(218) 722-2801

Ms. Tina M. Royer
Acting Vice-Provost
Brainerd Community College
501 W. College Drive
Brainerd, MN 56401
(218) 828-2525

Ms. Ann Joyce Sidoti
Director Student Services
Minnesota Community College System
550 Cedar Street, Suite 203
St. Paul, MN 55101-4798
(612) 282-2547

Ms. Mary Stafford
Assistant to the Superintendent
Independent School District 709
215 North First Avenue
Duluth, MN 55802
(218) 723-4117

Mr. Richard L. Tvedten
Curriculum Instructional Specialist
Minnesota Board of Technical Colleges
350 Capitol Square Building
550 Cedar Street
St. Paul, MN 55101
(612) 297-7315

Kia Witte
Instructor of Nursing
Inver Hills Community College
8445 College Trail
Inver Grove Heights, MN 55076-3209
(612) 450-8605

Ms. Chen-Li Yao
Associate Professor
Department of Chinese
National Central University
Taipei, Taiwan