UNIVERSITY OF MINNESOTA
Graduate School

Minutes of the Executive Committee Meeting
Tuesday, March 1, 1983
2:00 p.m. 331 Johnston Hall

Members present: Faculty representatives--Professors James Boen, Jerome Hammond, Dale Lange, Edward Sucoff, David Thompson, Gerhard Weiss; Duluth representative--Professor Thomas Jordan; guests--Professors Mario Bognanno, Peter Olin, Patrick Starr, and John White; administrative representatives--Deans Robert Holt (chair), Kenneth Zimmerman; student representatives--Brian Grogan, Karl Ruser, Bob Stevens, Fritz Weibel; Civil Service representative--Anne Aronson; staff--Andrew Hein, Klaus Jankofsky, Myrna Smith; secretary--Beverly Miller

I. FOR DISCUSSION

A. Presidential Task Force on Graduate Education and Research

Dean Holt called the committee's attention to the recently appointed Presidential Task Force on the Quality of Graduate Education and Research, to which he has been named as chair. He asked that this item be placed on the Policy and Review Council agendas, and that recommendations be developed for improving graduate education and research at the University. These recommendations would be brought to the Task Force for inclusion on its agenda.

B. Proposed Changes in Graduate School Tuition

Dean Holt addressed the issue of impending changes in tuition. He pointed out that it was likely that the objective in future would be to recover 35 percent of educational costs from tuition. The Graduate School's proposal for thesis credit registration must be considered in this context since the issue will not be how many dollars must be collected in Graduate School tuition, but how that financial burden will be borne among graduate students. It has been suggested that the thesis credit proposal be amended first by eliminating non-resident tuition among Graduate School students and second by prohibiting the inclusion of thesis credits in the "banding" proposal.

Mr. Stevens said that the Council of Graduate Students had raised five questions in relation to this issue: (1) How are the costs of individual graduate programs determined? (2) How does the proposal tie in with quality in graduate education? (3) Why would it be necessary to defer the elimination of non-resident tuition when other aspects of the thesis credit proposal could be adopted by fall, 1983? (4) Why were not all students to be allowed to transfer 8 thesis credits? (5) Why would not thesis credits be allowed in the "band?"

Dean Holt responded that costs are calculated by the Management Planning and Information Services Ofice; this is a complicated process which it is very difficult to address without being totally familiar with it. He said he believed that the amendments to the thesis credit proposal would make the University more competitive in attracting first class students from around the country by the elimination of non-resident tuition and would, thereby, strengthen the Graduate School Fellowship program. The elimination of non-resident tuition might not be possible by fall simply because more lead-time is required for the introduction of changes which have financial implications. Dean Holt said he would like to defer the issue of the transfer of thesis credits as this was an administrative detail affecting only a part of the students, which need not delay the proposal in its entirety. With respect to the use of the "band" for thesis credits, he said that the development of the "band" was to encourage students to take elective courses to expand and improve their programs. This would not happen if thesis credits could be taken in the "band." He pointed out that since tuition assessment in the future will hinge on recovering a given percentage of costs, the issue is irrelevant; the effect, if most students took their thesis credits in the "band," would be to force a compensating increase in the costs of course credits taken outside the "band" so that the same amount of money would be recovered.

There was further discussion of the possible introduction in the future of differential tuition rates calculated by the actual cost of programs. Concern was expressed about the way such costs were determined and the impact that differences in accounting practices from one unit to another have on these calculations whether or not actual differences in cost exist. Dean Holt said he was equally concerned that idiosyncracies in bookkeeping not be critical in making cost determination. He stressed that these issues were not a part of the present tuition proposals for the Graduate School.

C. Retrenchment of Graduate School Budget

Dean Holt reported that the Graduate School had been asked to retrench approximately $16,000 in the current year. Reductions for the coming year, he said, were not yet final.

D. Policies and Procedures for the Discontinuation of Graduate Programs

Dean Holt said that he would like to prepare a composite document for consideration by the Executive Committee at its next meeting; the document would be based on the discussions in the Policy and Review Councils. He asked whether there were individual issues considered particularly important. Dean Zimmerman said that the Languages, Literature and Arts Policy and Review Council had emphasized the differences which must be taken into account in such fields as Music, Theatre, and Art. Professor Lange stressed that numbers do not

measure quality, and that the document should differentiate those factors which were quantitative from those which were qualitative. Professor Jordan said he believed it important that a proposal for discontinuation of a program should at the outset clearly state who initiated the proposal and the basic reasons for it.

E. Recommendations of the Task Force on Doctoral Programs

Dean Holt said that the Graduate School will draw together the recommendations and comments of the Policy and Review Councils on the various recommendations of the Task Force for the next Executive Committee meeting. He asked that additional comments individuals might have be submitted quickly.

F. Grading Inflation, the Required G.P.A. for Masters' Programs and the Grading of Graduate Students in 5-Level Courses

Dean Holt asked the Committee for its advice on this matter. It was concluded that it is a small issue of quality which can be part of the larger discussions on improving the quality of graduate education and research.

G. Recommendations from the Language, Literature and the Arts Policy and Review Council on the Full-Time Load Definition for Foreign Students

Dean Hein reviewed the background for the present regulation. He pointed out that the student visa, on which most foreign students enter the University, requires that they be engaged full-time in work which is directly related to their degree programs. He stressed that the holding of a graduate assistantship, where this does not involve work which the student can actually offer toward his degree, cannot under Immigration and Naturalization Service rules be counted in determining full-time status. He said that, while it may be true in some areas that courses tend to be in four credit modules, this is not true throughout the University, many one-, two-, three-, and even five-credit courses being available. The requirement that a student be taking 9 quarter credits (or be doing the equivalent in work outside the classroom) is based on the assumption that a student who is full-time should be able to complete the degree in one and one-half to two years. He said that he did not believe that altering the present operational rule would solve any problems and might, in addition, endanger the University's credibility with the Immigration and Naturalization Service. Disagreements over whether 8 or 9 credits are adequate would become disagreements over whether 7 or 8 credits should be acceptable. He pointed out that certifications from advisers of degree work being pursued outside the classroom are accepted when a student is not actually engaged in 9 credits of coursework.

Since Professor Weiss, chair of the Council making the proposal, had had to leave the meeting before this discussion, it was decided to carry the item forward.

II. FOR ACTION

A. Approval of the Minutes of the Meeting of December 14, 1982

The minutes were approved as submitted.

B. Proposal for the Introduction of a Plan B Option for the M.S. Degree in Physics, Duluth

Professor Thompson reported that the proposal had been approved by the Physical Sciences Policy and Review Council. Professor Jordan added that students were interested in it because it would permit them to broaden their disciplinary base in a way which the Plan A did not.

The proposal was approved unanimously. (Copy of proposal attached with these minutes.)

C. Proposal for the Establishment of a Program for a Master of Landscape Architecture Degree

Professor Thompson reported that the Physical Sciences Policy and Review Council had approved the proposal. Professor Sucoff said the Plant and Animal Sciences Policy and Review Council had also approved, but contingent upon assurances of budgetary support. It was pointed out that a letter had been received from Dean Staehle of the the Institute of Technology after the proposal was considered by the Council. Mr. Stevens pointed out that students were not represented on the program review group which would assess the program annually. Professor Olin said this was an oversight which would be remedied.

Dean Holt asked whether the course requirement LA 8600, Teaching Practicum, was seen as a problem. It requires that students assist in teaching one of the undergraduate courses. Professor Olin said that some students would be teaching ultimately and that the M.L.A. is considered a terminal degree, therefore this was considered appropriate. Mr. Ruser said the question was raised in the Council of Graduate Students, but it was not seen as a problem. Professor Boen said he thought it fell well within the definition of an academic experience.

A question was raised about the credit distribution between major and related fields, and whether these met the usual Graduate School requirements; there is some ambiguity on the matter. Professor Olin said he thought that Graduate School requirements had been met; this was the intention. Dean Holt asked that this matter be resolved with Dean

Hein and that clarification about courses comprising the major be incorporated into the final proposal.

The proposal was approved and will go forward for action by the Board of Regents and the Minnesota Higher Education Coordinating Board.

D. Proposal to Disestablish the Program for the M.A. Degree in the Field of History, Duluth

Professor Hammond said that this proposal had come from the faculty of the program. Professor Jordan pointed out that the letter should be regarded as a surrender document. The department had no more teaching assistants and would lose a faculty member; there were simply not enough resources to go on. He said that they were sorry to see the program go as good scholarship was developing.

Professor Weiss asked whether disestablishment would affect other programs. Dean Jankofsky said it would have an impact on the English M.A. program, whose students often use History as a minor; a reduction in 5-level course offerings in History is a possibility. He pointed out that continuing to offer a minor would require a willingness on the part of the faculty to serve. This issue had not been addressed at the Council meeting, at which there was no Duluth representative.

The proposal was tabled. Dean Holt said that he would examine the pros and cons of the issue of the minor and would be in touch with the Council.

E. Proposal to Disestablish the Program for the Ph.D. Degree in the Field of Obstetrics and Gynecology

Professor Boen reported that the proposal, which originated with the faculty of the program concerned, had been approved by the Health Sciences Policy and Review Council. Dean Zimmerman pointed out that this recommendation was a consequence of the program review; many small clinical programs rarely have degree candidates.

The proposal was approved unanimously. It will be forwarded to the Board of Regents.

F. Proposal for Changes in the M.A. Program in Industrial Relations and the Addition of an Evening Program for the Degree

Professor Hammond said that the proposal had been approved by the Social Sciences Policy and Review Council. Professor Bognanno said that the proposal is a repackaging of the day school program, and an extension of it into the evening as well.

Professor Hammond said that the Council had particularly noticed the increase in the required number of credits for the degree. Professor Bognanno said that this revision, which is a major one, will permit

specialization in a particular area of Industrial Relations. The program will be inloaded with the regular faculty which may have to be augmented.

Dean Holt pointed out that the proposal suggests that the final oral is not a defense of the thesis since it occurs before the full examining committee has certified the thesis as ready for defense. Professor Bognanno said this was not the intention. Dean Holt asked that the wording be clarified with Dean Hein; the appropriate changes will be included in the final proposal.

Professor Lange asked about a foreign language requirement and the availability of research material. Professor Bognanno said that much is in the English language but that individuals may require foreign language facility depending upon their specialization. (Copy of proposal attached with these minutes.)

III. FOR INFORMATION

A. Disaffiliation of the Relationship between the Mayo Graduate School of Medicine and the University of Minnesota Graduate School, Constitutional Changes

Dean Zimmerman reported that all students enrolled at Mayo have been contacted to determine whether they will wish to finish their degrees as University students or whether they will take them from Mayo. He added that all special arrangements between the Graduate School and the Mayo Graduate School have been discontinued.

B. Operations Research

Dean Holt indicated that in the change in the deanship the recommendation for the disestablishment of the program had not been sent forward in a timely way. An inquiry from the office of the Vice President for Academic Affairs had brought this to his attention and a letter transmitting the December action of the Executive Committee had then promptly been sent forward.

Professor Thompson said that the Physical Sciences Policy and Review Council had concluded the matter should be reraised because irregularities were noted in procedure.

A motion to reconsider the proposal to disestablish the program was made.

Professor Starr distributed a summary statement concerning the program. He said that he believed that the analysis by the external review committee was inadequate; the recommendatons regarding obtaining departmental status for the program were, he said, irrelevant to its actual existence and status. The remarks concerning the failure to achieve a

truly interdisciplinary nature were not satisfactory. He said that faculty other than those in Mechanical Engineering have been involved and that those from that department are in essentially different "disciplines;" because of their areas of specialization they tend to publish in different journals. Students have not complained of the program, nor has criticism come from industries hiring the graduates. Elimination of the program, he added, would have no profound effect on the college.

Dean Zimmerman asked him to respond to the issue of the recommendation of the Prager subcommittee, and to the question of the willingness of some of the appointed faculty to involve themselves in the program. Professor Starr said that, although the subcommittee had polled the faculty, some members were on leave. He added that in a small program like this there are limited opportunities for advising. Faculty participate by teaching courses, supervising Plan B papers, and so on. In this respect, he said, the program does not differ from such programs as Control Sciences and Fluid Mechanics.

Professor Sucoff asked whether Operations Research students could have pursued their program under other major rubrics. Professor White responded that this was unlikely as many are not engineers. In Mechanical Engineering, for example, the graduate committee might have been reluctant to admit for this reason.

Professor Thompson asked what would become of the courses which are offered, many people are concerned that the courses continue to be available. Professor White replied that they would probably continue as they are.

Professor Starr said that disestablishment of the program would have the primary and perhaps only effect of changing options for students. Opportunities would be lost.

Professor Jordan said he believed that an existing program should remain unless there were compelling financial or quality reasons for disestablishment.

Dean Zimmerman said that the conclusions of the review were not flattering. He pointed out that a letter from Deans Staehle and Ibele to the program faculty, which was essentially sympathetic and asked that steps be taken to deal with issues raised by the review, went unanswered. Professor Thompson added that the Prager subcommittee survey of the program faculty, although it mentioned possible disestablishment of the program, did not elicit a strong response, only half of the faculty replying.

Following the departure of Professors Starr and White, the discussion was continued. Professor Thompson said that to the extent

possible measures of quality identified by Dean Ibele were covered in the Council's consideration of the matter. However, he said that on the basis strictly of numbers there was not a clear cut case for disestablishment. He said he believed that the lack of interest evidenced by the failure of the faculty to respond to the letter of the deans, or to the survey by the Prager subcommittee, was very important. Professor Thompson concluded that the review of the program came to be negatively interpreted because of the long passage of time and the eroding of resources.

A secret ballot was called for. The motion to disestablish the program was approved by a vote of 10 to 2.

C. Report from the Council of Graduate Students

No report.

D. Spring Quarter Meetings of the Executive Committee

Dean Holt asked about the possibility of having one meeting per quarter. Professor Hammond suggested scheduling one regularly but holding special meetings as necessary. Because there will be a number of agenda items during spring, one meeting has been scheduled for June 2 at 1:30 p.m. in room 331 Johnston Hall; a second meeting will be scheduled for May after consultation with members.

E. Letter from Dean Gault Concerning Honesty in Research

The committee was asked to consider the issue for discussion at the next meeting. Professor L. E. Scriven, chair of the General Research Advisory Committee, will be asked to attend and to discuss research issues in general and this issue in particular.

F. Associate Dean Search

Dean Holt reported that Dean Wallace would be leaving the Graduate School at the end of winter term. He said that although his term, as that of Dean Jankofsky who has agreed to stay to the end of the year, was coterminous with Dean Ibele's, he had agreed to stay on for the additional quarter to see the work of the General Research Advisory Committee to completion for the year. Dean Holt will be considering the matter of the appointment of a new dean.

G. Commencement Ceremonies

Dean Holt said that he wished to consider the reorganization of the Graduate School's commencement procedures and to review the possibility of conducting only one ceremony a year, although four graduation dates would continue to be used. He said he would like to see

greater University involvement in the event, perhaps combining it with the occasion of the annual Guy Stanton Ford Lecture in spring term. He said the administrative aspects will be explored and student reactions solicited.

H. Other Issues

Dean Holt asked whether there were other issues the members would like to bring before the Executive Committee.

Professor Thompson suggested that in looking at the criteria for disestablishment, the matter of de facto disestablishment, as in suspending admissions before disestablishment is decided, should be addressed.

Professor Lange asked that the issue of a foreign language requirement be raised. Dean Holt said that this could be a matter for the agenda of the Task Force on the Quality of Graduate Education and Research, together with the issue of other Graduate School-wide requirements.

Dean Jankofsky asked whether some Executive Committee meetings might be thematic rather than strictly business. Dean Holt replied that an end of the year meeting might be useful for this.

Professor Hammond asked that the use of limited teaching status appointments for graduate courses be reviewed. Professor Boen said he thought this was a serious issue also. Dean Holt replied that incentives should be sought which would reduce the use of such limited appointment; this was a matter he would be considering.

Professor Sucoff said that he believed that the Task Force on the Quality of Graduate Education and Research should have broad faculty support. He thought a memorandum from the Dean on the issues would be helpful. Dean Holt said that the letter of charge would be distributed; and after the first meeting of the Task Force it might be possible to get information out before the first Policy and Review Council meetings in the spring. He said the Task Force may have open meetings to solicit reactions. Professor Sucoff said he believed matters were urgent because of the speed with which budgetary decisions are being made which will govern the situation for two years.

The meeting was adjourned.

Respectfully submitted,

Beverly D. Miller
Assistant to the Dean

College of Letters and Science

UNIVERSITY OF MINNESOTA
DULUTH

Department of Physics
371 Marshall W. Alworth Hall
Duluth, Minnesota 55812
(218) 726-7124

December 16, 1982

Dean K. Zimmerman
Graduate School
Johnston Hall
101 Pleasant Street S.E.
University of Minnesota
Minneapolis, MN 55455

Dear Dean Zimmerman:

Enclosed is the proposal for a Plan B Master of Science degree in physics at Duluth. (Extra copies are being sent separately.) This proposal was approved by the UMD Graduate Faculty Committee December 15. It has also been approved by the Dean of the College of Letters and Science and the Vice Provost for Academic Administration at Duluth. We would like it to be considered by the Physical Sciences Policy and Review Council at its next meeting.

I would like to make two comments about the proposal. The few lines titled Proposed changes (on the second page of Section III, part B) are meant to be only the changes to be made in the Present description (written out on the first page). All the other paragraphs of the present description of the Plan B program are meant to apply to the proposed Plan B program as well.

We would like to have more 8000-level courses than our present 8199. Seminar: Selected Topics, and 8200. Research. We will look for opportunities to add some as this program develops. The Relativistic Quantum Mechanics course could be given an 8000 number.

Sincerely,

Thomas F. Jordan

Thomas F. Jordan
Director of Graduate Studies

TFJ:dh

Enc.

Proposal for: Addition of Physics M.S. Plan B to existing Physics M.S. Plan A

Submitted by the: Physics Department

of the: College of Letters and Science, Duluth

The proposal has been reviewed and approved by:

Howard G Hanson 12/8/82
Department Head (Date)

George Rapp Jr. 9 XII 82
Dean, College of Letters and Science, Duluth (Date)

Paul E Lurtz 17 Dec 82
Vice Provost for Academic Administration, Duluth (Date)

Thomas F Jordan 15 Dec 1982
Graduate Faculty Committee, Duluth (Date)

Physical Sciences Policy and Review Council (Date)

Dean, Graduate School (Date)

Vice President, Academic Affairs (Date)

UNIFORM PROGRAM INVENTORY AND PROPOSAL FORM

SECTION I
Program Proposal Abstract and Cover Sheet
(See Attached Instructions)

1 Unit, Campus or College College of Letters and Science; Duluth Code No. ____ (2)

I. General Information

A. Program Title M.S. (Plan B) in Physics (8–27)

B. Program Review Category: (check one) ___X___ (28) Regular
_____ (29) Experimental (If Experimental, give Reporting Date: ____ (30) / ____ (32) ____ (34))

C. Proposed Implementation Date: 9 (36) / 1 (38) / 83 (40)

D. Program Length: Total Cr/hr 44 (42–45) Classroom _____ (46–49) Laboratory _____ (50–53)

E. Administrative Unit Immediately Responsible for Program: Physics Department, UMD (54–73)

F. Describe the Program (in 50 words or less):

2 A Physics M.S. Plan B program would be added to the existing Physics M.S. Plan A program at Duluth. This would serve students who want a broader education in physics and related fields of mathematics,

3 computer science, or possibly other sciences, as preparation for employment or Ph.D. studies.

4

5 G. Expected student interest in the program during the first year of operation, and when the program reaches full operating level:

	First Year 83-4 (Yr.) (8)		Full Operation 84-5 (Yr.) (40)	
	Number (Headcount) Expected	Student Credit or Contact Hours	Headcount Capacity	Student Credit or Contact Hours
a. Enrollment — Program Enrollees	1 (10–13)	44 (25–28)	3 (42–45)	132 (57–60)
Other Students	(14–17)	(24–32)	(46–49)	(61–64)
Total	1 (18–21)	44 (33–36)	3 (50–53)	132 (65–68)
b. Program Graduates/ Completors	(22–24)	(37–39)	2 (54–56)	88 (69–71)

FORM NO. 25

A. Projected Costs of the Program: None ; II. Budget Data

	First Year (8)				Full Operation (8)			
	New		Re-assigned		New		Re-assigned	
	No. FTE	Annual Cost	No. FTE	Annual Cost	No. FTE	Annual Cost	No. FTE	Annual Cost
a. Faculty	10 12	$ 16 20	57 59	$ 63 67	10 12	$ 16 20	57 59	$ 63 67
b. Civil Service	13 15	$ 21 25	60 62	$ 68 72	13 15	$ 21 25	60 62	$ 68 72
c. Equipment, Supplies, etc.		$ 26 30		$ 73 77		$ 26 30		$ 73 77
Total Direct Costs (a+b+c)		$ 31 35		$ 78 82		$ 31 35		$ 78 82
d. One-time Costs		$ 36 40		$ 83 87		$ 36 40		$ 83 87
e. Space Rental		$ 41 45		$ 88 92		$ 41 45		$ 88 92
f. Indirect Costs		$ 46 50		$ 93 97		$ 46 50		$ 93 97
g. Total Program Costs (a+b+c+d+e+f)		$ 51 56		$ 98 103		$ 51 56		$ 98 103

B. Expected Sources of Funds for Program:

	First Year:			Full Operation:		
	Dollar Amount	% of Annual Expend.	One Time Input	Dollar Amount	% of Annual Expend.	One Time Input
a. Local	$ 10 14	51	$ 65 69	$ 10 14	51	$ 65 69
b. State	$ 15 19	53	$ 70 74	$ 15 19	53	$ 70 74
c. Tuition	$ 20 24	55	$ 75 79	$ 20 24	55	$ 75 79
d. Federal	$ 25 29	57	$ 80 84	$ 25 29	57	$ 80 84
e. Private	$ 30 34	59	$ 85 89	$ 30 34	59	$ 85 89
f. Dedicated Fees	$ 35 39	61	$ 90 94	$ 35 39	61	$ 90 94
g. Other (Specify)	$ 40 44	63	$ 95 99	$ 40 44	63	$ 95 99
h. Total	$ 45 50	100%	$ 100 105	$ 45 50	100%	$ 100 105

C. If there are any formal arrangements with other institutions or agencies, (e.g. clinical sites, cooperation, joint programs) explain, giving names of institutions: _____

D. System Verification:

8 15 22

Authorized Institution or System Signature | Title | Date

29 39 40 42 47

Section III. The Proposal

A. Introduction

This is a proposal to add a Physics M.S. Plan B program to the existing Physics M.S. Plan A program at Duluth. This would serve students who want a broader education in physics and related fields of mathematics, computer science, or possibly other sciences, as preparation for employment or Ph.D. studies.

B. The Proposed Program

Present description:

PHYSICS

Degree-M.S. (Plan A)

Director of Graduate Study - Professor Thomas F. Jordan

Prerequisite for Admission - Undergraduate degree in physics or equivalent.

Language Requirement - None.

Major Requirements - A minimum of 20 credits in six approved physics courses numbered above 5103, including at least 8 credits chosen from 5123 or 5124 or 5125 (no more than one of these three courses), and from 5109, 5166, 5174, 5176, 5177, and 5178. Students who propose a more interdisciplinary concentration (e.g., in geophysics) may plan a different program appropriate to their needs and interests with their faculty adviser; such programs require approval of the director of graduate studies.

Related Field or Minor Requirements - Eight credits in a related field(s) outside of physics. They may include courses from more than one department; for example, courses in biology, chemistry, or geology may be used to provide an interdisciplinary approach to environmental problems. A student who wants to complete a traditional minor must earn a minimum of nine credits in one department outside of physics.

Other Requirements - Thesis; final oral examination.

Proposed changes:

Degree-M.S. (Plan A or B)

Other Requirements - Plan A: Thesis. Plan B: A total of 44 credits in graduate courses and a Plan B project consisting of the preparation of three papers in courses. A final oral examination for Plan A; a final oral or final written examination for Plan B at the discretion of the examining committee.

The objective is to provide broader education in physics and related fields of mathematics, computer science, or possibly other sciences.

The only requirements that would be different from those of the existing Plan A program are the larger number of credits required in courses and the Plan B papers to be written in conjunction with the courses. A list of courses and some sample programs with Plan B papers are attached.

C. Need

Students have requested this program. There are some students who plan to continue graduate study for a Ph.D. degree and do not want to do the specialized work required for a thesis at the masters level. They want a broad program that will allow them to learn more physics and improve their skills with mathematics and computers beyond the level they reached as undergraduates.

Other students plan to seek employment after finishing the master's degree. In many areas of technology a master's degree in physics will provide a better basis for a career if it involves a broader knowledge of physics coupled with mathematics and computer skills.

D. Similar Programs

This is similar to the M.S. program offered by the School of Physics on the Twin Cities campus.

E. Quality Control

Information about the physics graduate faculty is attached. The administration, review, and evaluation of the program would be the same as for the existing Plan A program.

F. Implementation

The program would begin September, 1983. It would require no new faculty, staff, administration, equipment, space or computer or library services; in fact it would require no resources not already available to students in the existing Plan A program. No new courses are proposed.

Attachment 1. Graduate Faculty in Physics at UMD

Staff Vitae:

Bo Casserberg
Howard Hanson
Thomas Jordan
John Kroening
Donald Olson
Michael Sydor

NAME: Casserberg, Bo R. DATE OF BIRTH: October 3, 1941

RANK: Associate Professor

DATE OF FIRST APPOINTMENT AT UMD: September 16, 1968

HIGHEST DEGREE, DATE & PLACE: Ph.D., 1968, Princeton University

EDUCATION:

B.Phys. Institute of Technology, University of Minnesota, 1964
Ph.D. Princeton University, 1968

PREVIOUS EMPLOYMENT:

Princeton University, Research Associate, Physics, Summer 1968
University of Wyoming, Visiting Lecturer, Physics, Summer 1969
Case Western University, NSF Research Participant, Summer 1970
University of Minnesota, Duluth, Assistant Professor, Physics, 1968-73
University of Minnesota, Duluth, Assistant Professor, Physics, 1973-

MEMBERSHIP AND POSITIONS IN PROFESSIONAL SOCIETIES:

Phi Beta Kappa
Minnesota Area Association of Physics Teachers
American Association of Physics Teachers

HONORS & AWARDS:

IT Degree awarded "with high distinction," 1964
Phi Beta Kappa, 1964
Tau Beta Pi (engineering honor society), 1964

RESEARCH AREAS:

Paramagnetic resonance

RESEARCH GRANTS:

NSF, Research Participation for College Teachers, $2,000, 1970-73
Graduate School Grant-in-Aid, $4,742, 1975

PUBLICATIONS:

"Nuclear Spins and Moments of In^{110} and In^{112*}," with E. A. Phillips, accepted for publication in Phys. Rev. C.

"Electric Field Effects on Exchange-coupled Paramagnetic Ion Pairs," with J. F. Reichert, submitted to Physics Letters.

RESEARCH IN PROGRESS:

UNIVERSITY COMMITTEES AND SERVICE:

Department Library Committee, 1970-78
Member of Graduate Faculty Committee, 1976-77
UMD Calendar Committee, 1976-77
Departmental Director of Graduate Studies, 1976-79

REFEREE ACTIVITY:

American Journal of Physics

PAPERS READ AT PROFESSIONAL MEETINGS:

"Nuclear Spins of As^{70}," with E. A. Phillips and W. G. Unruh, Division of Electron and Atomic Physics, Am. Phys. Soc. Meeting, November 1969.

"Al^{3+} Electric Quadrupole Interaction in Topaz," with A. B. Denison and L. J. Sims, Am. Phys. Soc. Annual Meeting, January 1970.

COURSES TAUGHT SINCE FALL 1969:

Elementary Physics (1001, 1002, 1003)
Elementary Physics Lab
Ideas in Physics (1010)
Highlights in Physics (1015)
General Physics (19, 1019)
Intermediate Modern Physics (50, 51, 3050, 3051)
Electricity and Magnetism (3061, 3062, 3081)
Research (3111)
Electrical Networks (3085)
Electrical Networks Lab
Advanced Lab (5094)
Electronics (5120)
Network Theory and Electronics (5121, 5122, 5123)
Theoretical Physics (113, 115, 117)
Theoretical Mechanics (5123)
Mathematical Methods (5124)
Electromagnetic Theory (5125)
Introduction to Solid State Physics (5150)
Electrodynamics (5174, 5175, 5176)

* Pending.

NAME: Casserberg, Bo R. DATE OF BIRTH: October 3, 1941

RANK: Associate Professor

DATE OF FIRST APPOINTMENT AT UMD: September 16, 1968

HIGHEST DEGREE, DATE & PLACE: Ph.D., 1968, Princeton University

EDUCATION:

B.Phys. Institute of Technology, University of Minnesota, 1964
Ph.D. Princeton University, 1968

PREVIOUS EMPLOYMENT:

Princeton University, Research Associate, Physics, Summer 1968
University of Wyoming, Visiting Lecturer, Physics, Summer 1969
Case Western University, NSF Research Participant, Summer 1970
University of Minnesota, Duluth, Assistant Professor, Physics, 1968-73
University of Minnesota, Duluth, Assistant Professor, Physics, 1973-

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Paramagnetic resonance

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"Electric Field Effects on Exchange-coupled Paramagnetic Ion Pairs," with J. F. Reichert, submitted to Physics Letters.

RESEARCH IN PROGRESS:

UNIVERSITY COMMITTEES AND SERVICE:

Department Library Committee, 1970-78
Member of Graduate Faculty Committee, 1976-77
UMD Calendar Committee, 1976-77
Departmental Director of Graduate Studies, 1976-79

REFEREE ACTIVITY:

American Journal of Physics

PAPERS READ AT PROFESSIONAL MEETINGS:

"Nuclear Spins of As^{70}," with E. A. Phillips and W. G. Unruh, Division of Electron and Atomic Physics, Am. Phys. Soc. Meeting, November 1969.

"Al^{3+} Electric Quadrupole Interaction in Topaz," with A. B. Denison and L. J. Sims, Am. Phys. Soc. Annual Meeting, January 1970.

COURSES TAUGHT SINCE FALL 1969:

Elementary Physics (1001, 1002, 1003)
Elementary Physics Lab
Ideas in Physics (1010)
Highlights in Physics (1015)
General Physics (19, 1019)
Intermediate Modern Physics (50, 51, 3050, 3051)
Electricity and Magnetism (3061, 3062, 3081)
Research (3111)
Electrical Networks (3085)
Electrical Networks Lab
Advanced Lab (5094)
Electronics (5120)
Network Theory and Electronics (5121, 5122, 5123)
Theoretical Physics (113, 115, 117)
Theoretical Mechanics (5123)
Mathematical Methods (5124)
Electromagnetic Theory (5125)
Introduction to Solid State Physics (5150)
Electrodynamics (5174, 5175, 5176)

* Pending.

NAME: Howard G. Hanson DATE OF BIRTH: January 22, 1920

RANK: Professor and Head

DATE OF FIRST APPOINTMENT AT UMD: September 16, 1947

HIGHEST DEGREE, DATE AND PLACE: Ph.D., 1948, University of Wisconsin

EDUCATION:

B.S. Minnesota State University, St. Cloud, 1943
Ph.D. University of Wisconsin, 1948

PREVIOUS EMPLOYMENT:

University of Wisconsin, Teaching Assistant, 1944-47
University of Minnesota, Duluth, Assistant Professor, 1947
University of Minnesota, Duluth, Assistant Professor and Head, 1951
University of Minnesota, Duluth, Associate Professor and Head, 1955
University of Minnesota, Duluth, Professor and Head, 1959
Oak Ridge National Lab, Tennessee, Summer 1958
Oak Ridge National Lab, Tennessee, Summer 1959
Holloman Air Force Missile Base, New Mexico, Summer 1960
Lawrence Radiation Lab, California, Summer 1961
Lawrence Radiation Lab, California, Summer 1962

MEMBERSHIP AND POSITIONS IN PROFESSIONAL SOCIETIES:

American Association of Physics Teachers
American Physical Society
American Association for the Advancement of Science
Sigma Xi
Minnesota Area Association of Physics Teachers
Positions:
Council Member, American Association of Physics Teachers
Chairman of Search Committee appointed by president to find physicist to serve as Editor of Resource Letters and Reprint Books published by American Association of Physics Teachers, 1978.
National Representative, Minnesota Area Association of Physics Teachers 1965-1979
Past President, Minnesota Area Association of Physics Teachers

HONORS AND AWARDS:

Graduated with Honors, Minnesota State University, St. Cloud, 1943
Physics Department Physics Fellow, University of Wisconsin, Madison, 1946-47
Sigma Xi
NSF Faculty Fellowship, Sweden, 1963
Who's Who in America, American Men of Science, Who's Who in the Midwest, Who's Who in Science

RESEARCH AREAS:

Atomic Fluorescence
Random Geometrics

RESEARCH GRANTS: (Past 10 years only)

3/68-2/69	ONR, Atomic Fluorescence of Alkali Halides	$18,938
3/69-2/70	ONR, Atomic Fluorescence of Alkali Halides	18,811
3/70-2/71	ONR, Atomic Fluorescence of Alkali Halides	15,021
5/73-12/74	ONR, Randomly Spaced Spheres	18,000
		$70,770

RESEARCH IN PROGRESS:

Voronoi Cell Properties Study
Polarization of Atomic Fluorescence of Sodium Iodide

UNIVERSITY COMMITTEES & SERVICE: (Past 10 years only)

UMD Computer Committee (ad hoc), 1969
UMD Science Building Remodeling Committee, 1969
UMD Campus Safety and Civil Defense Comittee, 1969-71
UMD Campus Safety and Civil Defense Comittee, Chairman, 1969
UMD Student Behavior Comittee, 1970-71
UMD Building Comittee (Classroom Laboratory Bldg.), 1970-75
UMD Faculty Assembly, 1971-72
All University Library Committee, 1970-72
UMD Campus Assembly, 1974-77
UMD Radiation and Hazard Committee, 1974-79
UMD Internal Review Committee, Biology, 1976-77
UMD CLS Administrative Committee

REFEREE ACTIVITY:

NSF research proposal, Alkali Halide Study Instrumentation, Fall 1980.

PAPERS READ AT PROFESSIONAL MEETINGS: (Past 10 years only)

"Points, Spheres, and Voronoi Cells," Minnesota Area Association of Physics Teachers, St. Olaf College, November 1976.
"Spheres," Minnesota Academy of Science, UMD, May 1969.

PUBLICATIONS:

(1) "Quenching of NaI Fluorescence by H_2, HCL, CO_2," J. Chem. Phys. 23, 1391 (1955).

(2) "Fluorescence Intensity Ratio of Sodium Doublet Observed in the Optical Dissociation of Sodium Iodide Vapor," J. Chem. Phys., Vol. 27, 491, Aug. 1957.

(3) Report No. Dinal 838.3P, Project No. 838P; Contract No. DA-11-022-ORD-1223. Technical Report, "Quenching of Fluorescence by Foreign Gases and Vapors." Released by O.D.R. to Office of Technical Services (O.T.S.) Oct. 28, 1957.

PUBLICATIONS: (cont.)

(4) "Luminescence Emission Spectra of Lithium Iodide Scientillation Crystals," R. B. Murray, H. G. Hanson and J. J. Manning. Neutron Physics Division Annual Progress Report ending Sept. 1, 1958, ORNL 2609, p. 138.

(5) "Scintillation Properties of Non-activated Lithium Iodide," R. B. Murray, H. G. Hanson and J. J. Manning. Neutron Physics Division Annual Progress Report ending Sept. 1, 1958, ORNL 2842, p. 197.

(6) AFOSR-TR-60-150 (Technical Report), Dec. 1960, Holloman Air Force Base, N.M. "On the Use of a Radioactive Source in the Velocity Measuring Sensing-Head on a Sled on the High Speed Track," Howard E. Carr and Howard G. Hanson

(7) "UCRL-6539 Explosive Flash Bomb Luminosity Factors," David C. Oakley and Howard G. Hanson, Sept. 11, 1961.

(8) "Explosive Flashbomb Luminosity Factor," J. of the Soc. of Motion Picture & Television Engineers, p. 920, Dec. 1962, with David C. Oakley.

(9) "Rotational analysis of $^{1}-^{1}$ bands of ND," Howard Hanson, Ingvar Kopp, Mona Kronekvist. Arkiv for Fysik Vol. 30, 1, 1965.

(10) "Doppler Line Shape of Atomic Fluorescence of Sodium Iodide," J. Chem. Phys., Vol. 47, 4773 (1967).

(11) "Simulated Random Sequential Filling of Space by Non-Touching Uniform Spheres," Final ONR report, Contract N00014-67-0013-0033, Task NR 042-314.

(12) "Voronoi Cell Properties from Simulated and Real Random Spheres and Points." J. Statist. Phys. Vol. 30, No. 3 (to be published, Mar. 1983).

ABSTRACTS:

(1) "The Heat of Sublimation of Sodium Iodide," Am. J. of Phys., Vol. 21, Oct. 1953, p. 584.

(2) "The Quenching of Sodium Iodide Fluorescence by Various Gases and Vapors," Bulletin of the American Physical Society, Vol. 29, June 1954, p. 21.

(3) "Sodium D-Lines Intensity Ratio from Optically Dissociated NaI," Bulletin of the American Physical Society, Vol. 11 1, 22 (1956).

(4) "Fluorescence of Sodium Iodide," Am. J. Phys., Vol. 24, p. 298, April 1956.

(5) "A Centripetal Force Experiment," Am. J. Phys., Vol. 23, p. 484, October 1955.

(6) "Sodium D-Lines Intensity During Warmup of Sodium Arc Lamp," Am. J. Phys., Vol. 25, p. 327, May 1957.

PUBLICATIONS: (cont.)

(7) "Speed of Light on a Positron-Electron Chain," p. 134, Am. J. Phys., Vol. 25, Feb. 1958.

(8) Luminosity Study of Explosive Shocked Argon," Am. J. Phys., Vol. 30, p. 394, May 1962.

COURSES TAUGHT SINCE FALL 1969:

Elementary Physics (1001, 1002, 1003)
Elementary Physics Lab
Highlights in Physics (1015)
Physics for Elementary Education (Sci 18, Phys 1020)
Physics for Elementary Education Lab
Introduction to Physics (1030, 1031)
Applied Physics (1037)
General Physics (1107, 1108, 1109)
General Physics Lab
Advanced Lab (94)
Seminar (99, 3099)
Atomic Molecular Structure (5160)
Research in Physics (8200)
Energy (IS 1101)

NAME: Jordan, Thomas F. DATE OF BIRTH: June 4, 1936

RANK: Professor

DATE OF FIRST APPOINTMENT AT UMD: September 16, 1970

HIGHEST DEGREE, DATE AND PLACE: Ph.D., 1962, University of Rochester

EDUCATION:
B.A. University of Minnesota, Duluth, 1958
Ph.D. University of Rochester, 1962

PREVIOUS EMPLOYMENT:
University of Rochester, Research Associate, Physics, 1961-62
University of Rochester, Instructor, Physics, 1962-63
University of Pittsburg, Assistant Professor, Physics, 1964-67
University of Pittsburgh, Associate Professor, Physics, 1967-70
University of Minnesota, Duluth, 1970-
Visiting Professor, University of Rochester, 1976-77

ADDITIONAL EXPERIENCE:
Summer Institute for Theoretical Physics, University of Wisconsin, 1965
Summer - Physics Division, Aspen Institute for Humanistic Studies, Aspen, Colorado, 1966
Summer Institute for Theoretical Physics, University of Colorado, 1967
Summer - International Centre for Theoretical Physics, Trieste, Italy, 1968

MEMBERSHIP AND POSITIONS IN PROFESSIONAL SOCIETIES:
Sigma Xi

HONORS AND AWARDS:
National Science Foundation Postdoctoral Fellow, University of Bern, Switzerland, 1963-64
Alfred P. Sloan Research Fellow, 1965-67

RESEARCH AREAS:
Classical Relativistic Particle Mechanics
Relativistic Quantum Mechanics
Mathematical Physics
Hydrodynamics

RESEARCH GRANT:

RESEARCH IN PROGRESS:
Classical Relativistic Particle Mechanics
Relativistic Quantum Mechanics
Mathematical Physics
Hydrodynamics

UNIVERSITY COMMITTEES AND SERVICE:

Graduate Faculty Committee, UMD
Advisory Committee for D. Garber
Director of Graduate Studies for Physics
Physics Library Committee
Physical Sciences Policy - Review Council - Graduate School
Placement Committee, UMD
Internal Committee for Chemistry Graduate Program Review, Chairman
Division Committee Chairman - wrote plan to reorganize UMD into schools - wrote policy on how to build enrollment

REFEREE ACTIVITY:

Physical Review
Physical Review Letters
Journal of Mathematical Physics
American Journal of Physics

PAPERS READ AT PROFESSIONAL MEETINGS:

CLASSES TAUGHT SINCE FALL, 1969:

Highlights in Physics (1015)
Space and Time in Relativity (3025)
Thermal Physics (5107)
Statistical Physics (5109)
Theoretical Physics (5113, 5115, 5117)
Theoretical Mechanics (5123, 5126)
Mathematical Methods (5124, 5127)
Electromagnetic Theory (5125, 5128)
Electricity and Magnetism (5126, 5128)
Hydrodynamics (5166)
Mathematical Physics (5170, 5171, 5172)
Quantum Mechanics (5180, 5181, 5182, 5176, 5177, 5178)
Relativistic Quantum Mechanics (5185)
Electrodynamics (5174)

PUBLICATIONS:

(1) "Lie-Group Dynamical Formalism and the Relation between Quantum Mechanics and Classical Mechanics," with E. C. G. Sudarshan, Revs. Modern Phys. 33, 515 (1961).

(2) "Dynamical Mappings of Density Operators in Quantum Mechanics," with E. C. G. Sudarshan, J. Math. Phys. 2, 772 (1961).

(3) "Dynamical Mappings of Density Operators in Quantum Mechanics. II. Time-Dependent Mappings," with M. A. Pinsky and E. C. G. Sudarshan, J. Math. Phys. 3, 848 (1962).

(4) "The Quantum Mechanical Scattering Problem," J. Math. Phys. 3, 414 (1962).

PUBLICATIONS:

(5) "The Quantum Mechanical Scattering Problem. II. Multi-Channel Scattering," J. Math. Phys. 3, 429 (1962).

(6) "The Reduction of Operator Rings and the Irreducibility Axion in Quantum Field Theory," with E. C. G. Sudarshan, J. Math. Phys. 3, 587 (1962).

(7) "Relativistic Invariance and Hamiltonian Theories of Interacting Particles," with D. G. Currie and E. C. G. Sudarshan, Revs. Modern Phys. 35, 350 (1963).

(8) "Irreducible Representations of Generalized Oscillator Operators," with N. Mukunda and S. V. Pepper, J. Math. Phys. 4, 1089 (1963).

(9) "A No-Interaction Theorem in Classical Relativistic Hamiltonian Particle Dynamics," with John T. Cannon, J. Math. Phys. 5, 299 (1964).

(10) "Lorentz-Covariant Position Operators for Spinning Particles," with N. Mukunda, Phys. Rev. 132, 1842 (1963).

(11) "Hamiltonian Model of Lorentz Invariant Particle Interactions," with A. J. Macfarlane and E. C. G. Sudarshan, Phys. Rev. 133, B 487 (1964).

(12) "Lorentz Invariant Multichannel Scattering Formalism," J. Math. Phys. 5, 1345 (1964).

(13) "Quantum Theory of Interference of Light from Two Lasers," with F. Ghielmetti, Phys. Rev. Letters 12, 607 (1964).

(14) "Operators for Observables in Quantum Optics," Physics Letters 11, 289 (1964).

(15) "Operational Meaning of Higher-Order Optical Coherence," Helv. Phys. Acta 37, 697 (1964).

(16) "Restrictions Implied by Lorentz and Spin Invariance for Scattering Amplitudes," Phys. Rev. 139, B 149 (1965).

(17) "Conservation Laws Implied by Lorentz Invariance and Conservation of Spin," Phys. Rev. 140, B 766 (1965).

(18) "Determination of Optical Field Correlations from Photon Counts," with N. Mukunda, J. Math. Phys. 7, 849 (1966).

(19) "Characterizing Coherent States of the Radiation Field," J. Math Phys. 7, 2006 (1966).

(20) "Generators of the de Sitter Group for the Hydrogen Atom" with R. H. Pratt, Phys. Rev. 148, 1276 (1966).

(21) "One-dimensionality of Relativistic Particle Forces for Uniform Center-of-Mass Motion," with D. G. Currie, Phys. Rev. Letters 16, 1210 (1966).

(22) "Hamiltonians in Relativistic Classical Particle Mechanics," Phys. Rev., 166, 1308 (1968).

(23) "Conservation of Momentum and Angular Momentum in Relativistic Classical Particle Mechanics," with D. G. Currie, Phys. Rev. 167, 1178 (1968).

(24) "Interactions in Relativistic Classical Particle Mechanics," with D. G. Currie, Lecturers in Theoretical Physics XA, 91 (Proceedings of the Tenth Boulder Summer Institute for Theoretical Physics, edited by A. O. Barut and W. E. Brittin, Gordon and Breach, New York, 1968).

(25) "Linear Operators for Quantum Mechanics," John Wiley and Sons, New York, 1969.

(26) "Coulomb Group Theory for Any Spin," with R. H. Pratt, Phys. Rev. 188, 2534 (1969).

(27) "Momentum and Angular Momentum in Relativistic Classical Particle Mechanics," with C. S. Shukre, Phys. Rev. D 5, 799 (1972).

(28) "Constructing Examples in Relativistic Classical Particle Mechanics," with C. S. Shukre, J. Math. Phys. 13, 868 (1972).

(29) "Lorentz-invariant Newtonian mechanics for two particles," Phys. Rev. D 11, 2807 (1975).

(30) :Lorentz-invariant Newtonian mechanics for three or more particles," Phys. Rev. D 11, 3035 (1975).

(31) "Why -i is the momentum," Am. J. Phys. 43, 1089 (1975).

(32) "Conditions on wave functions derived from operator domains," Am. J. Phys. 44, 567 (1976).

(33) "Transports in Lake Superior," with S. Diehl, W. Maanum and M. Sydor, J. Geophys. Res. 82, 977 (1977).

(34) "Identification of the velocity operator for an irreducible unitary representation of the Poincare group," J. Math. Phys. 18, 608 (1977).

(35) "Nonexistence of kinematic constants for Lorentz-invariant Newtonian mechanics," Phys. Rev. D15, 3575 (1977).

(36) "Limits to the use of four-vectors in relativistic Newtonian mechanics," Phys. Rev. D16, 313 (1977).

PUBLICATIONS: (cont.)

(37) "Form of parity-covariant relativistic two-particle forces," Phys. Rev. D17, 2824 (1978).

(38) "Identification of the velocity operator in an irreducible unitary representation of the Poincare group for imaginary mass or zero mass and variable helicity," J. Math. Phys. 19, 247 (1978).

(39) "Simple proof of no position operator for quanta with zero mass and non-zero helicity," J. Math. Phys. 19, 1382 (1978).

(40) "Simple derivation of the Newton-Wigner position operator," J. Math. Phys. 21, 2028 (1980).

(41) Vertical structure of time-dependent flow dominated by friction in a well-mixed fluid," with J.R. Baker, J. Phys. Oceanogr. 10, 1091 (1980).

(42) "Vertical-structure functions for time-dependent flow in a well mixed fluid with turbulent boundary layers at the bottom and top," with J.R. Baker, J. Phys. Oceanogr. 10, 1691 (1980).

(43) "Resonant oscillation in the Duluth-Superior harbor," with K. Stortz and M. Sydor, Limnol. Oceanogr. 26, 186 (1981).

NAME: John L. Kroening

RANK: Associate Professor

DATE OF FIRST APPOINTMENT AT UMD:

HIGHEST DEGREE, DATE AND PLACE: Ph.D., 1962, University of Minnesota

EDUCATION:

B.S. University of Minnesota, 1956
M.S. University of Minnesota, 1956
Ph.D. University of Minnesota, 1962

PREVIOUS EMPLOYMENT:

University of Minnesota, Research Assistant, 1957-59
University of Minnesota, Research Assistant, 1960-62
University of Minnesota, Research Associate, 1962-65
University of Minnesota, Duluth, Assistant Professor, 1965-68
University of Minnesota, Assistant Professor, Summer 1966
University of Minnesota, Assistant Professor, Summer 1967
University of Minnesota, Duluth, Associate Professor, 1968-present
University of Minnesota, Assistant Professor, Summer 1969
Princeton University, Consultant, Summer 1969
University of Wyoming, Consultant, Summer 1970
University of Minnesota, Associate Professor, Summer 1971
University of Minnesota, Duluth, Associate Professor, Summer 1972
University of Minnesota, Associate Professor, Summer 1980

MEMBERSHIPS AND POSITIONS IN PROFESSIONAL SOCIETIES:

American Geophysical Union

HONORS AND AWARDS:

Convair Fellow, 1959-60

RESEARCH AREAS:

Infrared Astronomy
Atomic Physics
Lake Superior Basin Studies (proposed)
Atmospheric Transport
Atmospheric Ozone and Ionization Studies
Photochemistry of Ozone
Ballistic Hydrodynamics

RESEARCH GRANTS:

Graduate School 197

12/71-12/72	ONR, Ozone Program	$ 55,000
3/72-12/72	ONR, Atmospheric Ionization	20,000
12/72-7/73	ONR, Atmospheric Ionization	35,000
8/73-1/74	ONR, Atmospheric Ionization	24,700
	TOTAL	$134,700

RESEARCH IN PROGRESS:
Atmospheric Ozone and Ionization Studies from Ground Level to 100,000 ft.
Photochemistry of Ozone
Ballistic Hydrodynamics

UNIVERSITY COMMITTEES AND SERVICE:
UMD Campus Curriculum Committee, 1979
UMD Science Curriculum Committee, Chairman, 1969
UMD Student Housing Committee, 1971-74
UMD Student Housing Committee, Chairman, 1974

UNIVERSITY COMMITTEES AND SERVICE: (continued)
UMD Building Committee (Classroom Laboratory Bldg.)
UMD CLS Coordinator, U.S. Savings Bond Drive, 1975
UMD Committee for Merging Astronomy and Physics, 1977-78

REFEREE ACTIVITY:
Journal of Geophysical Research

PAPERS READ AT PROFESSIONAL MEETINGS:
See attached list.

COURSES TAUGHT AND DEVELOPED:
Elementary Physics 1001
Elementary Physics 1002
Elementary Physics Lab
General Physics 1107
General Physics 1109
General Physics Lab
Optics 5119
Seminar 3099 and Research 3111
Highlight in Physics 1015 (New Course Segment)
Astronomy 1020 (New Course)
Dynamics (3080)
Electricity and Magnetism (3081)
Modern Physics Lab (93)
Advanced Lab (94)
Modern Physics (106, 108, 110, 5101, 5102, 5103, 5106, 5108)
Introduction to Atmospheric Physics (5130)
Dynamics (MM 36, MM 1036)
Deformable Body Mechanics (MM 37, MM 1016, Egn 1016)
Statics (MM 1015, Egn 1015)
Engineering Graphics (Egn 1025)
Engineering Graphics Lab

PUBLICATIONS:

(1) "Atmospheric Ionization," Master's Thesis, Univ. of Minn., Mpls. (1959).

(2) "Ion Density Measurements in the Stratosphere," J. Geophys. Res., 65, pp. 145-177 (1960).

PUBLICATIONS: (Continued)

(3) "Atmospheric Ozone," (with E. P. Ney), Tech. Rept. No-AP18, Atmos. Phys., Univ. of Minn. (1961).

(4) "Atmospheric Ozone," (with E. P. Ney), J. Geophys. Res., 67, pp. 1867-1875 (1962).

(5) "Two Atmospheric Constituents - Ozone and Small Ions," Ph.D. Thesis, Univ. of Minn. and Tech. Rept. AP-20, Atmos. Phys., Univ. of Minn. (1962).

(6) "Atmospheric Small Ions and Dust, Annual Progress Rept.," Atmos. Phys., Univ. of Minn., Mpls. (1964).

(7) "Atmospheric Ozone," Annual Progress Rept., Atmos. Phys., Univ. of Minn., Mpls. (1964).

(8) "Aerosols in the Stratosphere: A Comparison of Techniques of Estimating Their Concentration," (with G. Newkirk, Jr.), J. Atmos. Sci., pp. 567-570 (1965).

(9) "Structure of the Lower Stratosphere," Annual Progress Rept., Atmos. Phys., Univ. of Minn., Mpls. (1965).

(10) "Stratosphere and Troposphere: Transport of Material Between Them," Science, 147, pp. 862-864 (1965).

(11) "Synoptic Observations of Multiple Ozone Maxima," (with H. T. Mantis) Atmos. Phys., Univ. of Minn., Mpls. (1967).

(12) "On the Transport of Material Across the Tropopause," (with J. Rosen and H. T. Mantis) J. of Geophys. Res., 73, No. 16, pp. 5463-5465 (1968).

(13) "Global Monitoring of Dust, Ozone and Water Vapor," CIAP*-DOT, May 1972, 21 pages.

(14) "Global Monitoring of Stratospheric Aerosol, Ozone and Water Vapor," CIAP*-DOT, June 1972, D. Hofmann, J. M. Rosen, T. J. Pepin and J. L. Kroening, 255 pages.

(15) "A Measurement of Ozone and Aerosol Content in the North and South Polar Stratosphere," D. Hofmann, J. Rosen and J. Kroening. (Submitted to J. of Geophys. Res.) 12 pages.

(16) "An Extensive Dust Layer in the Northern Hemisphere," J. M. Rosen, D. J. Hofmann, T. J. Pepin, J. Kroening, Nature, 240, Dec. 8, 1972. p. 347-356.

PUBLICATIONS: (Continued)

(17) "Global Measurement of Stratospheric Aerosol, Ozone and Water Vapor by Balloon-Borne Sensors," (Presented at Second Conference of the Climatic Impact Assessment Program (CIAP), Nov. 1972. D. Hofmann and J. Kroening, 32 pages.

(18) "Global Measurements of Stratospheric Aerosol, Ozone and Water Vapor by Balloon-Borne Sensor," CIAP*-DOT, December 1972. D. Hofmann, J. Rosen, T. Pepin and J. Kroening, 33 pages.

(19) "Global Monitoring of Stratospheric Aerosol, Ozone and Water Vapor," CIAP*-DOT, April 1973. D. Hofmann, J. Rosen, T. Pepin and J. Kroening, 312 pages.

(20) "Atmospheric Ionization," Final Rept. ONR Contract N00014-67-A-0113-0028 (1975).

PAPERS READ AT PROFESSIONAL MEETINGS:

"Atmospheric Ozone," J. L. Kroening, International Ozone Conference, Arosa, Switzerland, 1961.

"Stratospheric-Tropospheric Transport Processes," J. L. Kroening, International Ozone Conference, Univ. of Mexico, Albuquerque, N.M., 1964.

"Ozone Aerosol Interactions and Stratospheric-Tropospheric Exchange," J. L. Kroening, American Meteorological Society, University of Minnesota, Mpls., 1965.

"Physics Program at the University of Minnesota, Duluth," J. L. Kroening, Minnesota Cooperative Physics Project - Conference on Problems of Physics Instruction in the Lower Division, University of Minnesota, Mpls., 1969.

"Lower Division Curriculum for Physics and Engineering Students-Recent Developments at UMD," J. L. Kroening, Minnesota Cooperative Physics Program, Articulation of University and State College and Junior College Physics Curricula in Minnesota, University of Minnesota, Mpls., 1970.

Preliminary Balloon Measurements in the Global Monitoring Program," J. L. Kroening, et al., Coordination Meeting for Atmospheric Monitoring and Experiment Subprogram, National Center for Atmospheric Research, Boulder, Colorado, 1972.

"Global Measurement of Stratospheric Aerosol, Ozone and Water Vapor by Balloon-Borne Sensors," J. L. Kroening, et al., Second Conference on the Climatic Impact Assessment Program, Boston, Massachusetts, 1972.

PAPERS READ AT PROFESSIONAL MEETINGS: (Continued)

"The University of Wyoming Global Monitoring Program," T. Pepin, J. Rosen, and J. Kroening. AIAA/AMS International Conference on the Environmental Impact of Aerospace Operations in the High Atmosphere, Denver, Colorado, June 1973.

TELEVISION:

"Nuclear Warning Shot"--Interviewed on KBJR, Weekday (1981), Nov.

NAME: Donald E. Olson DATE OF BIRTH: September 23, 1922

RANK: Professor

DATE OF FIRST APPOINTMENT AT UMD: September 16, 1954

HIGHEST DEGREE, DATE AND PLACE: M.S., University of Wisconsin, 1950

EDUCATION:
B.S. Wisconsin State College, Superior, 1945
M.S. University of Wisconsin, 1950

PREVIOUS EMPLOYMENT:
Wisconsin State College, Superior, Dept. Assistant, 1947-52
Gogebic Junior College and L. L. Wright High School, Ironwood, Instructor, 1952-54
University of Minnesota, Duluth, Instructor, 1954-1959
University of Minnesota, Duluth, Assistant Professor, 1959-1969
University of Minnesota, Duluth, Associate Professor, 1969-1973
University of Minnesota, Duluth, Professor, 1973-present

MEMBERSHIP AND POSITIONS IN PROFESSIONAL SOCIETIES:
American Geophysical Union
American Association of Physics Teachers
Minnesota Area Association of Physics Teachers
The Society of Terrestrial Magnetism and Electricity of Japan
Minnesota Area Association of Physics Teachers, President, 1969

HONORS AND AWARDS:
Member, Sigma Xi, July 1978
Appointment, International Commission on Atmospheric Electricity (IAMP, UGGI) Consultant of Sub-Commissions III and VII, Measurements in the Free Atmosphere and Global Circuits, October 1971

RESEARCH AREAS:
Global electric circuit
Atmospheric electrical effects of the aurora
Extraterrestrial influence on climatic changes

RESEARCH GRANTS: (past ten years)
See attached list.

RESEARCH IN PROGRESS:
Atmospheric Electricity and the Study of Its Relation to Weather and Weather Systems
Environmental Effects of Electric Transmission Lines
Use of the Microcomputer as Lab Assistant

UNIVERSITY COMMITTEES AND SERVICE: (Last ten years)
UMD Task Force on Research and Field Study Center, 1973-1977
Physics Machine Shop Committee

REFEREE ACTIVITY: (Past ten years)
National Science Foundation, 1972, 1974
Office of Naval Research, 1975
National Aeronautics and Space Administration, 1979

PAPERS READ AT PROFESSIONAL MEETINGS: (Past ten years)
See attached list.

COURSES TAUGHT SINCE FALL 1969:
Elementary Physics (1001, 1002, 1003)
Elementary Physics Lab
General Physics Lab
Highlights in Physics (1015)
Energy Resources (1020)
Applied Physics (1037)
Applied Physics Lab
Introduction to Physics Lab (1033)
Introduction to Instrumentation (3040)
Physics Lab (3070)
Research (3111)
Advanced Lab (94)
Intermediate Physics Lab (50A, 51A, 3040, 3041)
Modern Physics Lab (93)
Electronics (5120)
Electronics Lab
Introduction to Atmospheric Physics (5130)
Research in Physics (8200)
Microcomputer Use in Instrumentation (3044)
Introduction to Instrumentation (3040)
Digital Electronics (3042)

RESEARCH GRANTS: (Past ten years)

3/69-8/69	ONR, Atmospheric Electricity	$ 10,000
10/69-8/70	ONR, Atmospheric Electricity	23,000
1970	NASA, Appollo Launch Support	2,200
8/70-8/71	ONR, Atmospheric Electricity	23,000
8/71-8/72	ONR, Atmospheric Electricity	23,000
6/71-12/71	USAF, Electrostatic Field Measurement System	4,984
6/71-6/72	USAF, Field Mills	20,983
1972	RESEARCH CORPORATION, Summer Support for Students	2,400
1972-73	ONR, Atmospheric Electricity	23,000

RESEARCH GRANTS: (cont.)

5/73-6/73	NOAA, Atmospheric Electricity 5 Year Program	4,250
9/73-8/74	ONR, Atmospheric Electricity	23,000
6/73-12/99	USAF, Atmospheric Potential Gradient Measurement	3,125
6/73-12/99	USAF, Atmospheric Potential Gradient Measurement	1,250
7/73-12/99	USAF, Field Mills	1,875
9/74-8/76	ONR, Extraterrestrial Information on Global Circuit	20,000
6/75-76	EPA, Watershed Rainfall	21,083
9/75-77	ONR, Atmospheric Electricity	23,000
11/75-6/76	STATE OF MINNESOTA, Electrical Field Measurements Under High Voltage Transmission Lines	4,000
3/75-3/76	ONR, Extraterrestrial Information on Global Currents	25,000
9/76-1/77	EPA, Reserve Mining Co. Monitoring Program (LSBSC)	6,400
6/76-6/77	EPA, Watershed Rainfall	21,484
1/77-6/77	MP&L, Wind Monitoring	6,000
8/77-11/77	STATE OF MINNESOTA, High Voltage AC & DC Power Line Studies	5,051
8/77-12/78	EPA, Meteorological Monitoring Contract	23,274
12/77-11/78	ONR, Atmospheric Electricity	30,000
-6/79	" " "	35,000
12/78-11/79	ONR, Influence of Solar Sector Crossing and Related Activity on the Global Electric Circuit	30,000
	SUBTOTAL	$ 416,359
12/78-11/79	ONR, Atmospheric Electricity	35,000
12/79-11/80	ONR, Atmospheric Electricity	35,000
12/80-1/81	ONR, Atmospheric Electricity	8,000
2/81-2/82	ONR, Atmospheric Electricity and Study its Relation to Weather Systems;	46,000
	SUBTOTAL	$540,359

RESEARCH GRANTS: (cont.)

	SUBTOTAL	$540,359
1023/80	IRRR, Wind Energy Study	1,975
7/1/80-6/30/81	Univ. Corp. for Atmospheric research, "Joint Program on Atmospheric Electricity at NOAA Site on Mauna Loa, Hawaii"	4,500
	SUBTOTAL	$546,834
7/1/80-9/30/81	EDP - Development of Microcomputer use in the Classroom	3,698
	TOTAL	$550,532

PUBLICATIONS:

Annual Reports, ONR, Atmospheric Electricity, from 1969 to the present.

Annual Report and Quarterly Reports, Red Clay Project, EPA, 1976, 1977, and 1978.

Final Report, Powerline Studies, State of Minnesota, October, 1977.

Final Report, "Measurement of the Wind in Northeastern Minnesota during Months of February through April, 1977," November, 1977, Minnesota Power and Light Company.

Final Report, "Air Sampling Study at Silver Bay, Minnesota, July 1-15, 1976," July, 1976.

"Measurements of Dissipation Array Performance at Eglin Air Force Base, Florida," Review of Lightning Protection Technology for Tall Structures, November, 1975, pp. 126-148. Office of Naval Research, U.S. Air Force, National Aeronautics and Space Administration, Federal Aviation Administration Symposium, Houston, Texas.

Report to ONR, "An Operational Lightning Warning System: A Method of Determining the Threshold of Dangers due to Electrically Disturbed Weather," April, 1975.

"Atmospheric Electricity Measurement During the Solar Eclipse of 7 March, 1970," Pure and Applied Geophysics, Vol. 85, 1972, with R.V. Anderson, H. Dolezalek, A.K. Kamra, H.W. Latham, H.W. Kasemir and R. Markson.

"Evidence for Auroral Effects on Atmospheric Electricity," Pure and Applied Geophysics, Vol. 84, pp. 118-138, 1971.

"Electrometer Design and Construction," Am. J. Phys., Vol. 36, p. 473, 1968.

PUBLICATIONS (cont.)

Apparatus Review: A New Millikan Oil-Drop Apparatus, Am. J. Phys., Vol. 33, No. 10, pp. 858-859, October, 1965.

"The Effect of Natural and Fission Product Radioisotopes on the Atmospheric Electrical Potential," Am. J. Phys., Vol. 34, p. 548, 1964.

"Some Recent Student Experiments at UMD," Am. J. Phys., Vol. 31, p. 314, 1963. (With H.G. Hanson)

"Use of Magnetron Magnets," Am. J. Phyus., Vol. 30, p. 394, 1962.

"A Beta-ray Spectrometer for Second Year Physics," Am. J. Phys., Vol. 26, p. 134, 1958.

"Motion of solid Particles Under Influence of Air Vibrations in a Tube," Am. J. Phys., Vol. 23, p. 483, 1953.

Abstract: "Auroral Effects on the Atmospheric Electrical Parameters," Report of Proceedings of International Association of Meterology and Atmospheric Physics, International Union of Geodesy and Geophysics, XIVth General Assembly, Lucerne, Sept.-Oct. 1967, p. 200.

Abstract, "A Report on Micropulsations in the Air-Earth Current Density in Stratosphere from 1966-1979," Proceedings of International Conference on Atmospheric Electricity, Manchester, England, July 26-Aug. 2, 1980.

PAPERS READ AT PROFESSIONAL MEETINGS: (Past 10 years)

"Electrometer Design and Construction," Minnesota Area Association of Physics Teachers' Meeting, 1969.

"Electrical Processes and Problems of the Upper Stratosphere and Mesophere," Joint General Scientific Assemblies IASPEI/IAGA, Madrid, Spain, September, 1969.

"Micropulsation Observed During the Measurement of Air-Earth Current Density with Radiosondes," at the XV International Union of Geodesy and Geophysics General Assembly, Moscow, USSR, August, 1971.

"Solar Cycle Variation in the Air-Earth Current Density," at IAGA/IAMAP Joint Assembly, Seattle, Washington, September, 1977.

"Variations in the Global Electric Circuit Over One Solar Cycle With Possible Meterological Relationships," IUGG International meeting at Canberra, Australia, Dec., 1979.

PUBLICATIONS (cont.)

"Applications of Evidence for Solar Influence on Global Electric Circuit in the Study of Ionosphere-Tropospheric Coupling," Aeronomy and Space Physics Winter Workshop, Canada Research Council, Univ. of Saskatchewan, Feb., 1981.

"Global Monitoring for Climate Change," NCAR, Boulder, Colorado, March 1981.

"Recommendations for Experimental Programs," ONR International Solar-Terrestrial Workshop, Minneapolis, May 19, 1981.

NAME: Sydor, Michael DATE OF BIRTH: December 25, 1936

RANK: Professor

DATE OF FIRST APPOINTMENT AT UMD: September 1964

HIGHEST DEGREE, DATE & PLACE: Ph.D., 1964, University of New Mexico

EDUCATION:

B.A. Sc Engineering Physics	University of British Columbia, 1960
Ph.D. Physics	University of New Mexico, 1964

ACADEMIC APPOINTMENTS:

University of New Mexico, Research Assistant, 1960-64
University of Minnesota, Duluth, Assistant Professor, 1964-68
National Science Foundation Institute at University of Minnesota, Minneapolis, Assistant Professor, 1965
National Science Foundation Institute at University of Minnesota, Minneapolis, Assistant Director, 1967
University of Minnesota, Duluth, Associate Professor, 1968-74
University of Minnesota, Minneapolis, Associate Professor, summer, 1968
University of Minnesota, Duluth, Professor, 1974-present
University of Wisconsin, Madison, Visiting Professor, summer, 1979

MEMBERSHIP AND POSITIONS IN PROFESSIONAL SOCIETIES:

Sigma Xi
International Great Lakes Research Society
Geophysical Union

HONORS & AWARDS:

Outstanding Teacher Award, University of Minnesota, Duluth, 1970
NSF Award, Institute of Optics, Rochester, New York, 1972

RESEARCH AREAS:

Optics
Thermodynamics
Environmental Physics

RESEARCH GRANTS: (Past 10 years)

See attached list

RESEARCH IN PROGRESS:

Numerical models for lakes and oceans
Statistical solution to gradient transfer problems
Remote sensing spectroscopy
Coherence properties of photons
Raman spectroscopy

UNIVERSITY COMMITTEES AND SERVICE:

Board member of Lake Superior Basin Studies Center, 1973-77
Search Committee for Director of Lake Superior Basin Studies Center
Search Committee for Vice Provost for Academic Affairs
Library Committee
Awards and Honor Committee
State of Minnesota Power Plant Siting Committee, 1975
U.S. Winter Navigation Advisory Committee, 1976-78
International Joint Commission - Technical Committee (PLUARG), 1975-76
U.S. - U.S.S.R. Scientific Exchange Program on Environmental Studies.
Visitation by two Soviet teams, 1977, 1978
Team member for N.A.S.A. Great Lakes Nimbus G Satellite Program, 1978

REFEREE ACTIVITY:

Review of Scientific Papers, American Society of Photogrammetry, 1978
Journal of Environmental Quality, 1978
Journal of Remote Sensing of Environment, 1978
Scanning Electron Microscopy, 1979
Referee for Sea Grant Proposals, 1977-79

PAPERS READ AT PROFESSIONAL MEETINGS: (Past 10 years)

See attached list

RESEARCH GRANTS: (Past ten years)

72-75	NASA, Remote Sensing of Lake Superior	$ 15,400
73-74	NASA, Remote Sensing of Lake Superior	7,500
73-74	U.S. Corps of Engineers, Transports in Lake Superior	21,812
74-75	NASA, Remote Sensing of Lake Superior	10,000
1/74-7/74	U.S. Corps of Engineers, Bubbler	23,000
10/74-3/76	EPA, Red Clay Turbidity, Transport in Lake Superior	57,170
74-75	NOAA, Studies of Ice Growth	16,450
1975	Rockefeller Grant with U of W, Madison, Lake Superior	6,000
7/75-6/76	EPA, Particulate Dispersion in Air and Water	15,000
75/76	NASA, Remote Sensing of Lake Superior	20,000
7/76-7/77	NASA, Remote Sensing of Lake Superior	15,000
2/76-4/77	EPA, Turbidity Plume Transport	37,211
3/76-3/77	EPA, Optical Detection of Particulates in Water	57,408
7/76-6/77	EPA, Particulate Dispersion in Air and Water	54,945

RESEARCH GRANTS: (cont.)

7/77-6/78	Particulate Dispersion in Air and Water	$ 77,000
3/77-3/78	EPA, Optical Detection	57,000
7/77-7/78	NASA, Remote Sensing of Lake Superior	20,000
6/78-6/80	EPA, Contaminant Dispersion in Lake Superior	134,000
7/78-7/79	NASA, Remote Sensing of Lake Superior	20,000
8/78-7/79	EPA, Dispersal of Coal Dust from Transshipment and Power Plant Storage Facilities	57,000
7/1/79-6/30/80	NASA, Remote Sensing of Lake Superior	15,000
7/1/80-6/30/81	NASA, Remote Sensing of Lake Superior	16,000
8/1/79-10/30/80	EPA, Dispersal of Coal Dust from Transhipment and Power Plant Storage Facilities	57,000
6/20/80-7/29/81	EPA, Contaminant Dispersion in Lake Superior	94,865
3/5/81-12/4/82	NASA, Water Quality Measurements Through Use of Nimbus 7	223,808
		$1,128,569

PUBLICATIONS:

(1) Diehl, S.R., D.T. Smith and M. Sydor. 1981. Random-walk simulation of gradient-transfer processes applied to dispersion of stack emission from coal fired power plants. J. Applied Meteorology.

(2) Oman, G.J. and M. Sydor, 1981. Plume development using a Lagrangian marker method. J. Am. Soc. Civil Eng.

(3) Jordan, T.F., K.R. Stortz and M. Sydor. 1981. Resonant oscillation in Duluth-Superior Harbor. Limnology and Oceanography 26(1): 187-191.

(4) Stortz, K.R. and M. Sydor. 1980. Transports in the Duluth-Superior Harbor. J. Great Lakes Res. 6(3): 223-231.

(5) Sydor, M., G.E. Glass and W.R. Swain. 1980. Transport of mining waste in Lake Superior. In Proc. of the 2nd Amer.-Soviet Symp. on the Use of Math. Models to Optimize Water Quality Management, ed. W.R. Swain and V.R. Shannon, pp. 180-196, p. EPA-600/9-80-033, Environmental Research Laboratory, Duluth, MN.

PUBLICATIONS: (cont.)

(6) Oman, G.J. and M. Sydor. 1980. A multi-layered nested grid model of Lake Superior. In Proc. of the 2nd Amer.-Soviet Symp. on the Use of Math. Models to Optimize Water Quality Management, pp. 207-236, EPA-600/9-80-033, Environmental Research Laboratory, Duluth, MN.

(7) Sydor, M. 1980. Remote sensing of particulate concentrations in water.' Applied Optics 19(16): 2974-2800.

(8) Sydor, M., J.A. Sorensen and V. Shuter. 1979. Remote sensing of snow albedo for determination of dustfall. Applied Optics 18(21): 3574-3578.

(9) Diehl, S.R., D.T. Smith and M. Sydor. 1979. Analysis of suspended solids by single-particle scattering. Applied Optics 18(10): 1653-1658.

(10) Shuter, V., K. Stortz, G. Oman and M. Sydor. 1978. Turbdity dispersion in Lake Superior through use of Landsat data. J. Great Lakes Res. 4(3-4): 359-360.

(11) Sydor, M., K.R. Stortz and W.R. Swain. 1978. Identification of contaminants in Lake Superior through Landsat data. J. Great Lakes Res. 4(2): 142-148.

(12) Sydor, M. 1978. Analysis of suspended solids in lakes using Landsat multispectral data. Canadian J. Spectroscopy 23(3): 91-97.

(13) Oman, G.J. and M. Sydor. 1978. Use of remote sensing in determination of chemical loading of Lake Superior due to spring runoff. Canadian J. Spectroscopy 23(2): 52-56.

(14) Sydor, M. 1978. Ice growth in Duluth-Superior Harbor. J. Geophys. Res. 83(C8): 4074-4078.

(15) Diehl, S., W. Maanum, T. Jordan and M. Sydor. 1977. Transports in Lake Superior. J. Geophys. Res. 82(6): 977-978.

(16) Stortz, K., R. Clapper and M. Sydor. 1976. Turbidity source in Lake Superior. J. Great Lakes Res. 2(2): 393-401.

(17) Sydor, M. 1976. Turbidity in Lake Superior. In A New Window on our Planet, ed. R.S. Williams Jr. and W.D. Carter, pp. 153-155. USGS

(18) Sydor, M. 1976. Western Lakes Superior ice. In A New Window on our Planet, ed. R.S. Williams Jr. and W.D. Carter, pp. 169-172. USGS.

(19) Stortz, K. and Sydor, M. 1974. Remote sensing of western Lake Superior. In Proceedings of the Ninth International Symposium on Remote Sensing of Environment 3:933-937.

PUBLICATIONS: (cont.)

(20) Bennett, P. and Sydor, M. 1974. Use of ERTS in measurements of water quality in Lake Superior and the Duluth-Superior Harbor. In Remote Sensing of Earth Resources Vol. 3, ed. F. Shahrokhi, pp. 85-92, University of Tennessee at Tullahoma.

(21) Sydor, M. 1974. Ice growth in Duluth Harbor and western Lake Superior. In Remote Sensing of Earth Resources Vol. 3, ed. R. Shahrokhi, pp. 107-116, University of Tennessee at Tullahoma.

(22) Sydor, M. 1973. Surface properties of RbI. Phys. Rev. 7(8):4012-4016.

(23) Sydor, M. 1971. Effects of surfaces on absorption spectrum of RbI crystals. Phys. Rev. Letters 27(19): 1286-1287.

(24) Sydor, M. 1969. Surface photoconductivity of RbI. Phys. Rev. 183(3) 846-848.

(25) Sydor, M. 1967. Intrinsic photoconductivity of RbI. Phys. Rev. 163(3): 873-875.

(26) Sydor, M. 1964. Measurement of high energy neutrons at high altitude. Proc. IQSY Symposium, Buenos Aires. (Ph.D. Thesis, advisor Leavitt).

(27) Katzenstein, J. and M. Sydor. 19162. Exploding wire as fast dynamic pinch. J. Applied Phys. 33(12): 718-723.

SCIENTIFIC REPORTS (partial list)

1. Sources and Transports of Coal Dust in the Duluth-Superior Harbor, 1980. (EPA-R803952).

2. Optical Detection of Fiber Particles in Water, 1979, (EAP-R804361).

3. Red Clay Turbidity and Its Transport in Lake Superior, 1979. (EPA-R005175-01).

4. Effects of Nemakji Runoff on Lake Superior, 1977, PLUARG report, EPA-005286-01).

5. Identification of Contaminants in Lake Superior Through Use of Satellite Data, 1976, NASA, (NGL-24-005264).

6. Ice Growth Studies in Duluth-Superior Harbor, 1974-1975, 1975 (NOAA-04-5-022-13).

SCIENTIFIC REPORTS: (Cont.)

7. Evaluation of Bubbler System for Winter Navigation, Howards Bay, Superior, Wisconsin, Winter 1974-1974, 1974, U.S. Army Corps of Engineers, (DACW-37-74-C0060).

8. Current Patterns and Turbidity in Extreme Western Lake Superior, Summer 1973, 1974, U.S. Army Corps of Engineers, (DACW-37-74-C0014).

RECENT PAPERS PRESENTED AT NATIONAL AND INTERNATIONAL SCIENTIFIC MEETINGS: (with students and colleagues)

Layered Numerical Model for Lake Superior, U.S.-USSR Symposium on Hydrodnyamic Modeling, 1979, at Cranbrook Institute of Science.

Transport of Mining Wastes in Lake Superior, loc. cit.

Variation of Snow Albedo with Dustfall in Duluth-Superior Harbor 22nd Conf. on Great Lakes Res., New York, 1979.

Dynamics of Duluth-Superior Harbor, loc. cit.

Identification of contaminants Through Remote sensing, invited paper at Joint Meeting of Analytical Chemistry Society and Canadian Spectroscopy Society, 1978.

Dispersion and Transport of Particulates in Lake Superior, 20th Conf. on Great Lakes Res.

Transports in Duluth-Superior Harbor, loc. cit.

Optical Properties of Suspended Solids, 19th Conf on Great Lakes Res., Geulph, Ontario, 1976.

Turbidity Sources in Lake Superior, loc. cit.

Ice Growth in Duluth-Superior Harbor, loc. cit.

Transports in Lake Superior, (numerical model of the lake) loc. cit.

Currents in Western Lake Superior, 18th Conf. on Great Lakes Res., Hamilton, Ontario, 1975.

Ice Growth and Packing in Western Lake Superior, Remote Sensing Conf. of Earth Resources, Tullahoma, Tennessee, 1974.

Water Quality Through Use of ERTS, loc. cit.

RECENT PAPERS PRESENTED AT NATIONAL AND INTERNATIONAL SCIENTIFIC MEETINGS:
(with students and colleagues) (cont.)

Remote Sensing of Western Lake Superior, 9th International Symposium on Remote Sensing, Ann Arbor, Michigan, 1974.

Several invited presentations at colloquia at the University of Wisconsin, Madison, and the University of Michigan, Ann Arbor, for people working in my research fields.

Attachment 2. Courses

Physics

5042. DIGITAL ELECTRONICS. (4 cr, §3042; prereq 3040 or #; 2 hrs lect, 5 hrs lab)
The operation and use of TTL and CMOS IC chips in digital equipment, writing in and reading RAM memories. A/D and D/A converters, and signal circuits.

5044. MICROCOMPUTER USE IN INSTRUMENTATION. (4 cr, §3044; prereq 3040, 3042, or #; 2 hrs lect, 5 hrs lab)
Introduction to interfacing microcomputers with different types of analog-to-digital converters. Applications in experimental sciences. Although computer programming is in Basic, previous experience in Basic is not required.

5092. OPTICS LABORATORY. (2 cr; prereq ¶5119; 4 hrs lab; offered when feasible)
Experiments in interference, diffraction, polarization, optical spectra, photon counting techniques.

5093. MODERN PHYSICS LABORATORY. (2 cr; prereq 3070 and ¶5101 or #; 4 hrs lab ar; offered when feasible)
Experiments in modern physics: microwaves, radioactivity, photoelectric effect, ionization of gases, and optical spectra.

5094. ADVANCED LABORATORY. (2 cr; prereq 3070 or #; 4 hrs lab ar)
Experimental problems of special interest to the student. Project may extend over more than 1 quarter. Credit will be given at the end of the quarter in which the project is completed.

5101-5102-5103. MODERN PHYSICS. (4 cr each; prereq 1109 and Math 3298; 4 hrs lect)
Selected topics in modern physics, including elements of quantum mechanics and applications.

5107. THERMAL PHYSICS. (4 cr; prereq ¶5101; 4 hrs lect)
Elements of statistical physics, thermodynamics.

5109. STATISTICAL PHYSICS. (4 cr; prereq 5107; 3 hrs lect plus independent study)
Principles of statistical physics applied to equilibrium properties of classical and quantum systems.

5119. OPTICS. (4 cr; prereq 1109 or #; 4 hrs lect)
Fundamentals of physical optics.

5123. THEORETICAL MECHANICS. (4 cr; prereq 3010; 3 hrs lect plus independent study)
Theoretical mechanics, including Lagrangian and Hamiltonian functions, symmetries and conservation laws, with examples from relatively and electrodynamics, and introducing relevant mathematics.

5124. MATHEMATICAL METHODS. (4 cr; prereq 5123; 3 hrs lect plus independent study)
Systematic development of mathematical techniques in mechanics and electromagnetic theory.

5125. ELECTROMAGNETIC THEORY. (4 cr; prereq 5124; 3 hrs lect plus independent study)
Electric and magnetic fields, Maxwell's equations and applications, radiation.

5130. INTRODUCTION TO ATMOSPHERIC PHYSICS. (3 cr; prereq 5125; 3 hrs lect; offered when feasible)
Atmospheric composition and structure, thermodynamics, radiative transfer, atmospheric electricity, chemistry, origin of the earth's atmosphere.

5150-5151. INTRIDUCTION TO SOLID STATE PHYSICS. (3 cr each; prereq 5103 and 5107; 3 hrs lect; offered when feasible)
Solid structure, thermal and electronic properties of solids, and solid surfaces.

5160. ATOMIC AND MOLECULAR STRUCTURE. (3 cr; prereq 5103 or #; 3 hrs lect; offered when feasible)
Fine and hyperfine structure of atoms and molecules, selection rules and transition probabilities, coupling schemes, and potential curves.

5166. HYDRODYNAMICS. (3 cr; prereq 5123 or #; 3 hrs lect; offered when feasible)
Mathematical description of fluid motion with particular emphasis on water waves and currents and some atmospheric problems.

5174. ELECTRODYNAMICS. (4 cr; prereq 5125 or #; 3 hrs lect plus independent study)
Maxwell's equations, relativity and electrodynamics, radiation and scattering of electromagnetic waves.

5176-5177-5178. QUANTUM MECHANICS. (4 cr each; prereq 5103 and 5125; 3 hrs lect plus independent study)
Schrodinger equation, operator formulation, angular momentum, symmetries, perturbation theory, scattering, identical particles, interaction with electromagnetic field.

5185. RELATIVISTIC QUANTUM MECHANICS. (3 cr; prereq 5178; 3 hrs lect; offered when feasible)
The Poincare group and relativistic one-particle quantum mechanics, elementary quantum field theory, electromagnetic interactions.

5187. PARTICLE PHYSICS. (3 cr; prereq 5185; 3 hrs lect; offered when feasible)
Properties of elementary particles, conservation laws and symmetry groups, strong and weak interactions.

8199. SEMINAR: SELECTED TOPICS. (Cr ar [may be repeated for cr]; prereq #)

8200. RESEARCH IN PHYSICS. (Cr ar [may be repeated for cr])

Related Fields

Mathematics

5326. LINEAR ALGEBRA. (3 cr; prereq 3320 or #)
A study of linear transformations and vector spaces including topics from orthogonality, canonical forms, bilinear forms, characteristic values and inner product spaces.

5370. OPERATIONAL MATHEMATICS. (3 cr; §5730; prereq 3380)
Laplace Transforms, Zourier Transforms, difference operators, numerical methods, and the use of these techniques in solving difference, differential, and integral equations.

5380. PARTIAL DIFFERENTIAL EQUATIONS. (3 cr; §5732; prereq 3380)
An introduction to the study of partial differential equations stressing the use of Fourier series, Green's functions, and other classical techniques.

5385. DIFFERENTIAL EQUATIONS II. (3 cr; prereq 3699; offered when feasible)
Uniqueness, comparison, separation, and existence theorems. Selected readings from the current literature, particularly in Sturmian theory and in modeling.

5390. SPECIAL FUNCTIONS. (3 cr; §5730-5731-5732; prereq 3380)
A study of Bessel's, Legendre's, and other special fundtions which arise in Sturm-Liouville problems and the use of such functions in solving differential equations.

5562. REGRESSION ANALYSIS. (3 cr; prereq 3561 or 5591, 3320, or #)
Simple, multiple, and polynomial regression. Matimation, testing, and prediction. Analysis of residuals. Computer analysis.

5590. MATHEMATICAL PROBABILITY. (3 cr; prereq 3298)
Axiomatic development of probability; discrete, univariate and multivariate random variables with their probability distribution; moments and moment generating functions.

5591. STATISTICAL INFERENCE. (3 cr; prereq 3350 and 5590)
Sampling distributions, central limit theorem, principle of maximum likelihood, interval estimation and tests of hypotheses.

5597. MULTIVARIATE STATISTICS. (3 cr; prereq 5591 and 3320; offered when feasible)
Multivariate normal distribution; inferenced about a mean vector; topics chosen from principal components, factor analysis, discrimination, classification, clustering, MANOVA, multivariate regression.

5598. STOCHASTIC PROCESSES. (3 cr; prereq 3320, 5590 or 5591; offered when feasible)
A study of Markov chains, random walks, compound distributions. Poisson process, birth-death processes, queues.

5671-5672. ABSTRACT ALGEBRA II AND III. (3 cr each; prereq 3670)
Theory of groups, rings, and fields, including the Sylow theorems and applications, isomorphism theorems, polynomial rings, extension fields, finite fields and an introduction to Galois theory.

5680. FINITE GROUPS. (3 cr; prereq 3670; offered when feasible)
A survey of the achievements in finite simple group theory from C. Jordan (1870) to J. Thompson (present). Topics discussed will include the Sylow theorems, permutation groups, classical linear groups, Burnside's theorem, the Feit-Thompson theorem, Thompson's N-theorem and 3 theorem and sporadic simple groups.

5701-5702. ADVANCED CALCULUS I AND II. (3 cr each; prereq 3699)
Sequences and series; limit superior, limit inferior, and an introduction to summability. Metric spaces; continuous functions on metric spaces, connectedness, completeness, and compactness. Sets of measure zero and the Riemann integral. Sequences and series of functions. Functions of several variables, partial differentiation, implicit functions, and integrals depending on a parameter.

5760. GENERAL TOPOLOGY. (3 cr; prereq 3699 or #; offered when feasible)
Introduction to fundamentals of general topology basic to modern analysis. Set theory, Euclidean spaces, metric spaces, topological spaces, continuity, connectedness, compactness, product spaces, axiom of choice, generalized convergence.

5820. COMPLEX VARIABLES. (3 cr; prereq 3699 or #; offered when feasible)
Complex numbers, derivatives, and integrals of analytic functions, elementary functions and their geometry. Cauchy's integral theorem and formula. Laurent expansions, evaluation of contour integrals by residues, fundamental theorem of algebra.

Computer Science

5526. DATA STRUCTURES. (3 cr, SMath 5526; prereq 3520, and 3523 or Math 3523, and Math 3350 or #)
Relations, graphs, trees, lists, queues, dequeues, program structure, organization, searching.

5530. NUMERICAL ANALYSIS. (4 cr, SMath 5530; prereq 3520 or 3510 or Math 3510, and Math 3380 and Math 3699 or #; 3 hrs lect, 2 hrs lab; offered when feasible)
Computer representation of numbers, unit roundoff, solution of nonlinear equations, polynomial interpolation, numerical integration and solution of differential equations.

5531. NUMERICAL LINEAR ALGEBRA. (4 cr, SMath 5531; prereq 3520 or 3510, and Math 5326 and Math 3670 or #; 3 hrs lect. 2 hrs lab; offered when feasible)
Solution of systems of linear equations. Pivoting and scaling. Error propagation. Iterative refinement of solutions. Orthogonal functions and least squares approximation.

5540. COMPARATIVE PROGRAMMING LANGUAGES. (3 cr, SMath 5540; prereq 3523 or Math 3523 or #; offered when feasible)
A survey of significant features of existing programming languages with emphasis on the concepts underlying these languages, and the implicit relationship between language source codes and their run-time representations.

5542. COMPUTER ARCHITECTURE. (3 cr, SMath 5541, SMath 5542; prereq 3523 or Math 3523, and 5526 or Math 5526; offered when feasible)
Uniform description of digital devices using vector Boolean algebra. Elementary design considerations. Introduction to computer architecture; typical hardware devices and configurations.

5543. OPERATING SYSTEMS I. (3 cr, SMath 5543; prereq 3523 or Math 3523, and 5526 or Math 5526; offered when feasible)
Efficient use of processors, memory, I/O devices, and files. Multiprogramming and multiprocessing. Scheduling, synchronization, reliability, and security problems. Job-control languages.

5715. MICROCOMPUTER SYSTEMS. (3 cr; prereq 3523; offered when feasible)
Microcomputer assembly languages, architecture, operating system issues, hardware devices, and configurations.

5725. ALGORITHMS. (3 cr; prereq 5526; offered when feasible)
Survey and analysis of algorithms used in combinatorics, numerical calculations, systems programming, and artificial intelligence.

5743. OPERATING SYSTEMS II. (3 cr; prereq 5543; offered when feasible)
Concurrent processes and problems associated with them. Name management. Resource allocation including queueing, system balancing, job activation and deactivation. Protection mechanisms and enforcement. Networking and distributed systems.

5745. DATA BASE MANAGEMENT SYSTEMS DESIGN. (3 cr; prereq 5526; offered when feasible)
A study of the concepts and structures necessary to design and implement a data base management system.

5755. THEORY OF PROGRAMMING LANGUAGES, TRANSLATION, AND COMPILING. (3 cr; prereq 5526; offered when feasible)
Finite-state grammars, lexical scanners, and implementation of symbol tables. Context-free Languages and parsing techniques. Syntax directed translation. Code generation and optimization. Intermediate languages.

5765. AUTOMATA, COMPUTABILITY, AND FORMAL LANGUAGES. (3 cr; prereq Math 3550; offered when feasible)
Finite state deterministic and non-deterministic machines, regular expressions, and closure. Formal grammars, pushdown automata, and grammar algorithms. Computability, Turing machines, and the halting problem.

5775. ARTIFICIAL INTELLIGENCE. (3 cr; prereq 5526; offered when feasible)
Data representation issues, search strategies, control, communication and perception questions in the artificial intelligence field. Some discussion of applications. Programming in LISP and discussion of other common languages used in artificial intelligence.

5970. SPECIAL TOPICS. (1-3 cr [may be repeated for a max of 6 cr]; prereq #; offered when feasible)
Directed reading and/or research in computer science.

Attachment 3. Sample Programs with Plan B Papers

a. For a student who plans to continue graduate study for a Ph.D. in theoretical physics.

Physics

5125 Electromagnetic Theory (4 credits)
5109 Statistical Physics (4)
5166 Hydrodynamics (3)
with a Plan B paper on solitary waves
5174 Electrodynamics (4)
with a Plan B paper on approximation of retarded interactions by predictive mechanics
5176-5177-5178 Quantum Mechanics (12)
with a Plan B paper on the Aharonov-Bohm effect
5150 Introduction to Solid State Physics (3)

Mathematics

5820 Complex Variables (3)
5390 Special Functions (3)
5380 Partial Differential Equations (3)
5370 Operational Mathematics (3)
5385 Differential Equations II (3)

b. For a student who plans to continue graduate study for a Ph.D. in experimental physics.

Physics

5123 Theoretical Mechanics (4 credits)
5124 Mathematical Methods (4)
5125 Electromagnetic Theory (4)
5109 Statistical Physics (4)
with a Plan B paper on statistical solution of gradient transfer problems
5176-5177-5178 Quantum Mechanics (12)
with a Plan B paper on possible deviations from exponential decay and the search for proton decay
5042 Digital Electronics (4)
5044 Microcomputer Use in Instrumentation (4)
with a Plan B paper on the design and use of digital filters

Computer Science

5715 Microcomputer Systems (3)
5526 Data Structures (3)
5745 Data Base Management Systems Design (3)

c. For a student who plans to seek employment involving electronic and computer skills in handling data.

Physics

5123 Theoretical Mechanics (4 credits)
5124 Mathematical Methods (4)
5125 Electromagnetic Theory (4)
with a Plan B paper on waveguides and cavities with finite conductivity
5109 Statistical Physics (4)
5119 Optics (4)
with a Plan B paper on double photon transitions in positronium
5150 Introduction to Solid State Physics (3)
5042 Digital Electronics (4)
5044 Microcomputer Use in Instrumentation (4)
with a Plan B paper on data acquisition systems

Computer Science

5715 Microcomputer Systems (3)
5526 Data Structures (3)
5543 Operating Systems I (3)
5530 Numerical Analysis (4)

d. For a student who plans to seek employment involving computer calculations and modeling.

Physics

5123 Theoretical Mechanics (4 credits)
with a Plan B paper on stability, bifurcations, and chaos
5124 Mathematical Methods (4)
5125 Electromagnetic Theory (4)
5109 Statistical Physics (4)
5166 Hydrodynamics (3)
with a Plan B paper on computer models of currents in Lake Superior
5174 Electrodynamics (4)
with a Plan B paper on computer calculations of two-particle electrodynamics with various treatments of radiation reaction

Mathematics

5390 Special Functions (3)
5380 Partial Differential Equations (3)
5370 Operational Mathematics (3)

Computer Science

5526 Data Structures (3)
5530 Numerical Analysis (4)
5531 Numerical Linear Algebra (4)
5725 Algorithms (3)

UNIVERSITY OF MINNESOTA
TWIN CITIES

Industrial Relations Center
537 Management and Economics Building
271 19th Avenue South
Minneapolis, Minnesota 55455

February 7, 1983

Dean Robert Holt
Graduate School
321 Johnston Hall

The attached proposal for changes in the Master of Arts in Industrial Relations (MAIR) day program, and a proposal for an Evening MAIR program are submitted for review and action by the Social Sciences Policy and Review Council at its meeting February 23, 1983. These changes were unanimously approved by the Graduate Faculty in Industrial Relations at its meeting January 11, 1983.

We would like to implement these revised/new degree offerings Fall, 1983, if they are approved by the Graduate School. We would also have to notify all applicants for Fall 1983 admission of these program changes (our application deadline for Fall Quarter is April 1).

If you have questions or need additional information, please contact me at 3-3826, or Mahmood Zaidi, our Director of Graduate Study, at 3-3827.

Sincerely,

Mario F. Bognanno
Chairman, Graduate Faculty
in Industrial Relations

Attachments (Program Proposals, A96 and GS53a Forms)

cc: Mahmood A. Zaidi
James G. Scoville
Ross E. Azevedo

A SUMMARY OF ITEMS FOR GRADUATE SCHOOL ACTION

Industrial Relations Program Revision

I. BACKGROUND

-- Change necessitated by:

. new legislation
. social and economic policy
. changing worker values

-- Changes proposed:

. program breadth
. program depth

II. SPECIFIC PROPOSALS

-- General structural changes:

. specify industrial relations subfields
. define a set of industrial relations core courses

-- Course changes:

. prerequisite changes
. title changes
. number changes
. bulletin copy changes
. content changes
. new courses

*Staffing, Training, and Development
*International Human Resource Management

-- Program Changes

. Qualitative changes in MAIR -- Plan A
. Qualitative changes in MAIR -- Plan B
. A proposal for an Evening MAIR Degree

BACKGROUND

The Master of Arts in Industrial Relations (MAIR) program has not undergone substantial revision for nearly ten years. Since that time, the range of problems (and policies) addressed in Industrial Relations has changed. New legislation, new developments in employment policy, growing multinationalism, changing worker-employer values and similar developments require curricular integration.

The function of managing human resources in all classes of organizations has changed over the past decade. It is generally recognized that professionals responsible for decisions relative to human resource questions are now expected to be well-grounded generalists as well as sub-field specialists. These demands necessitate curricular adaptation.

To insure that the qualifications of the MAIR graduate from the University of Minnesota meets the highest standards of academic and professional excellence, the Faculty has proposed major substantative changes (a) in the MAIR curriculum and (b) in its breadth/depth composition.

Changes in both form and substance are proposed. While some changes in course titles and numbers have been suggested to improve the "shape" or "layout" of the program, other proposed changes involve content considerations to reflect "state of the art" developments in the field. The proposed program is more structurally integrated than the current one; thus, it is believed to provide a more solid, contemporary academic foundation.

SPECIFIC PROPOSALS

General Structural Changes

The proposed structural changes are of two types. The first is the specification of subfields which make up the industrial relations program. They are the ___1 subfield for Research Methodology; ___ 2 for Industrial Relations Systems; ___ 3 for Staffing, Training, and Development; ___ 4 for Organizations; ___ 5 for Compensation; ___ 6 for Labor Markets, and ___ 7 for Collective Bargaining. While most of these classifications have been identified for several years, this proposal formally specifies the Research Methodology and Industrial Relations Systems subfields for clarification purposes.

The second structural change is to define of a set of industrial relations core courses. The following core courses act as introductions to subsequent courses in each industrial relations subfields: IR 8001, 8002, 8003, 8004, 8005, 8006, and 8007. The remaining courses in the program are designated advanced industrial relations courses or industrial relations seminars.

One way to "picture" this structure is as shown in Appendix I, Proposed and Existing Course Layout. This document breaks down the proposed course structure.

Specific Course Changes

Six types of course changes are proposed, namely: (a) prerequisite changes; (b) course title changes; (c) course number changes; (d) bulletin copy changes; (e) course content changes; and (f) new course proposals. Each is explained in turn.

a. Prerequisite Changes

Since the proposed MAIR Plan B program requires students to take all of the core courses, the first course in each subfield is designated as the prerequisite for its successors. This retains the 8002 prerequisite status for all the core courses (e.g., 8003, 8004, 8005, 8006, 8007), and requires as prerequisites 8001, 8003, 8004, 8005, 8006, or 8007 for courses beyond first level of courses in the individual subfields.

The MAIR Plan A program requires students to take one course from at least three areas in Industrial Relations plus three additional Industrial Relations courses as approved by the advisor and Director of Graduate Study.

b. Title Changes

As part of this proposal, changes are proposed in the titles of certain industrial relations courses. These title changes are intended to shorten some course names which were excessively long and/or to more effectively describe the content of the course. These changes, which affect 8002, 8006, 8007, 8027, 8805, 8806, and 8807, are in no way reflective of changes in course content. It also should be noted that the prerequisites for 8006, 8007, 8027, 8805, 8806, and 8807 also are changed because of the above-noted reasons with respect to core courses.

c. Number Changes

In restructuring the MAIR program, it became evident that certain courses were initially numbered in a manner inconsistent with the proposed subfield designations. For this reason, 8003 was changed to 8013, 8011 was changed to 8001, 8010 was changed to 8012, 8017 was changed to 8037,

8037 was changed to 8017, 8046 was changed to 8036 and 8047 was changed to 8032.

d. Bulletin Copy Changes

As a part of the proposed revision the bulletin descriptions of the IR core courses (8002, 8003, 8004, 8005, 8006, and 8007) have been changed to show that they are prerequisites to the subfields of the program. This reflects the new nature of the program and is not indicative of a change in course content.

Additionally, course descriptions for 8012, 8015, 8027, and 8035 were changed to reflect differences in the relative composition of course content. That is, through time the importance of some parts of these courses has increased; that of other parts has declined. These new course descriptions reflect this shifting emphasis but they do not represent a change in basic content.

e. Course Content Changes

To improve program quality, the Industrial Relations Graduate Faculty proposes significant revision in three of the courses in its labor market area, namely: 8006; 8026 (which is renumbered 8016); and 8036 (renumbered 8026). As will be made evident, the nature of these revisions is in the structure and emphasis of these courses rather than significant changes in course content when viewed as a total offering.

The proposed 8006 continues to focus on questions of labor force participation, employment and unemployment, wage determination, labor allocation and utilization, productivity and technological change. Now proposed as the introductory course to the labor market sequence, there is increased emphasis placed on analysis through greater use of primary data, cases and simulations.

The realignment of 8026 and 8036 as 8016, Micro Labor Market Analysis, and 8026, Macro Labor Market Analysis, pulls all the micro and macro issues of the previous courses into distinctly separate modules. Because there is no longer the necessity for developing both types of analytical frameworks in each course, students will benefit from a more thorough study and sharper delineation of disaggregate and aggregate analytical approaches.

f. New Courses

This proposal involves the request that two new courses to be added to the Industrial Relations program. One is the new 8003, Staffing, Training and Development, and the second is the new 8022, International Human Resource Management. These courses are proposed to allow full breadth to the IR offerings at the core and advanced levels, respectively.

The staffing, training, and development functions are crucial to the operation of any organization. In the field of industrial relations, both scholars and practitioners have recognized the importance of these practices for increasing productivity at the organizational level, enhancing the possibilities for continued employment for all workers within the organization, improving the quality of working life, and eliminating unfair discrimination in employment. To the extent that every organization ultimately depends upon the abilities and skills of its employees, the matching of skills with job tasks through careful staffing, training, and development plays a key role in determining the effectiveness of the organization ... and constitutes a crucial concern for the industrial relations practitioner.

With the switch to a program requiring a core course in each subfield within the Industrial Relations area, it is necessary that students have a

staffing, training, and development course as one of the components in their educational foundation. While individual students may choose to specialize in any of the other listed IR subfields, it is imperative that they understand the importance of the staffing, training, and development functions and their interrelationship with other functional areas in the human resource management process independent of their specialization.

The second proposed course, International Human Resource Management, also reflects the dynamic nature of the personnel management field. As ever increasing numbers of U.S. businesses become involved in foreign operations, there has developed the need for personnel practitioners with the ability to deal with the cultural, institutional, and legal milieux of these countries.

The intent of this course is to teach personnel practices with respect to domestic and U.S. expatriate employees of American companies operating overseas. As such, the course deals with the problems, practices, and procedures guiding personnel programs in foreign countries where different mixes of social, economic, and institutional forces shape the personnel function.

MAIR Program Changes

In line with the above proposed changes in the Industrial Relations courses, the Industrial Relations faculty proposes to change the course requirements for the MAIR degree. This proposed change is in the direction of expanding the course requirements for both the Plan A and Plan B offerings. This expansion in the number of required courses is part of the faculty's intention to increase both the breadth and depth of the student's experience in the Industrial Relations program. The particulars of the proposal are:

a. PLAN A

A minimum of 12 courses (48 course credits) and an accepted thesis are required. At least eight of the courses (32 credits) must be obtained in Industrial Relations as indicated below. Additional course work may be required by the advisor to ensure adequate preparation in the major field of study.

The course work consists of a minimum of 12 courses (48 course credits) which meet the following distribution.

(i) IR Courses:

1. IR 8002
2. IR 8001
3. One course from at least three areas in Industrial Relations plus three additional Industrial Relations courses.

(ii) Non-IR Courses:

A minimum of three courses (12 credits) is required in an approved field or fields of study related to industrial relations. Commonly selected fields are business administration, economics, psychology, sociology, or statistics.

(iii) One additional course which may be taken in IR or an outside related field.

(iv) Plan A. Thesis:

A thesis dealing with a specialized topic in the major field must be approved for the degree.

There is no foreign language requirement.

A final oral examination is required for all candidates for the Plan A Master's degree. Candidates will be admitted to the examination only after completion of the following requirements:

Candidates may take the final oral examination after completion of all courses appearing on the student's official program and after filing with the Graduate School the Thesis Reader's Report Form certifying that the thesis is ready for defense. The final oral examination will be conducted by the examining committee appointed by the Dean of the Graduate School.

A Final Oral Report Form must be signed by the student's examining committee and submitted to the Graduate School office. In the case of failure, unanimous consent of the examining committee is required to retake the Master's oral examinantion.

b. Plan B

A minimum of 16 courses (64 course credits) and completion of three Plan B Papers is required. The course work consists of the following distribution.

(i) IR Courses:

1. IR 8001
2. IR 8002
3. IR 8003

4. IR 8004
5. IR 8005
6. IR 8006
7. IR 8007
8. IR 8012
9. Four additional Industrial Relations courses total 48 credits in Industrial Relations courses.

(ii) Non-IR Courses:

The related field course requirements consist of a minimum of 16 credits earned in at least two related fields. As a general policy, it is recommended that students should include two courses in each of two related fields. Commonly selected fields are business administration, economics, psychology, sociology, or statistics. Students whose bachelor's degree is not in business administration or a related major are encouraged to select business administration as a related field.

(iii) Plan B Papers:

Three Plan B papers are required. One Plan B paper of the quality but not the scope of the Master's thesis, involving independent work under faculty supervision, shall be written in conjunction with a course appearing on the approved program. The two remaining Plan B papers must be written in conjunction with each of the courses 8001 and 8012.

There is no foreign language requirement.

A final oral examination is required of all candidates for the Plan B Master's degree. Candidates will be admitted to the examination only after completion of the following requirements:

Candidates may take the final oral examination after all course requirements have been completed. Candidates should have the faculty member to whom the Plan B paper was submitted certify approval of the paper to the examining committee. In case of failure, unanimous consent of the examining committee is required to retake the Master's oral examination.

A final Oral Report Form must be signed by the student's examining committee and submitted to the Graduate School.

This proposal, increasing the Plan A from 28 to 48 course credits, the Plan B from 44 to 64 course credits, is a further recognition of the increasing complexity of the field of industrial relations. Just as the course proposals outlined earlier reflect this evolution of the field, the expansion of the course requirements is intended to assure that the fullest range and depth of subject matter are presented to our students.

In sum, this proposed revision of our program structure is another element in the improvement of our Master's degree offering. It represents an updating and enhancement of program coverage and quality ensuring that the IR program at the University of Minnesota will retain its preeminence among industrial relations programs nationally.

The Evening MAIR Program

In addition to revising the structure and courses of the day MAIR program, we are proposing to offer an evening MAIR, or EMAIR degree. This offering is to be identical in course content to the day degree, with courses being offered in the evening. To ensure the quality of this program, all teaching in the program will be taught by the regular faculty of the Industrial Relations Department. The standards for application and admission, outlined below, are identical across degrees.

Program Admission

Admission to the day MAIR program is in the Fall and Spring Quarters and to the evening MAIR program in the Fall Quarter only. The requirements for admission to both programs are the same and include a Bachelor's degree, the Graduate Record Examination, letters of recommendation, prerequisite courses, and the Test of English as a Foreign Language (where appropriate).

Students must indicate, when applying, whether they are seeking admission to the day MAIR or evening MAIR program. Additionally, they will be asked, "Do you wish to be considered for the other program if there are not sufficient openings in your designated program?" Students will be evaluated on the basis of past academic performance as outlined below. The best students will be chosen without regard to specific program applied for, allowing the list to be extended only for those cases where a student cannot be admitted because the program to which he/she has applied has already had its available positions filled.

a. Bachelor's Degree

Admission to graduate studies in industrial relations is granted by the Graduate School. Any student with a Bachelor's degree or its equivalent may apply to the Dean of the Graduate School for admission.

b. Graduate Record Examination

All applicants are required to complete the Graduate Record Examination (GRE). For information about the GRE contact the University of Minnesota Student Counseling Bureau, 101 Eddy Hall, 192 Pillsbury Drive S.E., Minneapolis, Minnesota 55455 (373-4193) or go the nearest testing center recommended by your school.

c. Letters of Recommendation

Three letters of recommendation are required from persons well acquainted with the applicant's academic work and professional experiences.

Letters are to be sent directly to the Director of Graduate Study in Industrial Relations.

d. Prerequisite Courses

Before a student is formally admitted to the program, he or she must have successfully completed (i.e., received a final grade of C or better) the following prerequisite courses: Introduction to Macroeconomics, Introduction to Microeconomics, and General Psychology. Admitted students who lack these prerequisites may fulfill them at another institution of higher learning before entering the program or they may complete them at the University of Minnesota during their first quarter in residence. An official transcript must be submitted to the Director of Graduate Study verifying the grades received.

e. Test of English as a Foreign Language

The Test of English as a Foreign Language (TOEFL) examination is required for all foreign applicants whose native language is not English. The TOEFL exam is waived in cases where the applicant has completed an academic year in residence as a full-time student at another recognized institution of higher learning in the United States prior to entering the University of Minnesota (see the Graduate Bulletin for details).

f. Potential for Graduate Study

Admission to graduate work is granted on the basis of indicated potential for graduate study. In general, a grade point average of B (i.e., 3.0) or higher is required for admission. Grade level in social and behavioral science courses, the pattern of annual grade averages, letters of recommendation, competition for available openings, the scores on the Graduate Record Examination (GRE) and TOEFL (in the case of foreign students) also influence the decision.

Because of limits on program size, and the competitive nature of the admission process, many qualified students cannot be accepted for graduate work in Industrial Relations.

Transfer between Programs

The day and evening MAIR programs are distinct. Application for admission is to one program and transfer between programs will not be allowed except in most unusual circumstances. Class size restrictions and scheduling conflicts mitigate against such changes because of the administrative difficulties they cause.

Appendix I : Proposed and Existing Course Layout

IR Subfields	Proposed Program: IR Core Courses	Proposed Program: IR Advanced Courses				Existing Program					
Research Methodology	8-001**				8-801		8-011				8-801
Industrial Relations Systems	8-002	8-012**	8-022*	8-032**	8-802	8-002	8-010				8-802
Staffing, Training and Development	8-003*	8-013**	8-023	8-033	8-803	8-003		8-023	8-033		8-803
Organizations	8-004	8-014	8-024		8-804	8-004	8-014	8-024			8-804
Compensation	8-005	8-015	8-025	8-035	8-805	8-005	8-015	8-025	8-035		8-805
Labor Markets	8-006**	8-016**	8-026**	8-036**	8-806	8-006	8-016	8-026	8-036	8-046	8-806
Collective Bargaining	8-007	8-017**	8-027	8-037**	8-807	8-007	8-017	8-027	8-037	8-047	8-807

*: new courses

**: redesigned/moved course