

UNIVERSITY OF MINNESOTA
Graduate School

Minutes of the Executive Committee
Tuesday, March 5, 1968
1:00 P.M. 306 Johnston Hall

Present: Professors D. W. Warner, D. W. Thompson, E. W. McDiarmid, W. S. Loud, M. C. Reynolds, George Seltzer, C. M. Stowe; Deans W. E. Ibele, M. L. Gieske, T. W. Chamberlin; Dean Bryce Crawford, Jr., presiding; Shirley McDonald, secretary.

1. Graduate Faculty Nominations and Criteria for Appointment - Dean Crawford distributed copies of two letters containing reactions and suggestions in respect to nominations and appointment to the Graduate Faculty. These letters were in response to the letter Dean Crawford sent to department chairmen in which he outlined some guidelines and "indications of the general ways in which the group committees consider Graduate Faculty nominations."

Discussion on the item will continue.

2. Appointment to Graduate School Staff - Dean Crawford announced to the Committee that Professor Harry Lease, from the University of Minnesota at Duluth, will join the Graduate School as an assistant dean, 40% time, for at least the spring quarter, 1968. He will spend one day a week in Minneapolis in the Graduate School offices and one day a week at UMD working with departments and the Graduate School on the continuing development of graduate programs at Duluth.
3. Proposed Designation for the Master of Arts Degree for two areas in Education: (1) the M.A. with a major in Business Education (Plans A & B); and (2) the M.A. with a major in Distributive Education (Plans A & B) - this request does not constitute the establishment of new majors, but a separation of these two emphases from the present Curriculum and Instruction designation. The relisting of the offerings under these two titles has already been approved and designation of the majors as such will eliminate the confusion which now exists for prospective students.

Upon recommendation of the Education Group Committee (and consultation with Professor Seltzer for the Social Sciences Group Committee), the Executive Committee approved these two designations, and they will be listed in the Graduate School Bulletin.

4. Proposed Master of Arts with a major in Mathematics Education (Plan B) (Refer to Executive Committee Minutes, October 1967, Item 14) - this proposal has been under consideration by the Education and Physical Sciences Group Committees. Professor Loud prepared reports of discussions held during the several meetings held by the committee and with other consultants. Dean Crawford commented on the value of cooperation between faculty in subject matter fields and faculty in education. He also emphasized the point that new programs are the concern of the Graduate School as a whole, and that group committees should therefore be encouraged to avoid any provincial outlook, and to involve themselves in the development of new programs, even outside their own areas wherever they could thereby contribute to a consideration of such programs from the holistic Graduate School viewpoint.

Following careful discussion of the reports and the recommendation of the Education and Physical Sciences Group Committees, the Executive Committee approved the establishment of the M.A. degree with a major in Mathematics Education (Plan B) with the understanding that, (1) mathematics is an integral part of the program, with 12 to 18 credits of mathematics ordinarily required, and that literature describing the program will indicate this emphasis; (2) that the Mathematics Department, in supporting this proposal, recognizes the need to develop new 100 level mathematics courses, particularly for students in the program whose specialty is in elementary education, and will undertake to develop such courses.

Copies of the proposal and group committee reports which include these points are filed with the permanent file of these minutes. ✓

5. Master of Science Degree with a major in Mechanical Engineering (Plans A and B) at Rochester - This program, conducted through closed-circuit TV, is essentially the same program offered through the regular day classes on the Minneapolis Campus. Graduate School admission standards and all of the requirements for the Master's degree are the same. The students will spend a prescribed amount of time on the Minneapolis Campus with their advisers and in pursuit of research associated with the Plan A thesis or Plan B papers. Library facilities at Rochester are adequate. The thesis research must be conducted on the Minneapolis Campus so that laboratory facilities at Rochester are not in question. ✓

Actually, the action to be taken on this program is an approval to extend the 12 credit limitation through Joint Registration between the Graduate School and the General Extension Division. Exceptions to the 12 credit rule are made only where there are structured graduate programs planned and approved in advance by the department and the Graduate School and become regular offerings through the General Extension Division and the Graduate School. Since the Mechanical Engineering program at Rochester meets these requirements, the Physical Sciences Group Committee recommended that it be accepted and the Executive Committee approved.

6. Proposed Master of Science Degree Programs in Zoology, Botany, and Biology at Duluth (Refer to Executive Committee Minutes October 1967, Item 7; November 1967, Item 9; December 1967, Item 6) - The Life Sciences Group Committee has reviewed the proposal, holding several meetings in which additional supporting information was considered and with consultation with Duluth faculty in the fields. ✓

Professor Dwain Warner, speaking for the Life Sciences Committee, recommended that the programs be approved. The Executive Committee, recognizing the strength in the department at Duluth, approved the establishment of the: (1) M.S. degree with a major in Zoology (Plan A); (2) M.S. degree with a major in Botany (Plan A); and (3) M.S. with a major in Biology (Plan B).

The dean stated that the Graduate School will work with the Provost at Duluth to identify the steps still to be taken to develop plans to activate the programs and implement the decision.

7. Proposed change in the title of the major: from Recreation to Recreation and Park Administration (Master of Arts major and Ph.D. minor) - The Department of Recreation and Park Administration requested that the title of the major be changed because it will identify more accurately. ✓

the graduate specializations available to students.

The Education Group Committee recommended approval and the Executive Committee concurred.

8. Undergraduate Transcripts for Group Committee use - Dean Crawford reported that there is a small percentage of programs with certain graduate majors where the group committee needs to know about the student's undergraduate background. This is true particularly in areas where students with a variety of undergraduate majors apply for certain graduate majors. A case in point is the graduate major in Biology. The student's undergraduate major may have been in any one of a number of fields. This situation would probably not occur in the physical sciences, for example. And in checking with the chairmen present at this meeting, it would not seem to be an important factor in most areas.

Graduate School group-committee personnel will furnish the transcripts, on request, for those few situations where there is concern about undergraduate preparation. It will be helpful if group committee members, in reviewing programs, can give Graduate School staff a couple of days advance notice as to the transcripts needed.

9. General Extension Division Credits for the Collateral Field and Research Technique - It was proposed and tentatively approved at the February Executive Committee meeting that the 9 credits required for the Collateral Field and Research Technique can be taken through joint registration between the Graduate School and the General Extension Division as long as the total 12 credit limitation is not exceeded.

Following consideration by some of the group committees and further }
discussion by the Executive Committee, this proposal was given final }
approval.

10. The Written Examination in the Major Field for the Ph.D. Degree - Currently the written examination in the major field may be held prior either to the oral preliminary examination or to the final examination, or to both. In actual practice, according to Graduate School personnel, the written examination is given and the report filed in the Graduate School prior to the scheduling of the oral preliminary examination in all fields. (there has been one exception in a year's time and this was an unusual individual situation.)

Discussion on this was initiated in connection with the general consideration of the oral preliminary scheduling problems (refer to Executive Committee Minutes, February 6, Item 5) and brought up again since the 1968-70 Graduate School Bulletin is in process of preparation.

The Executive Committee agreed that the statement as it appears in the current bulletin should remain, pending a poll of the departments for their reaction on the timing of the written examination in the major.

11. The Master of Science and the Master of Arts Degree Designation - Some confusion exists between the Graduate School, Admissions and Records, and students about degree designation for the Master's degree.

Some fields do specify one or the other (M.A. or M.S.) designation in the

Graduate School Bulletin, but many do not. Students often enter one designation on the registration forms and another on the graduate program. When students apply for the degree, the designation on the application may differ from that on the program. The majors and degree designations for the commencement list are taken from the student programs.

It is the general philosophy, in the Graduate School, that when the designation is not specified by the departments, students should be free to elect the one they prefer.

The Graduate School will contact department chairmen in order to get a list of those fields which specify either the M.A. or the M.S. and those which will permit either designation.

12. Developments toward Graduate Programs in Theology in Twin City Seminaries

Dean Crawford reported to the Committee that there are six theological seminaries in the vicinity who are considering forming a consortium to offer a graduate degree (either Master's or Doctoral) and would like to cooperate with the Graduate School so that certain University graduate courses could be made available to their students.

The dean mentioned several stipulations under which the University could offer cooperation in such a venture. First, the degree would be granted by the seminary consortium and would in no way be a joint degree with the University of Minnesota. Second, the students would have to be admitted to the Graduate School, meeting all admissions standards, in a non-degree status. Since this type of admission could not be referred to a regular department for recommendation, an ad hoc Graduate School committee of faculty drawn from appropriate departments might be appointed to work with admissions personnel in the Graduate School. Third, students enrolled at the University of Minnesota would be required to pay fees in accordance with the normal University fee structure. Fourth, any participation by Minnesota Graduate Faculty members, outside of teaching their normal courses, would have to be arranged with the individual faculty members.

He also pointed out the benefits which our University graduate students in several areas could derive from the reciprocal availability of the graduate courses and study opportunities which the seminary consortium could provide.

13. Establishment of Candidacy for the Ph.D. Degree - Dean Gieske reported that ✓
the Graduate School is in the process of sending Certificates of Candidate in Philosophy to the Ph.D. students who have passed the preliminary oral examination.

The question of those who passed this examination with reservations was discussed. Some of the reservations are general and not too serious and can be removed during the final examination should the committee so decide. Certificates for these candidates will be issued. However, students whose reservations are more specific and require, perhaps, additional coursework, etc., will not receive the Certificates until the reservations have been removed.

The discussion turned to the philosophy behind the "pass with reservations." The Executive Committee agreed that there are instances where the examining

committee cannot make a sharp decision to pass or fail a candidate, but that perhaps a time limit for the removal of the reservation could be imposed.

The Graduate School will explore this possibility.

The date for the next meeting of the Executive Committee has been set for Tuesday, April 16.

Respectfully submitted,

Shirley McDonald,
secretary

March 7, 1968

UNIVERSITY OF *Minnesota*

COLLEGE OF EDUCATION • DEPARTMENT OF SECONDARY EDUCATION
MINNEAPOLIS, MINNESOTA 55455
October 10, 1967

MEMORANDUM

TO: Dean Bryce Crawford, Jr.

FROM: Robert Jackson, David C. Johnson, Donovan A. Johnson, Thomas Post, James Stochl

FOR: Consideration by Group Committee in Education, Psychology, and subsequent action by the Graduate School

REGARDING: Proposal for a Mathematics Education Major

The above staff members have discussed at length our entire graduate program in mathematics education during our weekly meetings over the past two years. As we have examined our current program and have explored plans for the future, we have come to the conclusion that our degrees, our courses and our staff need better identification and coordination. Hence, we are addressing the proposal below for a graduate major in mathematics education for your consideration.

At the present time there is much interest in graduate work in mathematics education because of the demand for:

- 1. Curriculum specialists for supervisors, coordinators and consultants for public schools,
- 2. College teachers of mathematics education,
- 3. College teachers of mathematics,
- 4. Specialists in research in mathematics education,
- 5. Specialists in curriculum development for projects such as Minnemast.

This interest is apparent from the frequent letters of inquiry about our graduate program in mathematics education. As a result of the nation-wide demand for specialists several universities such as Michigan State, Ohio State, Georgia and Texas have established specific units and graduate degrees in mathematics education.

The College of Education now has a block of courses specifically designed for graduate work in mathematics education:

- 1. Ed. C. I. 149A, 149B, 149C Elementary
- 2. Ed C. I. 165A, 165B, 192B Elementary and Secondary

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|----|-------------------------|-----------|
| 3. | Ed. C.I. 191, 192A, 194 | Secondary |
| 4. | Ed. C.I. 230, 231, 291 | Research |
| 5. | Ed. C.I. 232 | Problems |
| 6. | Ed. C.I. 233 | Seminar |

As comprehensive as our program is, several other universities have more graduate students in mathematics education than Minnesota. These programs at other universities do not seem as strong or appropriate as that at the University of Minnesota, but through publicity and catalog emphasis, graduate students are attracted to these institutions. Thus, it would seem important that the College of Education and the Graduate School take steps to make visible the strength in the mathematics education program at Minnesota. This can be done in several ways:

1. Identify the mathematics education courses by listing them in the catalog as mathematics education instead of Education Curriculum and Instruction.
2. Identify the M. A. and Ph.D. degrees as graduate degrees with a major in mathematics education.
3. Identify the staff as being professors of mathematics education.
4. Identify a specific unit of the College of Education as a mathematics education unit (the term unit is an undefined placeholder at this time).

It seems that this type of organization would strengthen our teaching, our research, and our service activities in the field of mathematics education. The outcomes from the actions above would be the following:

1. Obtaining financial support for projects would be made easier.
2. More high quality graduate students would be attracted.
3. Program development and review in mathematics education for elementary, secondary, and junior college mathematics would be more easily coordinated.
4. Research activities in this field would be stimulated.
5. Liaison with the School of Mathematics would be expedited.
6. Recruiting teaching assistants and research assistants would be assisted.
7. A brochure describing the program could be prepared and distributed to persons requesting information.

8. A unit which would review all graduate programs in mathematics education would be provided.

We have considered the problems involved in this organization. We have discussed them with the Deans of the College of Education, some of the departments involved, several of the standing committees of the College, and our colleagues in the School of Mathematics. From these efforts, over a lengthy period of time, it is our conclusion that the adoption of this proposal would greatly benefit the University of Minnesota.

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MATHEMATICS EDUCATION

College of Education
University of Minnesota

Departments: Elementary Education
Secondary Education
School of Education

Staff: Robert L. Jackson
David C. Johnson
Donovan A. Johnson
Thomas P...
James E. Stochl

MATHEMATICS EDUCATION

College of Education

University of Minnesota

The revolutionary changes in school mathematics during the past ten years has created a great need for well-prepared, competent leaders in mathematics education. The large scale school mathematics projects, the growth of federal support and the development of new technology have all contributed to change -- change which continues at an accelerating pace. Mathematicians, educators, psychologists, and school teachers have been actively involved in these changes. Even so, changes have frequently been made without consideration of learning theories, curriculum principles or instructional problems.

It is the responsibility of universities to prepare persons who can give strong leadership for the change ahead. This requires a graduate program that broadens and deepens backgrounds in mathematics, pedagogy, psychology, curriculum, philosophy of education and research. The graduate programs in mathematics education at the University of Minnesota are designed to meet the needs of the mathematics teacher, mathematics supervisor, mathematics department chairman, or elementary school specialist in mathematics.

Admission

Candidates for admission to graduate work in mathematics education are expected to have superior achievement in prior academic work. Candidates planning to complete a minor or related field in mathematics are expected to have at least a B average in undergraduate mathematics.

Application for admission to graduate work in mathematics education should be submitted to the Graduate School. Application forms may be obtained by contacting the Graduate School. The cost of an admission application is \$10.00. On the admission application, indicate specifically the degree sought and the major field desired, namely, mathematics education, and if possible, advisor. Applicants should be prepared to submit two copies of transcripts of previous college work.

Students who have completed a Master's degree at Minnesota and wish to pursue a higher degree or to continue to take courses for credit only should submit a Change of Status form to the Graduate School.

Adviser

The Graduate School will not normally assign an adviser to a student. The student should select an adviser from the following staff in mathematics education:

Robert L. Jackson, Elementary Education

David C. Johnson, Secondary Education

Donovan A. Johnson, Secondary Education

Thomas Post, Elementary Education

James E. Stochl, Elementary Education

The student should contact a member of the staff listed above to act as his adviser. Normally, the student who has completed his Master's degree at Minnesota

will continue with the same adviser unless the student or the adviser request a change.

Transfer of Credit

No graduate credits may be transferred from other institutions for the Master's degree. For degrees beyond the Master's, credits from other graduate schools may be submitted as part of the program for the degrees beyond the Master's. Credits earned in the first academic quarter or summer term as an adult special student may be transferred to the graduate record by petition. A maximum of 9 credits in the Extension Division of the University of Minnesota may be transferred to the graduate record by petition. No correspondence study courses may be transferred.

Residence

Candidates for advanced degrees must be registered for a minimum of 3 academic quarters and must pay not less than the full normal tuition for 3 quarters before receiving the degree. Candidates for degrees beyond the Master's must spend at least one year full time residence on the University campus. Candidates for the Doctor's degree must register for at least 3 academic years (9 quarters) of graduate study in approved subjects and thesis research.

Education Graduate Examination Battery

All candidates for graduate degrees in Mathematics Education are required to complete the Education Graduate Examination Battery. This test battery, scheduled once each quarter and summer session, must be completed before a student is permitted to submit an Application for Candidacy for the Master's Degree. This battery should be completed during the first quarter or session in which the student is registered.

Registration

Registration materials and class schedules must be obtained in the Graduate School Office, 316 Johnston Hall. These materials are never mailed to students.

Each registration must be approved by the student's major adviser.

Adult Special Student

Persons who have received a Bachelor's degree, who desire a special and limited course of study may be considered for admission to the College of Education as an Adult Special student. Admissions Form A24 should be used and filed with the University Admissions Office, 100 Morrill Hall. This status would be appropriate for those seeking course work for purposes of professional development and are not interested in pursuing a graduate degree. Courses open to Adult Special students are limited to those numbered 199 and below and no graduate credit is granted.

The Graduate School will accept only the first registration (academic quarter or summer term) of graduate level work (100 level) for graduate credit for adult special courses subsequent to regular admission to the Graduate School. This requires a petition for granting of graduate credit.

Support Programs for Advanced Graduate Study

Each year there are a limited number of assistantships and instructorships available to advanced degree candidates in mathematics education. Since the financial support available depends on the type of program and the amount of time involved, there is considerable range in amounts of support available. Those students who need support for full time graduate study should inquire about these opportunities with the Graduate School, the School of Mathematics, University High School or his adviser.

Bureau of Recommendations

The Bureau of Recommendations provides graduate students information about employment opportunities in all kinds of educational institutions. This is the only place on campus where complete descriptions, records and recommendations are assembled. These records, which are never destroyed, will be sent to prospective employers to support the individual's candidacy for a position.

All graduate students in Mathematics Education are urged to activate a placement record with the Bureau of Recommendations early in their program and to keep that record up to date. It is important that such records are available when requests for personnel are received.

SUMMARY OF PROGRAMS FOR THE
MASTER OF ARTS DEGREE IN
MATHEMATICS EDUCATION

The Graduate School provides two plans for earning the Master's degree at the University of Minnesota. In general, Plan B is the more appropriate for students majoring in Mathematics Education and the requirements for this degree are referred to here.

1. Application for Candidacy for the Master's Degree

Admission to the Graduate School does not guarantee that the student has been accepted as a candidate for the Master's degree. The student will complete and submit to the major adviser for approval and signature an Application for Candidacy for the Master's Degree (Form GS 62). This form should be filed in the Graduate School after completion of nine, but not more than fifteen, graduate credits and requires a grade point average of not less than 3.0 (B average) for approval.

2. Program Plan for Master's Degree

Upon notification of Application for Candidacy for the Master's degree, the student must file with his adviser a Master's degree Plan (Form GS 60-61). This plan includes all of the graduate courses selected to fulfill the degree requirements. The Master's degree, 'Plan B', requires completion of a minimum 45-credit program of graduate courses. However, programs in Mathematics Education typically include 48-51 credits. From 21-27 credits must be completed in education. The remaining work must be divided among two or more related fields with at least six credits in each of two fields. One related field should be mathematics and may include as much as 18 credits.

Approval of the Master's degree program includes the appointment of a three-member Master's degree examining committee by the Graduate School. The student's major adviser serves as chairman of this examining committee. The Graduate Group Committee which approves programs usually meets the third and seventh week of each quarter. Candidates are notified by mail of this action.

3. The Plan 'B' Research Paper

The 45 quarter hour requirement for the Master's degree includes at least nine credits of independent research work. Students working on Plan B paper must register for a total of 9 credits in a problems course such as Ed. C.I. 232 or Ed. C.I. 261 or Ed. C.I. 271. These courses are independent study courses in which the student consults with the instructor regarding his paper. The research courses, Ed. C.I. 230, Ed. C.I. 231 or Ed. C.I. 291 are appropriate courses for preparing Plan B papers. Students are not eligible for 200 level courses before Candidacy for a Degree is approved.

4. Comprehensive Examination

Upon completion of the course work and Plan 'B' paper, the student will take the appropriate examinations. Successful completion of these examinations is required for the Master's degree. Ordinarily, the oral examination is not required for the Master's degree in Mathematics Education but each student should consult his advisor as to whether an oral examination is necessary in his case.

Candidates are also expected to secure the examination report form from the Graduate School. This form is filed with the major adviser when (1) all course work, including the 9 credit research paper, is completed; and (2) the comprehensive examinations are successfully completed.

5. Typical Programs for Master's of Arts Degree in Mathematics Education

A. Elementary School Teachers

1. Major Field Courses (21-27 credits)

	<u>Course Number</u>	<u>Title</u>	<u>Credits</u>
	Ed. C.I. 119	Elementary School Curriculum	3
	Ed. C.I. 149A	Teaching and Supervision of Elementary School Mathematics	3
	Ed. C.I. 149C	Curriculum Development in Elemen- tary School Mathematics	3
	Ed. C.I. 165A	Mathematics for the Gifted	3
or			
	Ed. C.I. 149B	Materials Laboratory for Elemen- tary School Mathematics	3
	Ed. C.I. 192B	Computer-Assisted Instruction in Mathematics	3
	Ed. C.I. 230	Survey of Theory and Classical Research	3
	Ed. C.I. 233	Seminar in Mathematics Education	1
	Ed. c.I. 232	Problems: Mathematics Education	9*

2. Related Fields (18 or more credits)

Ed. Psy. 193	Psychology of Human Learning	3
Ed. Psy. 116	Statistics	3
Ed. Psy. 117	Measurement	3
Ed. Psy. 159	Personality Development	3
Math 100A	Foundations of Arithmetic.	3
Math 109	Theory of Numbers	3

Total Credits 46

B. Secondary School Teachers

1. Major Field Credits (21-27 credits)

<u>Course Number</u>	<u>Title</u>	<u>Credits</u>
Ed. C.I. 113	High School Curriculum	3
Ed. C.I. 149A	Elementary School Mathematics	3
Ed. C.I. 191	Secondary School Mathematics	3
Ed. C.I. 192A	Mathematics Laboratory	3
Ed. C.I. 192B	Computer-Assisted Instruction in Math	3
Ed. C.I. 291	Research in Mathematics Education	3
Ed. C.I. 232	Problems in Mathematics Education	9*

2. Related Fields (18 or more credits)

Math 109	Theory of Numbers	3
Math 131A,B	Modern Algebra	6
Math 178	Probability	3
Ed. Psych 116	Statistics	3
Ed. Psych 117	Measurement	3
Ed. Psych 193	Psychology of Learning	3

Total Credits 48

SUMMARY OF REQUIREMENTS

FOR THE

DOCTOR OF PHILOSOPHY DEGREE IN MATHEMATICS EDUCATION

There is considerable flexibility in the program for the Ph.D. degree in mathematics education in order to adapt the program to the background of experience and education of the candidate as well as to relate it to the professional goals of the candidate.

1. Doctoral Program

Students should file Doctoral Programs (Form GS 65) with the Graduate School as soon as the total program can be determined. This is usually done near the time when 40-50 graduate credits have been earned. The individual students program, requiring the signature of the major adviser and the minor adviser if a minor field is elected, contains a listing of all course work completed and planned for the Ph.D. program. This program must include all work in collateral fields or special research techniques to be taken in lieu of one foreign language (see #2 below) and should be filed with the language declaration. Students electing a Supporting Field rather than a minor field will have no minor adviser.

The program for a major in mathematics education generally consists of:

- a. A major consisting of 55-70 quarter hours of graduate credit in the major field. Students electing to major in Education may include in such major courses from all departments of the College of Education except those in which the minor is taken.
- b. A minor field consisting of 24-45 quarter hours of graduate credit. The minor field, normally representing courses from a single department, must be approved by a minor adviser.
- c. A supporting field consisting of 20-30 quarter hour credits may be selected instead of a minor. The supporting field may consist of courses from more than one department. It must be a coherent pattern of studies possibly embracing several disciplines but clearly forming a purposeful part of the doctoral program.

2. Language Declaration

When the student files the Doctoral Program with the Graduate School, the Language Declaration Form (GS 79) should also be filed. This indicates how the student plans to fulfill the language requirement.

The language requirement may be met in several ways: (1) proficiency in two foreign languages; (2) proficiency in one foreign language and 15 quarter hours of graduate credit in a Collateral Field (such as Physics, Psychology); (3) proficiency in one foreign language and 9 quarter hours in a special research technique (such as computer programming). It should be noted that the proficiency requirement in languages may be satisfied in various ways, including the satisfactory

completion of a 3-quarter hour course in some languages. The language requirement and the minor or supporting field must be completed before the Preliminary Written or Oral Examinations can be scheduled.

3. Acceptance of the Program

A Graduate Group Committee acts on each program filed and after approval by the Group Committee and the Graduate School, a preliminary examination committee is appointed. The committee usually consists of 5 faculty members, 3 from the student's major field and 2 from the minor or supporting field.

4. The Preliminary Examination

The preliminary examination should be scheduled after the language requirement has been fulfilled and the minor field or supporting field is completed. This examination is conducted in two parts -- written and oral.

When the written portion of the preliminary examination is passed, the major adviser, as chairman of the preliminary examination committee, certifies this to the Graduate School. The oral portion of the examination is then scheduled by the Graduate School, usually after the student has determined, in advance, a possible time and date from members of the committee.

The candidate should supply each member of the examining committee with a summary of his education and experience.

It should be noted that both the written and oral preliminary examination deals with both the major and minor (or supporting) fields. Only after successful completion of the oral portion of the preliminary examination is the student considered a candidate for the degree.

5. Thesis and Final Oral Examination

The prospectus of the thesis and the research design to be followed must be submitted to the Graduate Group Committee for approval. Upon approval, the Graduate Group Committee will appoint a five-member final examining committee, three of whom are designated as the thesis committee.

The thesis review committee, which is chaired by the major adviser, is charged with advising the student in his research study. The adviser usually provides major direction to the student in the development and initial writing of the thesis, though the candidate and the adviser may wish to involve other members at various times for assistance and counsel.

Upon completion of the final draft of the thesis, it must be registered with the Graduate School in a form suitable for circulation and review by the three-member thesis committee. The presentation of the thesis to the final oral examining committee can only be scheduled when the thesis review committee registers its approval with the Graduate School on the appropriate report form. Approval by the thesis review committee means that the thesis is considered ready for examination at the final oral. It does not preclude revision as recommended by the total committee in the final oral examination.

The final oral examination, conducted by the five-member final oral examination committee, covers the thesis and the candidate's field of special study. A summary of the dissertation must be supplied to all members of the examining committee prior to the final examination.

6. Typical Program for Ph.D. Degree in Mathematics Education

Ph.D. programs are designed according to the background and professional plans of the candidate. The programs recorded below are merely suggestive rather than prescriptive.

Ph.D. Major: Education Minor: Mathematics

1. Mathematics Education (27 credits)

149A Teaching and Supervision of Elementary School Mathematics
149C Current Developments in Elementary School Mathematics
165A Mathematics for Gifted Children

or

165B Mathematics for Slow-Learning Children
191 Teaching and Supervision of Mathematics in Secondary School
192A Mathematics Laboratory
192B Computer-Assisted Mathematics Education
194 New Content and Method
233 Seminar in Mathematics Education
291 Research in Mathematics Education

2. Curriculum and Instruction (9 credits)

113 Secondary School Curriculum
129 Trends and Issues in Secondary Curriculum
172 Supervision of Secondary Instruction

3. Educational Psychology (21 credits)

117 Basic Principles of Measurement
170 Psychology of Intelligence
196-197 Psychology of School Learning
216-17-18 Statistical Methods

4. History and Philosophy of Education (6 credits)

131 Comparative Education
141 Critical Issues in Contemporary Education

5. Mathematics (36 credits)

111 Development of Number Systems
130A, B, C Introduction to Analysis
131A, B, C Linear Algebra and Group Theory
221A, B, C Complex Analysis

or

205A, B, C General Algebra

COMPREHENSIVE EXAMINATIONS

The candidate who is completing a graduate degree in mathematics education is expected to be informed in the following areas:

1. Professional organizations and the professional literature
2. New developments in school mathematics programs
3. Current trends and unresolved issues
4. Criteria for the evaluation of strategies, materials or instruction
5. Significant research studies, criteria for evaluating research and the design of research studies
6. Goals and objectives for school mathematics
7. Significant events, books and leaders influencing mathematics education during the past ten years
8. Evaluation of achievement
9. Principles of learning involved in learning mathematical concepts, skills or attitudes

In preparation for the comprehensive examination, the candidate should be familiar with these publications:

1. Professional journals such as The Mathematics Teacher and The Arithmetic Teacher
2. Selected yearbooks of the National Council of Teachers of Mathematics
3. Materials produced by experimental projects
4. Professional books used as textbooks for mathematics education courses

GRADUATE COURSES FOR A DEGREE IN MATHEMATICS EDUCATION

1. Mathematics Education (24 credits)

- 149A Teaching and Supervision of Elementary School Mathematics
- 149B Materials Laboratory for Elementary School Mathematics
- 149C Current Developments in Elementary School Mathematics
- 165A Mathematics for Gifted Children
- 165B Mathematics for Slow-Learning Children
- 191 Teaching and Supervision of Mathematics in Secondary Schools
- 192A Mathematics Laboratory
- 192B Computer-Assisted Mathematics Education
- 194 New Content and Method in Secondary School Mathematics
- 230 Survey of Theory and Classical Research
- 231 Recent Research in Elementary School Mathematics
- 232 Problems: Mathematics Education
- 233 Seminar in Mathematics Education
- 291 Research in Mathematics Education (Secondary)

2. Curriculum and Instruction (12 credits)

- 113 Secondary School Curriculum
- 119 Elementary School Curriculum
- 129 Trends and Issues in Secondary Curriculum
- 150 Supervision and Improvement of Instruction
- 151 Diagnosis and Treatment of Teaching Difficulties
- 170 Programs and Procedures of Curriculum Development
- 172 Supervision of Secondary Instruction
- 173 Preparation of Curriculum Materials

3. Educational Psychology (12 credits)

- 116 Introductory Statistical Methods
- 117 Basic Principles of Measurement
- 125 Social Psychology
- 140 Instruments and Techniques of Measurement
- 141 Computer Programming
- 159 Personality Development and Mental Hygiene
- 170-71 Psychology of the Intellect
- 182 Education of Exceptional Children
- 183 Education for Gifted Children
- 196-97 Psychology of School Learning
- 208 Methods in Educational Research
- 216-17-18 Statistical Methods
- 297 Psychology of Knowledge Acquisition
- 298 Psychological Theories of Teaching

4. Educational Administration (6 credits)

- 201-2 Foundations of Educational Administration
- 227 Public School Personnel
- 230 School Community Relations
- 215 Administration of the Elementary School
- 264 Administration of the Secondary School

5. History and Philosophy of Education (6 credits)

- 131 Comparative Education
- 141 Critical Issues in Contemporary Education
- 155 History of Western Educational Thought
- 156 History of Ideas in American Education
- 182 Comparative Philosophies of Education

6. Mathematics (21 credits)

- 100A, B, C Foundations of Mathematics
- 109 Theory of Numbers
- 111 Development of Number Systems
- 116A, B Modern Geometry
- 117A, B, C Geometry
- 125A, B Critical Reasoning in Mathematical Analysis
- 130A, B, C Introduction to Analysis
- 131A, B, C Linear Algebra and Group Theory
- 140 Projective Geometry
- 147 Vector Analysis
- 164-5-6 Theory and Programming of Modern Digital Computers
- 178A, B, C Introduction to Probability
- 187 Non-Euclidean Geometry
- 203 A, B, C General Algebra
- 221 A, B, C Complex Analysis

These courses emphasize the mathematics program in grades K - 6

These courses emphasize the mathematics program in grades 7 - 17

Ed. C.I. 149 A	-----Advanced Methods and Supervision	-----	Ed. C.I. 191
Ed. C.I. 149B	----- Materials	-----	Ed. C.I. 192
Ed. C.I. 149C	----- Current Developments	-----	Ed. C.I. 194
Ed. C.I. 231	----- Recent Research	-----	Ed. C.I. 291

These courses emphasize the mathematics program in grades 1 - 8

-
- Ed. C.I. 165A Mathematics for Gifted Children
 - Ed. C.I. 165B Mathematics for Slow-Learning Children
-

These courses emphasize the total mathematical program from Kindergarten through Junior College

-
- Ed. C.I. 192B Computer-Assisted Mathematics Instruction
 - Ed. C.I. 230 Theory and Classical Research
 - Ed. C.I. 232 Problems: Mathematics Education
 - Ed. C.I. 233 Seminar: Mathematics Education

COURSE OUTLINES

Ed. C.I. 149A Teaching and Supervision of Mathematics in the Elementary School

Present practices and trends in methods, evaluation and diagnosis; objectives, psychology and philosophy related to improvement of instruction. (3 credits; prerequisites: Ed. C.I. 62 or equivalent undergraduate course or elementary teaching experience.)

The purpose of this course is to promote a more effective teaching of mathematics by:

- a) developing a modern philosophy of mathematics instruction;
- b) relating modern learning theory to the teaching of mathematics;
- c) utilizing the best evaluation procedures to measure the attainment of instructional objectives;
- d) illustrating methods of teaching mathematics for meaning and understanding.

The course content would include:

- a) Principles of learning pertinent to the modern program of mathematics in the elementary school.
- b) Objectives for mathematics instruction which reflect the needs of present day society.
- c) Current philosophy related to improvement of mathematics instruction.
- d) Materials and procedures for evaluation and diagnosis.
- e) Literature on current issues and problems.
- f) Special attention given to improving teaching methods in developing understandings, attitudes and problem-solving techniques.
- g) Discussion of individual differences in mathematics with emphasis on procedures for individualizing instruction.

Major units in the course outline are:

- a) Current philosophy on mathematics education.
- b) Objectives for mathematics instruction.
- c) Principles of learning applied to mathematics teaching.
- d) Concept formation.
- e) Problem solving.
- f) Mental hygiene and mathematics.
- g) Language and symbolism.
- h) Diagnosis.
- i) Evaluation.
- j) Individual differences.
- k) The role of the supervisor.

Possible textbooks:

- a) 21st Yearbook NCTM, Learning Mathematics: Its Theory and Practice
- b) 25th Yearbook NCTM, Instruction in Arithmetic
- c) 26th Yearbook NCTM, Evaluation in Mathematics
- d) Evaluating Pupils' Understanding of Arithmetic, Prentice-Hall
- e) Creative Teaching of Mathematics in Elementary School, Smith, Allyn & Bacon

Ed. C.I. 149B Materials Laboratory for Elementary School Mathematics Instruction

Printed and programmed materials, audio-visual aids, and community resources; laboratory projects and techniques of using mathematical devices and instruments. (3 credits; prerequisites: Ed. C.I. 62 or Ed. C.I. 149A or #).

The purpose of this course is to promote a more effective teaching of mathematics by:

- a) showing techniques and materials for making mathematics meaningful;
- b) providing opportunity to make and use models and devices;
- c) encouraging the proper use and evaluation of audio-visual materials and community resources;
- d) providing experiences in field work, excursions, and laboratory techniques.

The course content would include:

- a) The source, selection and use of mathematical devices such as slide rule, desk calculator and nomographs
- b) Field work involving the use of such instruments as plane table, transit and hypsometer.
- c) Demonstration of laboratory techniques and equipment.
- d) The making of models, devices, exhibits and collections.
- e) The making of audio-visual aids such as transparencies for overhead projector, tape recordings, bulletin boards and displays.
- f) Excursions to survey the community resources.

Major units in the course outline are:

- a) The mathematics classroom.
- b) Films and filmstrips.
- c) Library books and enrichment reading.
- d) Teaching machines and programmed instruction.
- e) Computing devices and calculators.
- f) Models and mock-ups.
- g) Overhead, tapes and records.
- h) Manipulative devices - laboratory activities
- i) Exhibits, projects and bulletin boards.
- j) Games, puzzles and contests.

Possible textbooks:

- a) 32nd Yearbook NCTM, Instructional Aids
- b) A Guide to Use and Procurement of Teaching Aids for Mathematics, NCTM
- c) Understanding Mathematics with Visual Aids, Littlefield, Adams & Co.
- d) Bulletin Board Displays for Mathematics, Dickeson Press
- e) Teaching Aids for Elementary Mathematics, Turner, Holt, Rinehart, Winston

Ed. C.I. 149C Current Developments in Elementary School Mathematics Instruction

Contemporary literature, trends and experimentation with content; criteria for program evaluation. (3 credits; prerequisites: Ed. C.I. 62 or Ed. C.I.149A or #)

The purpose of this course is to promote a more effective teaching of mathematics by:

- a) systematic studying mathematical systems and investigating their relationship to the content of the mathematics program in the elementary school;
- b) providing the opportunity to become familiar with recent mathematics programs, courses of study, and curricular proposals;
- c) providing experience in analyzing and evaluating recent program developments in terms of goals and principles of learning.

The course content would include:

- a) Familiarity with recently developed programs in elementary school mathematics, such as S.M.S.G., Minnemast, etc.
- b) Analysis of recent curricular proposals, such as the Cambridge Report.
- c) Survey of current courses of study, such as the California "Strands" Report.
- d) Development and the application of criteria useful for evaluating new developments in content.
- e) Discussion of mathematical topics, such as numeration systems, non-metric geometry, numbers and number operations, sets, and logic to determine the appropriate emphasis and grade placement which should be assigned to each.
- f) The writing, collection, and evaluation of units of instruction.

Major units in the course outline:

- a) Historical background.
- b) Current thinking.
- c) Goals -- old and new.
- d) Geometric ideas.
- e) Operations and properties of numbers.
- f) Extensions of familiar topics.
- g) Analysis and evaluation of mathematics programs.

Possible textbooks:

- a) 24th Yearbook, NCTM, The Growth of Mathematical Ideas: Grade K-12
- b) The Revolution in School Mathematics, NCTM
- c) An Analysis of New Mathematics Programs, NCTM
- d) Elementary School Mathematics: New Directions, USOE
- e) Goals for School Mathematics, ESI

Ed. C.I. 165A Mathematics for Gifted Children

Curriculum and methods of instruction for academically talented children; development of enrichment units; source materials for teachers. (3 credits; prerequisites: Ed. C.I. 62 or Ed. C.I. 149A or #)

The purpose of this course is to promote a more effective teaching of mathematics to academically talented children, grades 1 - 8, by:

- a) considering administrative provisions for the mathematically talented;
- b) considering what content is appropriate for gifted children;
- c) considering the activities which take place outside the classroom that contribute to the development of mathematical talent;
- d) considering teacher characteristics and teacher preparation which may facilitate the enrichment of the mathematics program;
- e) illustrating productive methods of teaching gifted children;
- f) developing materials and enrichment units to be used with gifted children.

Course content might include:

- a) Suggested enrichment ideas from geometry.
- b) Suggested enrichment ideas from algebra.
- c) Suggested enrichment ideas from number theory.
- d) The writing and collection of instructional units to be used at various grade levels.
- e) Suggestions for organizing and using a mathematics club outside the classroom setting.
- f) Suggestions for utilizing mathematical contests, exhibits, and affairs.
- g) Field trips which illustrate important applications of mathematics.
- h) Classroom provisions in mathematics for the superior pupil.
- i) Organizational provisions for the gifted student.
- j) Extensive bibliographic information which would be helpful to the teacher of talented children.

Possible textbooks:

- a) 27th Yearbook, NCTM, Enrichment Mathematics for the Grades
- b) Mathematics for the Academically Talented Student, NCTM
- c) The Superior Pupil in Junior High School Mathematics, USOE
- d) Education for the Talented in Mathematics and Science, USOE
- e) Creative Teaching of Mathematics in Elementary School, Allyn & Bacon

Ed. C.I. 165B Mathematics for Slow Learning Children

Development of units of instruction for slow-learners which emphasize those mathematical concepts essential for vocational competence. Investigation of experimental materials and methods designed to improve mathematical performance of low-achievers. (3 credits; prerequisites: Ed. C.I. 62 or Ed. C.I. 149A or #)

Basic assumptions underlying the course:

- a) The U.S. needs the potential manpower of the achiever in mathematics.
- b) Low achievers will not be qualified for future employment unless they learn more mathematics than is the case now.
- c) Mathematics ability of the low achiever can be developed to the extent necessary for a saleable skill.
- d) The low achiever should have mathematics instruction necessary for a saleable skill and a rich cultural citizenship.

The purpose of this course is to promote a more effective teaching of mathematics to low achievers, grades 1 - 8, by:

- a) examining environmental and psychological factors affecting low achievers;
- b) developing purposeful and varied classroom activities such as games, puzzles short cuts and discovery exercises which arouse curiosity and imagination;
- c) investigating uses of a laboratory setting and experimentation with concrete materials.

Course content might include:

- a) An analysis of basic mathematical understandings necessary for an informed and competent citizenry such as those suggested by the post-war commission.
- b) Diagnosis and treatment of major problems affecting the low achiever in mathematics.
- c) The integration of basic mathematical concepts into lessons and/or units of instruction designed for low achievers.
- d) Use of various media of instruction such as audio-visual aids, models, manipulative devices and laboratory experiences which have particular value in teaching the low achiever.
- e) Use of community resources such as community leaders, citizens and representatives of business and industry in developing course content and possible job opportunities.
- f) Role of the parent-school-teacher in developing basic mathematical competence with low achievers.
- g) Administrative organization for providing maximum individual growth of low achievers.
- h) Examination of new curricular patterns and materials for low achievers in mathematics such as those being prepared by the School Mathematics Study Group and the National Council of Teachers of Mathematics.

Possible textbooks:

- a) 22nd Yearbook, NCTM, Emerging Practices in Mathematics Education.
- b) Education in Mathematics for the Slow Learner, NCTM
- c) Teaching Mathematics to Slow Learners and Mentally Retarded John Day Co.
- d) How Children Fail, John Holt

Ed. C.I. 191 Teaching and Supervision of Mathematics in the Secondary School

The application of theories of learning, curriculum development, evaluation theory, philosophy of education and research to school mathematics programs. (3 credits; prerequisite: Ed. T. 67 or equivalent and secondary teaching experience).

The purposes of this course are to promote a more effective teaching of secondary mathematics by:

- a) developing a modern philosophy of secondary mathematics instruction;
- b) relating modern learning theory to the teaching of secondary mathematics;
- c) utilizing the best evaluation procedures to measure the attainment of instructional objectives;
- d) illustrating methods of teaching mathematics;
- e) developing school mathematics programs for all ability levels;
- f) developing methods of evaluating the effectiveness of a teacher.

The course content would include:

- a) Principles of learning pertinent to the modern program of mathematics in the secondary school.
- b) Objectives for mathematics instruction which reflect the needs of present day society.
- c) Current philosophy related to improvement of mathematics instruction.
- d) Materials and procedures for evaluation and diagnosis.
- e) Literature on current issues and problems.
- f) Special attention given to improving teaching methods in developing understandings, attitudes, and problem solving techniques.
- g) Discussion of individual differences in mathematics with emphasis on procedures for individualizing instruction.

Major units in the course outline are:

- a) Current philosophy on mathematics education.
- b) Objectives for mathematics instruction.
- c) Principles of learning applied to mathematics teaching.
- d) Concept formation.
- e) Problem solving and creativity.
- f) Computational skill.
- g) Positive attitudes and motivation.
- h) Language, symbolism and structure.
- i) Individual differences, diagnosis, remedial instruction.
- j) Evaluation and research.
- k) Textbook evaluation.
- l) The supervision of instruction.

Possible textbooks:

- a) 21st Yearbook, NCTM, Learning Mathematics: Its Theories and Practice
- b) 26th Yearbook, NCTM, Evaluation in Mathematics
- c) Johnson, Guidelines for Teaching Mathematics, Wadsworth
- d) Polya, Mathematical Discovery, Wiley
- e) Willoughby, Contemporary Teaching of Secondary School Mathematics, Wiley

Ed. C.I. 192A Mathematics Laboratory

The role of instructional material, the principles of instruction and of learning involved, and the evaluation of instructional materials. The types of instructional materials involved includes: films, models, overhead projectors, classroom equipment, mathematics laboratory kits, and supplementary enrichment materials. (3 credits; prerequisite: Ed. T. 67 or Ed. C.I. 191 or #).

The purpose of this course is to promote a more effective teaching of secondary mathematics by:

- a) studying techniques and materials for making mathematics instruction effective;
- b) providing opportunity to make and use models and devices;
- c) learning how to evaluate instructional materials;
- d) providing experiences in field work, excursions, and laboratory techniques;
- e) learning sources of materials.

The course content would include:

- a) The source, selection and use of instructional aids such as films, filmstrips, models, equipment, supplies, and projectuals.
- b) Field work involving the use of such instruments as plane table, transit, and angle mirror.
- c) Demonstration of laboratory techniques and equipment.
- d) The making of models, devices, exhibits and collections.
- e) The making of audio-visual aids such as transparencies for overhead projectors, tape recordings, bulletin board displays.
- f) Excursions to survey the community resources available.
- g) Research in the use of instructional materials in mathematics.

Major units in the course outline are:

- a) The role of concrete and audio-visual aids in learning mathematics.
- b) Laboratory lessons and discovery.
- c) The use, evaluation and source of audio-visual materials.
- d) The use, evaluation and source of manipulative materials.
- e) Enrichment with supplementary books and pamphlets.
- f) Projects, fairs and contests.
- g) Learning games, puzzles, toys, tricks.
- h) Calculators, slide rules and nomographs.
- i) Facilities for the mathematics department.
- j) Bulletin board and chalkboard materials and techniques.

Possible textbooks:

- a) 32nd Yearbook NCTM, Instructional Aids for the Mathematics Teachers
- b) Frame, Facilities for the Mathematical Sciences, NCTM
- c) A Guide to Use and Procurement of Teaching Aids for Mathematics, NCTM
- d) Hess, Mathematics Projects Handbook, D.C. Heath
- e) Kenna, Understanding Mathematics with Visual Aids, Littlefield, Adams & Co.
- f) Johnson, Guidelines for Teaching Mathematics, Wadsworth Publishing Co.
- g) Cundy and Rollot, Mathematical Models, Oxford

Ed. C.I. 192B Computer-Assisted Mathematics Instruction

A study of the role of the computer in a mathematics department in terms of its contribution to learning concepts, problem solving, and computational skill. This study involves a consideration of varied types of equipment and languages available, the programming of problems, and instructional materials available. (3 credits, prerequisite: Ed. T. 67 or Ed. C.I. 191 or #).

The purpose of this course is to promote a more effective teaching of mathematics by:

- a) showing techniques and materials for utilizing computer facilities in mathematics courses;
- b) providing experiences in the utilization of computer facilities;
- c) providing opportunities in developing materials for computer utilization;
- d) provide the teacher with the proper tools for an effective evaluation and subsequent selection of computer facilities and instructional materials.

Major units in the course include:

- a) A study of the emerging role of the computer in elementary and secondary school mathematics instruction.
- b) A study of materials available in computer science and computer-assisted mathematics instruction.
- c) Criteria for selection of facilities and instructional materials.
- d) Instruction in a simple algorithmic language.
- e) Identification of specific content areas and subsequent development of instructional materials appropriate for computer utilization.
- f) Utilization of various pieces of hardware (involving field trips to computer companies and to schools using different types of computer facilities).
- g) Review of recent research and pertinent literature.

Possible textbooks:

- a) NCTM, Computer-Oriented Mathematics
- b) NCTM, Computer Instruction in Secondary Mathematics
- c) NCTM, 32nd Yearbook, Instructional Materials for the Mathematics Teacher
- d) SMSG, Algorithms, Computation and Mathematics (12th grade high school course)

Ed. C.I. 194 New Content and Method in Mathematics

An intensive study of curriculum developments in secondary mathematics: the philosophy, content and effectiveness of new program. The criteria for evaluating a school mathematics program, ways of implementing a new program, and research results will also be covered. (3 credits; prerequisite: Ed. C.I. 191 and Ed. C.I. 113 or its equivalent, and secondary teaching experience or #).

The purpose of this course is to promote more effective teaching of secondary mathematics:

- a) become familiar with the content, goals, and effectiveness of new secondary programs;
- b) apply principles of curriculum development to the evolution of new secondary programs;
- c) become familiar with the basic issues, current literature, leaders and research involved in new secondary programs;
- d) apply the developments in mathematics, psychology, pedagogy and technology to the design of a new school program.

Major units in the course outline are:

- a) Historical perspectives of curriculum development in mathematics.
- b) New programs in secondary school mathematics, such as the Cambridge Report.
- c) The goals of mathematics instruction.
- d) The scope and sequence of a mathematics program.
- e) The pedagogy for an effective mathematics program.
- f) Criteria for the evaluation of a mathematics program.
- g) Research in the evaluation of mathematics program.
- h) The implementation of a new mathematics program.

Possible textbooks:

- a) NCTM, The Growth of Mathematical Ideas
- b) NCTM, The Revolution in School Mathematics
- c) Goals for School Mathematics, Houghton Mifflin
- d) Kinsella, Secondary School Mathematics
- e) Johnson and Rahtz, The New Mathematics in our Schools
- f) Fehr, Mathematics Today, OECD
- g) Willoughby, Contemporary Teaching of Secondary School Mathematics
- h) Adler, The New Mathematics, John Day

Ed. C.I. 230 Survey of Theory and Classical Research in Mathematics Education

Critical review of classical research findings and relevant theoretical formulations; criteria for appraising research methods, educational implications. (3 credits; prerequisite: Ed. C.I. 149A or Ed. C.I. 191 or #).

The purposes of this course would be to train and develop research workers in mathematics education, as well as to offer to teachers, supervisors, and administrators an opportunity to study research findings and their implications for instruction.

(Please note that this course surveys the total range of mathematics instruction from Kindergarten through Junior College.)

The content of this course would include:

- a) a survey of the important contributions to the mathematics program from research findings;
- b) investigation of primary sources of research done by G. L. Anderson, Brownell, Buswell, Fawcett, Hendrix, McConnell, Paiget, Swenson, Van Engen, Washburne, and others;
- c) development of criteria for evaluating research methodology;
- d) a study of how research findings have lead to the formulation of a theory of mathematics instruction.

Ed. C.I. 231 Recent Research in Elementary School Mathematics Instruction

Recent issues, problems and findings in curriculum gradation of subject matter, methods and materials of instruction; criteria for evaluating research. (3 credits; prerequisite: Ed. C.I. 230 or #).

The purpose of this course would be to train and develop research workers in mathematics education as well as to offer to teachers, supervisors and administrators the information available from research.

The course content would include:

- a) a review of recent research in mathematics education;
- b) an exhaustive review of research on selected topics (i.e., problem solving, grade placement, etc.);
- c) the establishment of criteria for evaluating research results;
- d) the study of the implications of research for the mathematics teacher;
- e) discussion of problems which need to be studied.

Ed. C.I. 232 Problems in Mathematics Education

This is a course for independent study and preparation of a research report or special problem. Students confer individually with the instructor to plan and carry out a special problem in mathematics education at any level in mathematics education, kindergarten - junior college for the Master's degree starred credit paper. (Credits: 3-9*; prerequisite: Ed. C.I. 230 or Ed. C.I. 231 or Ed. C.I. 291 or #.)

Ed. C.I. 233 Seminar in Mathematics Education

A seminar for advanced graduate students to discuss current issues and research. It provides an opportunity for the graduate student and the mathematics education staff to exchange ideas, to design research, to develop proposals and to explore problems in mathematics education in depth. (Credits: 0-3; prerequisite: #.)

Ed. C.I. 291 Research in Mathematics Education

The intensive study and evaluation of current research in mathematics education and the design of research studies for the M.A. or Ph.D. degree, the significant contributions of research and its implementation in the mathematics program. (3 credits; prerequisite: Ed. C.I. 191 or #).

The purpose of this course is to prepare research workers as well as to offer teachers, supervisors and administrators an opportunity to study research in mathematics education:

- a) learning methods of conducting research in mathematics education;
- b) becoming familiar with the research which has been completed in the teaching of mathematics;
- c) relating the implications of research findings to the current mathematics classroom;
- d) planning a research study to be carried out in a school setting;
- e) learning the sources of reports of research;
- f) building an interest in research in mathematics education.

Major units in the course are:

- a) The design of a research study.
- b) Sources of research reports and types of research.
- c) Criteria for research evaluations.
- d) The results of research studies.
- e) Implications of research.
- f) The preparation of a research report.
- g) Financial support for research.

OCT 24 1967

UNIVERSITY OF *Minnesota*

COLLEGE OF EDUCATION
DEPARTMENT OF SPECIAL EDUCATION • MINNEAPOLIS, MINNESOTA 55455

October 23, 1967

To: Dean Bryce Crawford

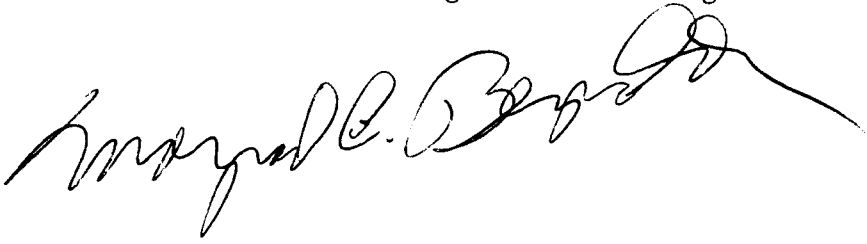
From: Maynard C. Reynolds

The Group Committee reviewed the proposed new MA program in Mathematics-Education with much favor and recommends its approval. We note that this does not involve much of a change in course offerings and such. But it may represent a significant turn toward organizing "education" specialties along disciplinary (rather than school level) lines. This appears promising, and, in particular, the proposed Mathematics-Education program is sure to be very good. See attached memo, dated October 10, from the Math-Ed faculty. We deferred action on a major in Math-Ed at the Ph.D. level at Dean Edward's suggestion pending further studies by the College of Education Committee at the Doctorate in Education.

We also approved -- at our October 20 meeting -- the first set of advisors for the new Ed.D. - Educational Administration program. In this connection we agreed, in general, with the criteria for such advisors suggested in Clifford Hooker's memo of October 5, (copy attached).

May I mention one minor item. If and when the G.S. 74 forms are revised (nominations to Graduate Faculty) we suggest a section be provided for summary of experience the nominee has had in graduate advising.

*Tommy
2/2/68
C. Reynolds
11/1/67*



INSTITUTE OF TECHNOLOGY
SCHOOL OF MATHEMATICS • MINNEAPOLIS, MINNESOTA 55455

November 27, 1967

Professor W. Loud
210B Main Engineering

Dear Professor Loud:

Today the representatives of the College of Education principally concerned with mathematics education on the elementary and secondary level and the representatives of the Department of Mathematics principally concerned with the preparation of students for mathematics education on the elementary and secondary level met to review the proposal for the renaming of the existing Master's Degree in Education, curricula and instruction. The proposal to relabel this Master's Degree as a Master's of Mathematics Education met with the approval of the group. There are several details concerning establishing new courses and revising existing ones to meet the needs of the students, and all parties agreed that this could be worked out.

I hope that this report will be useful to you when you meet with the Group Committee and Executive Committee of the Graduate School.

Sincerely yours,



D. A. Storwick
Professor and Associate Head
School of Mathematics

je

cc: ✓ Donovan Johnson

FEB 9 1968

OF THE DEAN

February 7, 1968

To: Physical Sciences Group Committee

From: W. S. Loud

I had a conversation with Dean Kegler of the College of Education to discuss the graduate program in education for English teachers.

A typical program as described to me by Dean Kegler might be 18 credits of English, 6 credits of Speech, History or Classics, 12 credits of Education, and 9 credits of Plan B papers. As I see this, there is a 21-credit major (12+9) and 24 credits in related fields (18 in English, 6 elsewhere).

The distribution in credits is somewhat similar to the Mathematics Education program with some important differences:

1. It is more oriented to English itself than the Mathematics Education program is to mathematics. I think this is partly because there is not such a well-developed field for English as that of "Mathematics Education" in mathematics.

2. In the opinion of Dean Kegler, the M.A. in English is not in general suited to the needs of teachers, whereas the M.A. or M.S. in mathematics is suited and is used, as mentioned by Professor Donovan Johnson.

3. I think it is fair to state that 100-level courses in English are much more available to students than are 100-level courses in mathematics. A student with a major in secondary mathematics teaching has no difficulty in finding many 100-level courses that he can use. Such is definitely not the case for an elementary teacher whose undergraduate mathematics course work is usually very limited.

Feb 27

To: Members of the Physical Sciences Group Committee

From: W. S. Loud

Subject: Reaction to our suggestions with respect to Mathematics Education

I have recently had a conference with Professor Maynard Reynolds, who is chairman of the Education Group Committee, in which he reports to me the reaction from Mathematics Education to our suggestions. Professor Reynolds has examined the report and has contributed to it.

I believe that our principal concern had been to ensure that any graduate program with the title "Mathematics Education" should have a well-defined component of work in mathematics. We felt that there should be a statement to this effect with the stipulation that some number of credits of mathematics (about 12) should be part of the M.A. program.

Dean Crawford seems to think this is a reasonable suggestion, and Professor Reynolds reports that the Mathematics Education group agrees as well. A statement like the following has been suggested to form a part of any announcements about the program and also as a part of the program as approved by the Graduate School.

"Offerings on Mathematics are important components of M.A. programs for students majoring in Mathematics Education. For secondary school teachers, these programs normally will include from 12 to 18 credits for Mathematics as one related field for the Plan B degree. Although the Mathematics Education courses for elementary school teachers emphasize content as well as methods for that level, appropriate Mathematics courses also are desirable parts of these programs."

I believe this statement first shows the clear intent of the people in Mathematics Education to have mathematics play an integral role in the program. The third sentence gave me some pause, but there is the implication that when suitable mathematics courses are available, they will be used. I think the word "normally" is reasonable. There are obvious possibilities where exceptions should be made. In effect the Mathematics Education Department agrees to amend its program proposal to include the above sentences, and this is then subject to approval by the Graduate

School. The people in Mathematics Education fully accept the responsibility to regulate themselves according to the amended program.

Of course the reaction was not wholly positive. They do not like to see their program "regulated" by sources external to themselves. No other majors are formally required to put into bulletin copy that their minors or related fields must be such and such. I think it was also felt that the agreement as worked out with the mathematics department should have been sufficient evidence for the validity of the program. As a result, it is not wished that the above statement appear in the Graduate School Bulletin, although as mentioned above, it would appear in announcements.

A further point that was made was that direct regulation to the extent of prescribed bulletin copy for Mathematics Education has its implications in many fields of X-Education, some of which are in operation and are operating well.

I feel that I should have your reaction to this report soon, at least before the next meeting of the Executive Committee, which is March 5. The question which comes to my mind is: Does the inclusion of such a statement as given above in announcements and in the program material approved by the Graduate School, but not in the bulletin copy, meet the spirit of our discussion?

March 1, 1968

To: Graduate School

From: W. J. Loud

Subject: Recommendation of physical Sciences Group Committee with regard to the proposal in Mathematics Education.

At its meeting on February 15, 1968 the Physical Sciences Group Committee had a second discussion of the proposed graduate program in Mathematics Education. Professor James Stoehl of Mathematics Education was present as a source of information.

Preliminary groundwork for the discussion had been done. Professor Loud had conferences with Professors Donovan Johnson and Stoehl and also with Dean Kegler. The results of these conferences are summarized in some of the attached materials.

It developed that the principal concern of the group committee was the fact that it seemed possible from the proposed description that a student could qualify for a Master's degree in Mathematics Education with as few as six credits of work in Mathematics. It was felt that this simply should not be allowed, that the name "Mathematics Education" implies an interest in mathematics and that substantial work in mathematics should be expected.

It was pointed out by Professor Stoehl both in the conference with Professor Loud and at the February 15 meeting that it was indeed the practice in advising students in the program that students are expected to take work in mathematics to a substantial extent.

After further discussion the committee arrived at the following recommendations.

1. It should be explicitly recognized and incorporated in any description of this program that mathematics is an integral part of the program. A statement like: "Mathematics is an integral part of the program and 12 to 18 credits of mathematics are ordinarily required" should be a part of any description of this program and should appear in the Graduate School Bulletin.

2. The committee strongly endorses the proposed formation of 100-level mathematics courses particularly for students in this program whose specialty is in elementary education and for whom the present 100-level offering in Mathematics may not be suitable.

(This report is only on the actions taken at the February 15 meeting. There has been further discussion since then, which will be reported later.)

February 7, 1968

To: Physical Sciences Group Committee

From: W. S. Loud

Subject: Proposal for Mathematics Education Major

On January 11, 1968 the committee discussed the proposal for a Mathematics Education Major in the Graduate School. This involves the renaming of a presently existing program to identify it better. The committee felt that the title "Mathematics Education" would imply substantial graduate work in mathematics, and that since the program as proposed does not in fact require very much mathematics, the committee felt it should withhold its approval.

I have since had a conference with Professors Donovan Johnson and James Stoehl of Mathematics Education. I obtained considerable information from them about the program and also about the larger question of X-Education programs in other disciplines. I have also made further inquiries in this direction from other people in education because such programs, when they relate to science fields, should also be considered by this committee.

The proposal for Mathematics Education has no parallel in the Graduate School because this is, in a sense, a pioneering effort. It reflects the change in the College of Education to a more discipline-oriented structure. At present all the various X-Education programs are included in the large area known as Curriculum and Instruction. Mathematics Education is an active field at Minnesota and there is close cooperation between the Mathematics Education program and the School of Mathematics, with a good relationship existing.

The Mathematics Education group has consulted several times with the School of Mathematics over a period of two years. On November 27, 1967 the proposal itself was considered resulting in a letter of approval from Professor Storvick.

Another point which needs clarification is the feeling on the part of the people in Mathematics Education that Mathematics Education should be considered as a discipline distinct from Mathematics. An example which is similar to this, though not an exact parallel, is Educational Psychology as contrasted with Psychology. There are also Music and Music Education offered at Minnesota, although here there is some overlap of faculty. I think we need to examine the extent to which "Mathematics Education" is understood as a discipline separate from "Mathematics" by persons external to both fields.

Relating to the specific program under consideration, the reasons for the stated low mathematics requirement are of a bureaucratic rather than a substantive nature. The Master of Arts Degree in Mathematics Education is usually a Plan B degree. Mathematics is required as one of the two related fields. This automatically involves at least six credits in mathematics. No more credits than this were specified because it was believed that the Graduate School would not permit any requirement as to credits in any related field beyond the automatic six. It is in fact the case that the advisers of students in mathematics education do ask the students to take substantially more than six credits of mathematics. It would be possible within the program to have an 18-credit related field in mathematics, a second 6-credit related field and a 21-credit major in mathematics education. For some of the students this probably would not

be suitable as those whose specialty is elementary education might not find enough graduate courses in mathematics which were both accessible and of interest. It is the expressed desire of the people in mathematics education to maximize the amount of mathematics studied by the students consistent with their degree objectives.

In the Plan B M.A. program, the 21 credits of Mathematics Education include 9 credits for papers and 12 credits of course work. The remaining 24 credits are then 9 to 15 in Mathematics, 6 to 9 in Educational Psychology, and 3 to 6 in Curriculum and Instruction. It was pointed out that students who wished more work in mathematics are strongly advised to take a major in mathematics with a minor in education.

Professors Johnson and Stochl have looked at this report and have offered their suggestions for revision.

February 7, 1968

To: Physical Sciences Group Committee

From: W. S. Loud

I had a conversation with Dean Kegler of the College of Education to discuss the graduate program in education for English teachers.

A typical program as described to me by Dean Kegler might be 18 credits of English, 6 credits of Speech, History or Classics, 12 credits of Education, and 9 credits of Plan B papers. As I see this, there is a 21-credit major (12+9) and 24 credits in related fields (18 in English, 6 elsewhere).

The distribution in credits is somewhat similar to the Mathematics Education program with some important differences:

1. It is more oriented to English itself than the Mathematics Education program is to mathematics. I think this is partly because there is not such a well-developed field for English as that of "Mathematics Education" in mathematics.

2. In the opinion of Dean Kegler, the M.A. in English is not in general suited to the needs of teachers, whereas the M.A. or M.S. in mathematics is suited and is used, as mentioned by Professor Donovan Johnson.

3. I think it is fair to state that 100-level courses in English are much more available to students than are 100-level courses in mathematics. A student with a major in secondary mathematics teaching has no difficulty in finding many 100-level courses that he can use. Such is definitely not the case for an elementary teacher whose undergraduate mathematics course work is usually very limited.

- F. Drop the following course:
EdCI 154. Elementary Social Studies and the Social
Science Disciplines. (3 cr)
- G. Change the prerequisites for EdCI 208. Research in Elementary
Social Studies. (3 cr)
From
(Prereq EdCI 61, or 102, 154 or #)
To
(Prereq EdCI 102 or #)

IX. Mathematics Education

The faculty in mathematics education, and the Elementary Education and Secondary Education Departments recommended that the mathematics education courses be given a separate and new prefix identifying them as mathematics education rather than as EdCI. Also the offering of graduate majors in mathematics education were recommended at both the MA and PhD levels. It is believed that such changes would provide greater visibility for the mathematics education program and be a better indicator of the content in the mathematics education program. It was also felt that the changes would facilitate coordination of the total mathematics education program.

The Curriculum Committee was very receptive to the proposals on mathematics education. The Committee was ready to approve the designation of the courses to Math Ed and to approve the Master of Arts with a major in mathematics education, but was reluctant to consider a PhD major in mathematics education at this time. The Committee did approve a motion to recommend to the Ad Hoc Program Development Committee on Doctoral Work in Education that the Curriculum Committee approves in principle the pattern suggested by the mathematics education faculty for Ph.D. program development.

- A. Change the course prefixes, numbers, and prerequisites for the following courses. (Course descriptions and titles will remain the same.):
- From
EdCI 149A. Teaching and Supervision of Mathematics in the Elementary School. (3 cr § 149; prereq 62 or #)
To
MthE 111. Teaching and Supervision of Mathematics in the Elementary School. (3 cr; prereq EdCI 62 or #)
 - From
EdCI 149B. Materials Laboratory for Elementary School Mathematics Instruction. (3 cr; prereq 62 or 149A or #)
To
MthE 121. Materials Laboratory for Elementary School Mathematics Instruction. (3 cr; prereq 111 or EdCI 62 or #)

3. From
EdCI 149C. Current Developments in Elementary School
Mathematics Instruction. (3 cr; prereq 62 or 149A or #)
To
MthE 131. Current Developments in Elementary School
Mathematics Instruction. (3 cr; prereq 111 or EdCI 62 or #)
 4. From
EdCI 165A. Mathematics for Gifted Children. (3 cr;
prereq 62 or 149A or #)
To
MthE 145. Mathematics for Gifted Children. (3 cr;
prereq 111 or EdCI 62 or #)
 5. From
EdCI 165B. Mathematics for Slow Learning Children. (3 cr;
prereq 62 or 149A or #)
To
MthE 155. Mathematics for Slow Learning Children. (3 cr;
prereq 111 or EdCI 62 or #)
 6. From
EdCI 192B. Computer Assisted Mathematics Instruction.
(3 cr; prereq EdT 67 or EdCI 191 or #)
To
MthE 166. Computer Assisted Mathematics Instruction.
(3 cr; prereq 112 or EdT 67 or #)
 7. From
EdCI 230. Theory and Classical Research in Mathematics
Education. (3 cr; 149A or 191 or #)
To
MthE 200. Theory and Classical Research in Mathematics
Education. (3 cr; 111 or 112 or #)
 8. From
EdCI 233. Seminar: Mathematics Education. (0 - 3 cr;
prereq #)
To
Mth 290. Seminar: Mathematics Education. (0-3 cr;
prereq #)
- B. Change the course prefixes, numbers, titles, and some prerequisites
of the following courses (course descriptions will remain the same.):
1. From
EdCI 191. Advanced Teaching and Supervision of Secondary
mathematics. (3 cr)
To
MthE 112. Teaching and Supervision of Mathematics in the
Secondary School. (3 cr)

2. From
EdCI 192A. Materials Laboratory for Secondary School Mathematics. (3 cr; prereq grad student or experienced tchr)
To
MthE 122. Materials Laboratory for Secondary School Mathematics Instruction. (3 cr; prereq grad student or experienced tchr)
3. From
EdCI 194. New Content and Methods in Mathematics. (3 cr; prereq experience in math tchg)
To
MthE 132. New Content and Methods in Secondary School Mathematics Instruction. (3 cr; prereq experience in mathematics tchg)
4. From
EdCI 231. Recent Research in Elementary School Mathematics Instruction. (3 cr; prereq 230 or #)
To
MthE 201. Research in Elementary School Mathematics Education. (3 cr; prereq 200 or #)
5. From
EdCI 291. Research in Mathematics Education. (3 cr; prereq 191)
To
MthE 202. Research in Secondary School Mathematics Education. (3 cr; prereq 112)
6. From
EdCI 232*. Problems: Teaching Mathematics. (cr ar; prereq 230 or 231 or 291)
To
MthE 280*. Problems: Mathematics Education. (cr ar; prereq 200 or 201 or 202)

C. Institute a Master of Arts degree program with a major in mathematics education.

X. Music Education

- A. Drop the following courses:
 1. MuEd 51. Teaching Music (Kindergarten-Primary Grades). (2 cr)
Drop effective Fall Quarter 1967.
 2. MuEd 52. Teaching Music (intermediate Grades). (2 cr)
Drop effective Fall Quarter 1967.
 3. MuEd 54. Teaching Music in the Nursery, Kindergarten, and Primary Grades. (2 cr) Drop effective end of Spring Quarter 1967.

COLLEGE OF EDUCATION
DEPARTMENT OF EDUCATIONAL ADMINISTRATION
MINNEAPOLIS, MINNESOTA 55455

October 5, 1967

TO: Maynard C. Reynolds, Chairman
Graduate Group Committee for Education and Related Fields

FROM: Clifford P. Hooker *CH*

SUBJECT: Approval of Ed. D. Advisers in Educational Administration

Pursuant to the directions of the Executive Committee of the Graduate School (meeting of June 6, 1967), I am enclosing five nominations for Ed. D. advising in educational administration. Item 3 on the regular Graduate School form indicates that the major field is educational administration - Ed. D. Degree.

The faculty in educational administration has identified the following factors as being the most appropriate measures to determine full membership (B status) in the Graduate School:

1. Experience in administration
2. Administrative certificates held or eligibility for such certificates
3. Consulting work with school districts and other educational institutions
4. Lectures to school administrators and boards of education
5. Membership in professional associations normally identified with school administrators
6. Published articles, monographs, and books

The documentation to support these nominations is attached to the Graduate School form and follows the above categories.

*Hooker
Curtin
Popper
Davis +
Nickerson*

*Recommend approval of the five nominations
I assume that other nominations will be made
to supplement this original list of Ed. D. advisers.*

October 6, 1967

Robert Fuller

FEB 6 1968

OFFICE OF THE DEAN

COLLEGE OF EDUCATION
DEPARTMENT OF SPECIAL EDUCATION • MINNEAPOLIS, MINNESOTA 55455

February 6, 1968

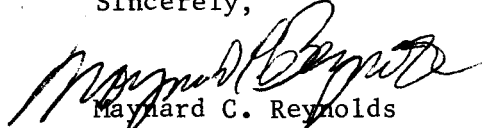
Dean Bryce Crawford
Graduate School
321 Johnston Hall

Dear Dean Crawford:

Re the attached letter of January 16, 1968, from Dean Edwards, the Group Committee on Education-Psychology- SSPA-Philosophy recommends approval of the proposed relisting of courses in Business Education (BE) and Distributive Education (DE). These two fields have emerged as valid and distinct specializations in education and we think it will be a gain for all concerned to have this change in labeling.

Although you might wish to consider referring this proposal to the George Seltzer Committee, I think the ties to the Business School are not like those of Mathematics Education and Mathematics.

Sincerely,


Maynard C. Reynolds
Director

MCR/pn

George Seltzer:-

*I see no problem; do you?
Please return with your advice.*

mas

JAN 16 1968

COLLEGE OF EDUCATION • MINNEAPOLIS, MINNESOTA 55455

Office of the Dean

January 16, 1968

Dean Bryce Crawford, Jr.
The Graduate School
316 Johnston Hall

Dear Dean Crawford:

The College of Education Faculty has approved the re-listing of Curriculum and Instruction offerings in the fields of Business Education and Distributive Education under these two titles, respectively (abbreviation BsEd and DE). The faculty action was taken after recommendation for approval by the faculties of the two fields, the full Secondary Education Department, and the Curriculum Committee of the College. This action carries the recommendation that Business Education and Distributive Education be listed as majors for the M.A. degree, just as several other special areas already are listed (Music Education, Agricultural Education, Industrial Education, etc.).

PLAN A
+ PLAN B

In no sense does this recommendation involve the offering of a "new" major emphasis for the M.A. program, nor does it involve any expansion of course offerings. The combination of fields under Curriculum and Instruction at present leads to confusion by prospective students who seek to find the particular offerings which will make up their majors in Business Education or Distributive Education. With both of these fields moving ahead strongly in the graduate program, and with additional advisers recently joining the faculty, it seems useful and wise to designate the majors clearly so that the work now actually being offered in the Graduate School may be evident.

The recent recommendation regarding Mathematics Education was more extensive than this one is, since it involved also the listing of a doctoral minor and the combination of previous offerings by elementary and secondary education faculties in the planning of the new major. The clarification now requested for Business Education and Distributive Education is more similar to that approved a year or so ago for the field of Recreation and Park Administration, in which an on-going program was clarified and designated instead of being concealed under Physical Education.

If the Graduate School approves this clarification, the M.A. advisers in Business Education would be Dr. Ray Price and Dr. Robert Driska; and in Distributive Education, Professor Warren Meyer and Drs. Richard Ashmun and Mary Klaurens.

Attached is a copy of the newly arranged course listings as they will appear in the College of Education bulletin. For the courses numbered 200 or above, the Graduate School form has already been sent to the Group Committee. We hope that approval of our faculty's recommendation by the Graduate School may be forthcoming in time for the publication of the Graduate School bulletin, in the copy for which we have used the new designations. In the front of our section for that bulletin, we have inserted "Business Education" and "Distributive Education" under the available M.A. majors; and if by any chance this recommendation is not approved by the Graduate School, or if

Déan Crawford
January 16, 1968
page 2

approval is delayed beyond the bulletin deadline, then editing in your office should include crossing out those two areas from the M.A. major list. I should point out, however, that in that case, there will be marked confusion about how a student in either of these areas should proceed. Perhaps this difficulty is simply inherent in the desirable double clearance always necessary from the College and from the Graduate School.

Both Business Education and Distributive Education prepared statements of justification for submitting their proposals to the Department of Secondary Education. The most important argument in each case was that the recommendation would not change the work taken by students for the M.A. in these fields, but instead would provide listings so that identification at application and in program planning would be clear instead of being "lost" under the broad Curriculum and Instruction offerings as at present.

We strongly urge approval of the new listings for these fields.

Sincerely yours,



Marcia Edwards
Associate Dean

ME:lee

OLD LISTING	NEW LISTING	TITLE AND CREDITS
EdCI 131	BsEd 131	Advanced Teaching of Technical Business Subjects (3 cr)
EdCI 132	BsEd 132	Teaching the Basic Business Subjects (3 cr)
EdCI 133	BsEd 133	Consumer Education in the Schools (3 cr)
EdCI 156	BsEd 156	Trends in Business Education (3 cr)
EdCI 157	BsEd 157	Organization and Supervision of Business Education (3 cr)
EdCI 158	BsEd 158	Materials and Methods in Office and Stenographic Procedures (3 cr)
EdCI 161	BsEd 161	Curriculum Construction in Business Education (3 cr)
EdCI 237	BsEd 237	Seminar: Research in Business, Distributive, and Economic Education (No cr)
EdCI 239*	BsEd 239*	Problems: Business Education (Cr ar)
EdCI 136	DE 136	Organization and Administration of Distributive Education (3 cr)
EdCI 137A	DE 137A	Materials and Methods in Cooperative Part-Time Classes (3 cr)
EdCI 138	DE 138	Training Store and Office Supervisors (3 cr)
EdCI 139	DE 139	Coordination Techniques (3 cr)
EdCI 141	DE 141	Cooperative Occupational Education Programs (3 cr)
EdCI 142	DE 142	Business and Distributive Programs for Adults (3 cr)
EdCI 146	DE 146	Issues and Trends in Distributive Education (3 cr)
EdCI 147	DE 147	Workshop: Teaching Display (3 cr)
EdCI 148	DE 148	Post-Secondary Business and Distributive Education (3 cr)
EdCI 159	DE 159	Materials Laboratory, Secondary School Distributive Education (3 cr)
EdCI 160	DE 160	Materials Laboratory, Occupational Relations
EdCI 238*	DE 238*	Problems: Distributive Education (Cr ar)

Office of the Dean

February 20, 1968

Dean Millard L. Gieske
327 Johnston Hall
Minneapolis Campus

Dear Dean Gieske:

MINOR
I am forwarding herewith, a letter dated February 16, 1968 from Professor Richard Donnelly which proposes a change in title for the MA and Ph.D. programs in Recreation. They propose that the major be entitled "Recreation and Park Administration" rather than "Recreation."

Apparently, there was an oversight in our getting this to the Graduate School earlier, and they wish now, if possible, to get this into the Graduate School bulletin now being readied for the printers.

I am quite certain that the Group Committee on Education will react favorably to the proposal. We can deal officially with this at our next meeting on February 27, and hand it on to the Executive Committee for the March 5 agenda.

On the basis of the likely approval of this, could we get it into the Graduate bulletin now and pull it out at galley level if necessary.

Sincerely,

Maynard Reynolds R.E.

Maynard C. Reynolds
Chairman, Education Group Committee

MCR:rf

*OK'd by Group Committee.
This one needs attention by Executive Committee on 3/5
2/27/68
[Signature]*

UNIVERSITY OF *Minnesota*

Office of the Director

COLLEGE OF EDUCATION
SCHOOL OF PHYSICAL EDUCATION
MINNEAPOLIS, MINNESOTA 55455

February 16, 1968

Dr. Maynard Reynolds
Graduate Group Committee for Education
101B Pattee Hall
Minneapolis Campus

Dear Maynard:

This is written regarding our telephone conversation about the proposal to change the name of the title for the Master of Arts major and Ph.D. minor in Recreation to Recreation and Park Administration. This change in title was approved by the College of Education Curriculum Committee on November 1, 1967. This proposal should have been forwarded to the Graduate Group Committee for Education some time ago, but it was inadvertently neglected.

There is a need for some urgency for clearance and approval on the proposal in order to have it incorporated in the 1968-70 Graduate School Bulletin; that is, of course, if the proposal is approved by your committee and the Graduate School.

After talking with you, I also had a phone conversation with Dean Gieske. He was sympathetic to our problem and indicated it would most likely be approved by the Graduate School Dean if you were quite sure the Group Committee would approve the proposal.

The change in title to Recreation and Park Administration more accurately reflects the current picture in this field. The name of the national professional association in this field is the National Recreation and Park Association; the professional association in our state is the Minnesota Recreation and Park Association. The name of our University department in this field is Recreation and Park Administration. The universities with outstanding graduate programs in this field have similar titles for their departments and programs. The new title will in the final analysis more appropriately reflect the graduate specializations available to our students. Therefore, I strongly recommend that the Graduate Group Committee for Education approve the following proposal.

"Change the title of the Master of Arts major and Ph.D. minor
in Recreation to Recreation and Park Administration."

Sincerely,

Rich

Richard J. Donnelly
Director

cc: Dean Millard Gieske
Dean Marcia Edwards

February 9, 1968

Mrs. Shirley McDonald
Principal Executive Secretary
Graduate School
327 Johnston Hall

Dear Mrs. McDonald,

On January 16 of this year I wrote to Dean Crawford relative to the Mechanical Engineering graduate program conducted by the closed circuit television to the Rochester areas, and asked for administrative approval on three points as delineated in that letter. Dean Ibele further discussed this with Dean Crawford and in further conversations which I have had with him, he suggested it would be helpful in firming the final decisions if I could provide additional information on two additional points. These points were as follows:

1. Are any laboratory facilities necessary for the conducting of this graduate program T.V. extension to Rochester, and if so, what is available?
2. Are library facilities necessary for the proper extension of this program to Rochester, and what, if any, facilities are available?

These are pertinent questions, and I shall answer each in turn:

1. Laboratory Facilities - No laboratory facilities are now required or necessary in this program beyond those required for the thesis involvement. Since the thesis must be conducted on campus, this does not become a problem with the current program.

As an addendum I should add that we have given this issue considerable thought in case, in the future, laboratory courses are offered as a part of the program. One solution we would consider follows the path which the University of Wisconsin has taken in the development of a mobile laboratory for instruction in Dynamics. This laboratory is moved actively throughout the state of Wisconsin. This then becomes a pre-packaged mobile arrangement transported to various educational sites. However there is no need for such a facility at the present time in conjunction with our program and we do not foresee need for one in the immediate future.

February 9, 1968


Page Two

Mrs. Shirley McDonald
Graduate School

Insofar as laboratory demonstrations in conjunction with lectures is concerned, this is a distinct possibility. However, no problem exists since it is easier to televise demonstrations than it is to offer them in a large classroom, since the details of the demonstration may be made more intimate by close-ups. At the present time, no such demonstrations are necessary, however.

2. Library Facilities - More pertinent, immediate considerations involve library facilities for off-campus students. In conjunction with the present courses, no extensive library facilities are necessary other than duplicate copies of a few reference texts. In the case of Rochester, IBM has already indicated their willingness to purchase any such references needed for already existing courses. The problem has further been discussed with Mrs. Burnam of the Engineering Library at the University of Minnesota. In the future it is our intent to indicate to Rochester those reference books which we feel are necessary for the proper conduct of specific courses to be televised. Rochester will then either purchase the books directly, or we will arrange through the University of Minnesota Library for duplicate copies of the books to be purchased and to be provided by Inter-Library Loan either to the Rochester Public Library or to the IBM Library. Since, currently, virtually all of our students in the Rochester area are employed by IBM, it is our feeling that the IBM Library should purchase duplicate copies of the books we request as reference material and they are willing to do so. If expansion of the students in this area occurs outside of the IBM context, we would then propose that the IBM Library facilities required for the course be made generally available.

Sincerely yours,


R. C. Jordan
Professor and Head
Department of Mechanical Engineering

RCJ/skh

CC: Dean Warren Ibele
Dean Bryce Crawford
Dean Willard Thompson
Dr. Darrell Frohrib

JAN 18 1968

OFFICE OF THE DEAN

INSTITUTE OF TECHNOLOGY
SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING • MINNEAPOLIS, MINNESOTA 55455

January 16, 1968

Dean Bryce L. Crawford, Jr.
Graduate School
321 Johnston Hall

Dear Dean Crawford:

In September of 1965, the Mechanical Engineering Department undertook the offering of a Master's degree program by closed-circuit television to the Rochester area and approval of this program was requested in my September 23, 1965 letter to you, a copy of which is attached. This program was premised upon its involvement in regular day classes extended by closed-circuit T.V. and with on-campus students acting as a control on the performance of the off-campus students. As detailed in my letter, procedures and standards for admission were identical with those of our regular program. Further, on-campus participation in advising and project activity was to be required of all students before the Master's degree would be conferred. As pointed out at that time the experiment was to involve a complete set of offerings over an extended period of time. Prior to my request to you, the entire Mechanical Engineering Graduate Committee reviewed the potential program and established the recommendations which were submitted to you, since our graduate group was particularly concerned that the standards of the program be comparable in all ways to our regular program.

In the minutes of the Graduate School Executive Committee of October 24, 1965, the program was reviewed and approved with the statement that "Since this program is in actuality the same one offered on campus, no Executive Committee approval is required. A copy of the subcommittee's report is filed with the permanent file of these minutes."

Concomitantly, the Graduate School became involved in problems of joint Extension Division and Graduate School registration and restricted the extension graduate credits to twelve. Although the Mechanical Engineering Department had no involvement over the administrative procedures for registration, it was decided by others that this program would be most expeditiously handled through such joint registration procedures. Therefore, some

confusion has existed as to whether or not the Graduate School's approval of the total program overrode the joint registration restrictions of twelve credits. Up to this time the Mechanical Engineering Department has been unaware that this confusion existed. Therefore, at this time I would like to make certain recommendations relative to our program in order to clarify the status of the students presently enrolled and to "tidy up" any loose administrative ends that may still exist.

Before making specific recommendations, may I preface these by advising that the Mechanical Engineering Graduate Committee has reviewed the program at several times since its inception. The Mechanical Engineering faculty continues to endorse the program and wishes to continue it indefinitely. Three recommendations to accomplish this follow:

(1) The present conditions under which the program is offered are best delineated by reference to the accompanying copy which has just been prepared by the Mechanical Engineering Department for possible printing. This is submitted for Graduate School approval and, if approved, will be printed through funds to be made available by the Extension Division.

(2) Although the joint registration procedure was devised primarily for other purposes than the ME-TV program, the mechanics of registration are most simply carried out administratively if the joint registration procedure can be used for this purpose. This simplifies both financing and student registration. It is, therefore, our recommendation that the joint registration procedure be continued but with waiving of the twelve-credit limitation.

(3) Since confusion has existed in the past relative to the application of the twelve-credit limitation to the ME-TV program we hope, therefore, that this request for a waiver of credit limitation be made retroactive to the beginning of the program. Seven students have completed more than 12 credits of work on the program and one has completed 33. These students have completed this work with understanding of themselves and the Mechanical Engineering Department that full credit was to be allowed. Of equal importance, the work has been accomplished competently with high standards of competition and under regular members of the graduate staff following regular admission through Graduate School.

In summary, the Mechanical Engineering Department reiterates its satisfaction with the closed-circuit TV extension of its regular Master's program to the Rochester area and wishes to continue it indefinitely. We, therefore, request (a) approval of the accompanying material which we hope soon to print relative to our closed-circuit television graduate program (b) use of the

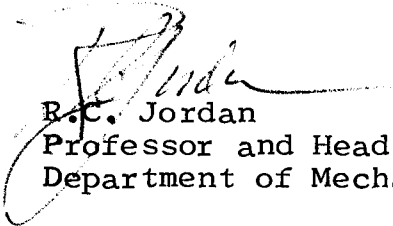
Dean Bryce L. Crawford, Jr.

-3-

January 16, 1968

joint registration procedure already devised as the simplest administrative way of arranging financing and student registration, and (c) blanket waiver of the twelve-credit limitation as applying to the degree program under joint registration retroactive to the beginning of the program itself.

Sincerely yours,



R.C. Jordan

Professor and Head
Department of Mechanical Engineering

RCJ/mlp

cc: Dean Warren B. Cheston
Dean Willard L. Thompson
Enclosure

**GRADUATE STUDY VIA CLOSED
CIRCUIT TELEVISION IN THE
MECHANICAL ENGINEERING DEPARTMENT
UNIVERSITY OF MINNESOTA**

This brochure describes the opportunities and policies of the Closed Circuit Television Graduate Program in the Mechanical Engineering Department of the University of Minnesota. Recognizing the increasing need for graduate education of engineers remote from the University campus, the faculty of this department has established a Master's program of study which utilizes closed-circuit television to remote locations. This program is governed by specific policies and sets forth long-term course offerings which permit the student and his advisor to plan a definite program of study similar to students in residence.

The Mechanical Engineering Department offers opportunity for graduate study in a wide spectrum of disciplines within the profession. These include:

- Thermodynamics, Heat and Mass Engineering Transfer
- Design, Instrumentation and Control
- Power and Propulsion
- Industrial Engineering
- Bioengineering
- Particle Technology
- Engineering Graphics
- Environmental Control

Certain courses from these fields will be offered via closed-circuit television to designated sites. Most of this work will be offered during day-time hours.

Outstanding companion departments to Mechanical Engineering offer courses which may be taken via closed-circuit television; certain of these offerings are formally included in the course offerings enumerated below. These include mathematics, engineering mechanics, and electrical engineering. Courses from these departments may be included in the major or may be used as a full minor program.

POLICIES OF THE PROGRAM

The Master's program is administered under the policies of the Graduate School as described in the Graduate School Bulletin. The admission policy is re-stated, in part, here:

Any student with a Bachelor's degree or its equivalent from a recognized college or university may apply to the dean of the Graduate School for admission. An applicant with the necessary background for his chosen major field, an excellent scholastic record from an approved college or university, and satisfactory character and professional qualifications may be admitted for graduate work on recommendation of the graduate faculty of the Mechanical Engineering Department and approval of the dean of the Graduate School.

An applicant who holds a Bachelor's degree or its equivalent from a recognized college, but whose scholastic record and qualifications are marginal from the point of view of preparation for, and probable success in, graduate work may be admitted conditionally to the Graduate School. In such cases the Graduate School reserves the right to cancel the registration if at any time the scholastic record falls substantially below the standard for successful graduate work.

The Mechanical Engineering Department Closed-Circuit Television Graduate Program enables the student to pursue his degree under one of two plans, Plan A or Plan B:

Plan A: Master's Degree with Thesis:

Major and Minor Work -- In choosing a field for major or minor work, the student must complete in the Graduate School a minimum of 18 quarter credits in the major and 9 in the minor with a combined grade point average in the major and minor of 2.8. No graduate credit is allowed for course work of D quality.

In cases where the student takes course work beyond the minimum requirements, both the advisor and the graduate group committee may demand comparable standards of performance for all work taken in

evaluating and approving the minimum program submitted, and may reject the minimum degree program if the total record falls below a 2.8 GPA and may also terminate candidacy.

The student's work for the minor must be logically related to his major work. The dean and the group committee may, in exceptional cases, allow minor subjects to be taken in the same department as that of the major.

All requirements for the Master's degree under Plan A must be completed within 7 years. The 7-year period specified includes all work transferred to the graduate record of the individual, whether this transferred work was taken as an adult special student at the University of Minnesota or under any other conditions in which transfer is permitted.

Admission to the Graduate School involves a specified major field. Any subsequent proposal for a change in major necessitates a formal request to the Graduate School.

Master's Thesis -- The student shall submit the title of his thesis and a complete program of the work to be offered for the degree on a form secured at the Graduate School office. The thesis title must be approved by his advisor and by the appropriate group committee. The thesis should be on a topic falling within the field of the major. The candidate will ordinarily devote approximately half of his time to the preparation of the thesis, including courses on which the thesis is based.

Examinations -- All candidates for the Master's degree will meet the regular requirements as to examinations, reports, etc., of the classes in which they are registered.

In addition to the usual course examinations, the candidate for the Master's degree Plan A must pass a final written examination, a final oral examination, or both, at the discretion of his examining committee, which must meet collectively and determine the appropriate course of procedure.

Plan B: Master's Degree Without Thesis:

Under Plan B, the student must pass either a final written examination or a final oral examination or both, at the discretion of his committee. The committee must meet collectively and determine the appropriate course of procedure. Plan B differs in substituting for a thesis a heavier course requirement. While it does not permit an indiscriminate scattering of courses over unrelated fields, it does not stress concentration on one major and one minor field. It is understood that more than one field will be included outside the field of concentration. Insofar as it has a professional aspect, the Master's degree under Plan B is less a test of research interest and more adapted to individuals who will profit by a broader range of knowledge in their fields. Whether taken for professional or cultural purposes, the requirements under Plan B are meant to test interests and intellectual abilities for a different purpose but not on a different level from those for Plan A.

Under Plan B, candidates for the Master's degree must complete, with a GPA of 2.8, a minimum of 45 quarter credits in graduate courses. At least 21 of the 45 credits hours should be in the major field. Not less than 18 of the 45 hours should be offered in at least two related fields with a minimum of 6 credits required in each. Papers representing the quality but not the range of the Master's thesis shall be prepared in three advanced courses or seminars or in problems courses or courses which permit independent work under faculty supervision and involve 9 credits. This requirement may be satisfied with a combination of the above which is acceptable to the Graduate School. The work may be done either in the major field or in related fields.

All requirements for the Master's degree Plan B must be completed within 7 years. The 7-year period specified above includes all work transferred to the graduate record of the individual, regardless of whether this transferred work was taken as an adult special student at the University of Minnesota or under any other conditions in which transfer is permitted.

Intelligent planning of the student's program requires that he present to his advisor a statement of the college work completed with credit. In planning his program, the student should not include in "related fields" courses from the field of concentration.

Under this plan, the candidate will be examined by a committee of not less than three members, normally two from the major and one from a related field, appointed by the dean of the Graduate School upon recommendation of the appropriate group committee. This examination may be written or oral or both, at the discretion of the examining committee.

The principal interest of the Mechanical Engineering graduate faculty is that students enrolled in the television program experience as nearly as possible the genuine graduate study characteristic of students in residence. To facilitate this, each student will have a formal advisor with whom he will maintain regular contact to permit active academic guidance, both in planning his program and in the research associated with a Plan A thesis or Plan B papers. It is the student's responsibility to formally identify with an advisor before he has taken more than 9 academic credits of work. Furthermore, the student will be expected to pursue a program at a reasonable rate of progress, with defined academic objectives set forth in a formal program of study, and approved by the Graduate School of the University.

The faculty also believes that a definite amount of on-campus study is not only desirable but necessary in graduate education. Therefore, all students in the closed-circuit television graduate program are expected to spend a prescribed amount of time on the Minneapolis campus of the University. In the early stages of his study, prior to individual research activity, each student will make a minimum of two visits per quarter to the campus for discussions with his advisor and instructors. Later, if he is enrolled in Plan A, he is expected to spend one day per week on campus during his enrollment for thesis. This time will be devoted primarily to research and staff discussions. If enrolled in Plan B, he is expected to be on campus four hours per week during the time he is involved in Plan B paper research and writing.

COURSE OFFERINGS

The Closed-Circuit Television Graduate Program in Mechanical Engineering is structured to offer a balanced roster of courses from several divisions of the Department, and all participating students should be free to select a coherent program of study from this roster under the guidance of their graduate advisors. The courses enumerated below, taught in the School of Mechanical and Aerospace Engineering and the School of Mathematics, will be offered through the Spring quarter, 1969.

Fall, 1967

- ME 133 - Heat Transmission - 0 credits
- MM 180 - Applied Elasticity I - 3 credits
- M 167 - Fourier Series and Boundary Value Problems - 3 credits

Winter, 1968

- ME 234 - Convection - 3 credits
- MM 181 - Applied Elasticity II - 3 credits
- M 168 - Elementary Theory of Complex Variables - 3 credits

Spring, 1968

- ME 235 - Radiation - 3 credits
- MM 182 - Applied Elasticity III - 3 credits
- M 168B - Applications of Complex Variables - 3 credits

Fall, 1968

- IE 120 = Probability Models in Industrial Engineering and Operations Research - 3 credits for non-IE majors
0 credits for IE majors.
- MM 193 = Introduction to the Theory of Mechanical Vibrations - 3 credits
- M 147 - Vector Analysis - 3 credits

Winter, 1969

- IE 173 - Engineering Economic Analysis - 3 credits
- ME 198 - Industrial Instrumentation and Control - 3 credits
- M 148 - Differential Equations - 3 credits

Spring, 1969

IE 175 - Elements of Reliability - 3 credits

ME 199 - Introduction to Feedback Control Systems - 3 credits

M 149 - Determinants and Matrices - 3 credits

Courses in addition to this specific set may be taken in connection with the Electrical Engineering Department's closed-circuit television program of graduate education. In that program, the following two sequences are generally offered every year in the evening:

ITM 167 - Elementary Partial Differential Equations - 3 credits

ITM 168A - Elementary Theory of Complex Variables - 3 credits

ITM 168B - Integral Transforms - 3 credits

EE 150 - Dynamical Methods in Electrical Engineering - 3 credits

EE 151 - Thermodynamic Methods in Electrical Engineering 3 credits

EE 152 - Statistical-Mechanical Methods in Electrical Engineering -
3 credits

Other courses in the Electrical Engineering Program, in electrical energy conversion, network theory, communications theory, and control theory may be available if there is sufficient demand. Courses taken in these areas must satisfy the coherent program of study required of his overall activity.

In each of these courses, the off-campus student will be responsible for the same material and will comply with the same schedules as the on-campus student. His personal attendance at a class on campus is encouraged whenever possible.

Each student is urged to enroll in one, and preferably two, graduate courses per quarter, to maintain a reasonably paced program. He is free to enroll in any on-campus graduate course sanctioned by his advisor whenever his industrial work obligations permit. If the student does not wish to utilize television offerings during a given quarter, he is expected to use that time either to attend courses on campus, or to fulfill his Plan A or B research requirement.

This program of graduate study via closed-circuit television is intended to be a continuing program. Therefore, a roster of courses to be offered over a three year interval will be up-dated periodically and made available through the Mechanical Engineering Department of the University of Minnesota to aid the student in planning a specific plan of study.

The course roster may be procured through the Mechanical Engineering Department (Room 129, Mechanical Engineering, University of Minnesota, Minneapolis, Minnesota, 55455) or through the Office of Continuing Education in Engineering and Science, (Room 207 Nolte Center). Additional questions may be directed to Dr. Darrell Frohrib (Room 325 Mechanical Engineering Building, Telephone 373-3008 or 373-3014).

September 23, 1965

Dean Bryce L. Crawford, Jr.
Graduate School
321 Johnston Hall

Dear Bryce:

The Mechanical Engineering Department plans to undertake a modest experimental program which may be regarded as off-campus graduate study at the master's degree level. Therefore, this should have Graduate School approval and encouragement. I believe you are already aware of most of the aspects of this program, but perhaps some of the details and the way we intend to conduct it should be discussed.

At this time those students who will be on the program consist of a group of sixteen, all employed at Rochester, Minnesota. The medium of communication will be closed-circuit television. Starting winter quarter those classes which will be involved will be day classes with our on-campus graduate students and with monitoring TV cameras and receivers located in the back of the classrooms. Effectively, the students at Rochester can be regarded as seated in the back of the classroom. Regular students on the Minnesota campus will be able to view the Rochester extension of the classroom by turning around and looking toward the back of the classroom.

McK
Certain offerings will be provided each quarter, but it is our intent that these students be pushed through a fixed master's curriculum. Procedures and standards for admission to Graduate School will be identical with those for our on-campus students. While the majority of the students will probably minor in mathematics, we see no reason why some might not minor, for example, in electrical engineering. The pattern of the major courses will vary dependent upon those courses made available to the students. Some may wish to

September 23, 1965

include courses in mechanics and materials in the major and this will be quite satisfactory to us. It is conceivable that some students may minor in mathematics and wish to include some advanced work in electrical engineering along with the mechanical engineering work in the major. If their work is dominated by mechanical engineering courses this, too, would be considered by the Mechanical Engineering Graduate Committee. Thus it is our intent that the actual programs be tailored in the same way that any other graduate programs are tailored. We would hope that some students might obtain a leave of absence from their company or companies and spend a quarter on the campus taking such additional work which they might not be able to obtain through the closed-circuit television medium.

It is not our intention that the advising be done by one man but probably by several of our staff. In order to accomplish this it is our intention to request that all of the initial sixteen students spend an afternoon on campus and during this time we will review with them our facilities, introduce them to several of our senior staff and discuss and develop their potential programs. In this way we hope to impress upon them the fact that we regard them as no different than our regular graduate students. All programs developed will be reviewed by our entire Mechanical Engineering Graduate Committee before these are forwarded with recommendation to the Graduate School. After the program is under way, we hope that it may be possible to arrange for periodic telephone conversations between the individual students and their advisers and, if possible, for the students to visit the adviser periodically on the Minneapolis campus.

As you know, this program was started in a somewhat nebulous way last year and a number of Rochester students took 6 to 9 credits of closed-circuit television evening courses, principally in the field of mathematics, with the understanding that up to 9 credits of work, if satisfactorily completed, would be petitionable to an eventual master's program. The new closed-circuit classroom under development will be completed by the beginning of winter quarter, and this fall these students will be registered in M&M 147 as an additional mathematics course acceptable for the master's program in Mechanical Engineering.

Dean Bryce L. Crawford, Jr. - 3 - September 23, 1965

We would appreciate prompt consideration and, hopefully, approval of the Graduate School for this experimental program. As I believe you can see, we have every intention of maintaining identical standards with these students as we do with our regular graduate students and electronically co-mingling, if I may suggest a term.

Sincerely yours,

R. C. Jordan
Professor and Head
Department of Mechanical Engineering

RCJ/mp

cc: E. A. Fletcher
J. B. Holte
F. Verbrugge
W. L. Thompson

A. W. Warner

December 26, 1967

Dean Bryce Crawford
Graduate School
University of Minnesota
321 Johnston Hall
Minneapolis, Minnesota 55455

Dear Dean Crawford:

On December 8, 1967, the "Life Sciences" Group Committee (combined Agriculture and Biological Group Committees) met at 4:00 p.m. for the special purpose of discussing further, and acting upon, the proposal for initiating Masters Programs in Biology, Botany and Zoology at Duluth.

After more than two hours of discussion the committee decided unanimously to:

1. Table the present proposal.
2. Withhold the Graduate Faculty appointments in Biology at Duluth that were made at our Group Committee meeting on November 27.
3. Transmit to your office the following points that were either not covered adequately in either the original proposal, or in supplementary material submitted later, but which the Committee believes to be essential to such a proposal:
 - a. Reasons for request
 - (1) To serve a need of students locally (e.g. teacher training)
 - (2) To provide a local source of trained people (e.g. teachers)
 - (3) To improve undergraduate opportunities for course enrichment.
 - (4) To attract and hold superior staff.
 - (5) To study more intensively the local environment.
 - b. Facilities and staff presently available
 - (1) Staff description (including present course loads, current research activities, areas of research interest).
 - (2) Teaching, research and office space allocations in the new building.
 - (3) Major equipment available.
 - (4) Field facilities.
 - (5) Interactions with other departments and outside groups.
 - (6) Special opportunities for graduate study and staff and student research in the Duluth region.

- c. Sample curricula for each M.S. degree plan.
- d. Vitae for proposed Graduate Faculty (more complete than previously supplied. Include copies of representative publications, previous grant support, covering letters of support, etc.).
- e. Needs of the proposed new program
 - (1) New courses
 - (2) New academic staff (Biochemistry, et al) (both undergrad and grad courses and staff in Biochem. needed)
 - (3) New Civil service staff (secretarial, animal-plant caretaker, etc.)
 - (4) New facilities and equipment.
 - (5) Reduction in teaching loads
 - (6) Funds for:
 - (a) new faculty
 - (b) new teaching assistants
 - (c) new teaching equipment
 - (d) research

The Committee considered of great importance to the proposal a covering letter from the Duluth administration expressing its full academic and financial support toward initiating a new approved Graduate Program in the Biological Sciences.

Meeting adjourned at 6:15 p.m.

Respectfully submitted,

Dwain W. Warner
D. W. Warner
Life Sciences Group Committee

C. M. Stowe
C. M. Stowe, Chairman
Life Science Group Committee

C. C. Number 40

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval 5-2-67

A PROPOSAL TO ESTABLISH THE DEGREE OF MASTER OF SCIENCE
IN BOTANY AND IN ZOOLOGY (PLAN A) AND IN
BIOLOGY (PLAN B)

DEPARTMENT OF BIOLOGY
DIVISION OF SCIENCE & MATHEMATICS
UNIVERSITY OF MINNESOTA, DULUTH

APRIL, 1967

A graduate program in the biological sciences on the Duluth campus will complement the existing program in chemistry as well as those to be proposed in physics and geology. For some students, the Master's degree in one of the areas of biology will probably be a terminal degree but other students who complete the Master's program here may continue graduate work on the Minneapolis or St. Paul campuses, or elsewhere.

The proposed Master's degree in the Department of Biology at the University of Minnesota, Duluth, will follow the general requirements for the degree as described in the Graduate School Bulletin 1966-1968 (pp. 10-16). The department proposes to offer the M. S. degree in Botany and in Zoology under Plan A and in Biology under Plan B.

Plan A will require appropriate course work, a research problem, and thesis. The Plan B program will be directed toward the enrichment of the subject-matter area for high school teachers of biology as well as for others who might desire a broader base of course work in the life sciences rather than the research experience required by the Plan A approach to the degree.

The Department of Biology has had, for many years, a strong undergraduate curriculum in both field and laboratory aspects of biology which provides a sound basis on which to build a program at the level of the Master's degree. This would serve the dual purpose of providing a greater in-depth training for qualified students as well as recruiting and retaining faculty who have a sincere interest in both teaching and research.

ADMISSION REQUIREMENTS

For major work, general biology (Biology 1-2 or equivalent) and at least 20 credits in biological sciences approved by the department. For minor work, general biology (Biology 1-2, or equivalent). It is strongly recommended that the student have a background in chemistry, mathematics, and physics; deficiencies in these areas must be corrected.

Students admitted to the program will be required to write a comprehensive qualifying examination at the beginning of their graduate training in order that areas of weakness in the biological sciences may be identified. The results of the examination will serve, in part, as a basis for determining the most effective advising.

Plan A may be taken with a major in botany and a minor in zoology or with a major in zoology and a minor in botany. With either major, other minors such as chemistry, geology, and physics will also be available.

Plan B may be taken with a major in biology and with course work in related fields such as botany, chemistry, education, geology, physics, and zoology.

LANGUAGE REQUIREMENT

Reading knowledge of a foreign language must be demonstrated either by examination (Princeton Standard Examination) or by presenting a certificate from the appropriate language department. Under certain circumstances, an approved collateral field may be substituted for the language requirement.

BIOLOGY COURSES

**Biology 101 f,w,s	Basic Botany and Zoology	1-9
Biology 135*	Cell Metabolism	5
Biology 171*	Evolution	3
Biology 180*	Limnology	4
Biology 190*	Biochemical Genetics	3
Biology 298	Seminar	1-3

**May be repeated for credit

BOTANY COURSES

Botany 118*	Advanced Plant Taxonomy	4
Botany 150*	Plant Ecology	5
Botany 151a*	Plant Physiology	3
Botany 151b*	Plant Physiology Laboratory	2
Botany 153*	Plant Anatomy	5
Botany 156*	Mycology	3
Botany 299	Research	1-9

ZOOLOGY COURSES

Zoology 123*	Advanced Insect Biology	4
Zoology 128*	Experimental Embryology	5
Zoology 132*	Ecology of Birds	3
Zoology 146*	Helminthology	3
Zoology 155a*	Animal Behavior	3
Zoology 155b*	Animal Behavior Laboratory	2
Zoology 164*	Fish Biology	4
Zoology 172a*	Ecology of Animal Populations	3
Zoology 172b*	Ecology of Animal Populations Lab	2
Zoology 299	Research	1-9

*Courses in which papers may be written in partial fulfillment of the requirements under Plan B.

RESEARCH FACILITIES

The new Life Science building, with four floors and 48,000 square feet of floor space, will be ready for use in the fall quarter, 1967. In addition to faculty offices, teaching laboratories and library, the following facilities will be available for research purposes: seven research laboratories with a total area of 2200 square feet; isotope rooms, 456 square feet; herbarium and workroom, 576 square feet; and an aquarium room, 336 square feet. In addition, there are two controlled environment rooms as well as research space in conjunction with the invertebrate and vertebrate zoology laboratories. The new greenhouse, with an area of 2200 square feet, will provide additional space for both teaching and research. The Limnological Research Center and the two research vessels, ONEOTA and S.S.JACOBS, are well equipped for investigations in various aspects of water quality and limnology. Facilities at the Northeast Experiment Station, as well as a 40-acre tract of wooded land on the Talmadge River, will provide excellent opportunities for research.

FACULTY

The present staff of the Department of Biology consists of ten full-time members at the rank of Assistant Professor and above, nine of whom have the doctorate, plus three full-time instructors and three part-time instructors. The department is requesting one additional faculty member for 1968-1969.

Theron O. Odlaug, Professor and Head
Ph.D. New York University 1940
Parasitology, Limnology

Pershing B. Hofslund, Professor
Ph.D. University of Michigan 1954
Ornithology, Vertebrate Natural History

Blanchard O. Krogstad, Professor
Ph.D. University of Minnesota 1951
Insect Ecology

John B. Carlson, Professor
Ph.D. Iowa State University 1953
Plant Anatomy

Paul H. Monson, Associate Professor
Ph.D. Iowa State University 1959
Plant Taxonomy

Edward Flaccus, Associate Professor
Ph.D. Duke University 1959
Plant Ecology

Hollie L. Collins, Assistant Professor
Ph.D. Michigan State University 1965
Animal Behavior, Ichthyology

George E. Ahlgren, Assistant Professor
Ph.D. University of Minnesota 1966
Plant Physiology

Rolf E. Huff, Assistant Professor
Ph.D. University of Indiana 1961
Embryology

Walter Fluegel, Assistant Professor
M. S. North Dakota State University 1956
Microbiology

Linda Holmstrand, Instructor
B. S. University of Minnesota 1962
Human Anatomy & Physiology

Charlotte MacLeod, Instructor
M. A. University of Minnesota 1967
General Biology

Helen Hanten, Instructor
B. S. University of Minnesota 1966
General Biology

LIBRARY LIST A. Journals (monthly, bi-monthly etc.) Available on the
Duluth Campus.

<u>NAME</u>	<u>YEAR-TO-DATE</u>
AGRONOMY JOURNAL	1934
AMERICAN FERN JOURNAL	1952-1957
AMERICAN FISHERIES SOCIETY, TRANSACTIONS	1944 -
AMERICAN FORESTS	1899-1933 1937-1944 1946-1948 1951 -
AMERICAN JOURNAL OF ANATOMY	1948 -
AMERICAN JOURNAL OF BOTANY	1931 -
AMERICAN JOURNAL OF TROPICAL MEDICINE & HYGIENE	1952 -
AMERICAN JOURNAL OF TROPICAL MEDICINE	1949-1951
AMERICAN MICROSCOPICAL SOCIETY, TRANSACTIONS	1929-1938 1943
AMERICAN MIDLAND NATURALIST	1910-1930 1944-1946 1948 -
AMERICAN NATURALIST	1937 - 1944 -
AMERICAN ZOOLOGIST	1961 -
ANATOMICAL RECORD & SUPPLEMENTS	1948 -
ANIMAL BEHAVIOR	1960 -
ANIMAL KINGDOM	1965 -
ANNALS OF APPLIED BIOLOGY	1954 -
ANTONIE VAN LEEUWENHOEK	1966 -
ANNALS OF ENTOMOLOGICAL SOCIETY OF AMERICA	1908 -
APPLIED MICROBIOLOGY	1960 -
AUDUBON FIELD NOTES	1947 -
AUDUBON MAGAZINE	1902-1904 1908 -
AUK	1884-1900 1912 -
AVICULTURAL MAGAZINE	1965 -
BACTERIOLOGICAL REVIEWS	1949 -
BIOLOGICAL ABSTRACTS	1926 -
BIOLOGICAL BULLETIN	1948 -
BIRD BANDING	1954 -
BIRD STUDY	1945-1966
BOTANICAL GAZETTE	1939 -
BOTANICAL REVIEW	1935 -
BRITISH BIRDS	1960 -
BRITTONIA	1943 -
BULLETIN OF ENTOMOLOGICAL RESEARCH	1960 -

<u>NAME</u>	<u>YEAR-TO-DATE</u>
CAMBRIDGE PHILOSOPHICAL SOCIETY, BIOLOGICAL REVIEWS	1960
CANADIAN ENTOMOLOGIST	1909-1910
	1929
	1955 -
CANADIAN FIELD-NATURALIST	1949 -
CANADIAN JOURNAL OF RESEARCH	1935-1950
CANADIAN JOURNAL OF BOTANY	1951 -
CANADIAN JOURNAL OF ZOOLOGY	1951 - 1953
	1956 -
CANADIAN JOURNAL OF MICROBIOLOGY	1966 -
CONDOR	1899 -
CONTRIBUTIONS OF NATIONAL HERBARIUM	1957 -
COPEIA	1949 -
CRUSTACEANA	1960 -
ECOLOGICAL MONOGRAPHS	1942 -
ECOLOGY	1926 -
ECONOMIC BOTANY	1947 -
ENTOMOLOGICAL SOCIETY OF AMERICA, ANNALS	1954 -
ENTOMOLOGICAL SOCIETY OF ONTARIO PROCEEDINGS	1960 - 1963
EVOLUTION	1947 -
EXCERPA BOTANICO	1959 -
EXPERIMENTAL PARASITOLOGY	1951 -
FLICKER (now The Loon)	1947 -
GENETICS	1947 -
J 22. Geological Society of America Bulletin 1 - 77	1890 -
J 23. Geological Survey Bulletins	1906 -
J 24. Geological Survey Professional Papers	
J 25. Geological Survey Water Supply Papers	
HELMINTHOLOGICAL SOCIETY OF WASHINGTON PROCEEDINGS	1949 -
HILGARDIA	1953 -
IBIS	1953 -
JACK-PINE,,WARBLER	1943 -
JOURNAL FUR ORNITHOLOGIE	1966 -
JOURNAL OF ANIMAL ECOLOGY	1954 -
JOURNAL OF BACTERIOLOGY	1944 -
JOURNAL OF ECOLOGY	1961 -
JOURNAL OF ECONOMIC ENTOMOLOGY	1908 -
JOURNAL OF EXPERIMENTAL BIOLOGY	1945 - 1947
	1960 -
JOURNAL OF EXPERIMENTAL PSYCHOLOGY	
JOURNAL OF EXPERIMENTAL ZOOLOGY	1928 -
JOURNAL OF FORESTRY	1924 -
	1926 -
JOURNAL OF GENERAL MICROBIOLOGY	1956 -
	1957 -
	1960 -
JOURNAL OF GEOLOGY	1893 -
JOURNAL OF HELMINTHOLOGY	1949 - 1956
JOURNAL OF HEREDITY	1947 -
JOURNAL OF MAMMALOGY	1929 -

<u>NAME</u>	<u>YEAR-TO-DATE</u>
JOURNAL OF MOLECULAR BIOLOGY	1959 -
JOURNAL OF PARASITOLOGY	1914 -
JOURNAL OF RANGE MANAGEMENT	1956 -
JOURNAL OF WILDLIFE MANAGEMENT	1948 -
LIMNOLOGY & OCEANOGRAPHY	1956 -
MICHIGAN BOTANIST	1962 -
MIGRANT	1952 -
MINNESOTA ACAD. SCIENCES	
MYCOLOGTA	1909 - 1918
	1949 -
NATURALIST	1950 -
NATURALISTE CANADIEN	1932 -
NATURE	
NATURE REVIEW	1909
	1919 - 1921
NEW YORK FISH & GAME	1954 - 1961
OIKOS	1960 -
OSTRICH	1966 -
PARASITOLOGY	1928 -
PASSENGER PIGEON	1945 -
PHYSIOLOGICAL ZOOLOGY	1946 -
PLANT PHYSIOLOGY	1948 -
QUARTERLY REVIEW OF BIOLOGY	1926 -
RADIATION BOTANY	1961 -
RADIATION RESEARCH	1954 -
RHODORA	1925 -
RING	1954 -
ROYAL SOCIETY, PROCEEDINGS, SERIES B., BIOLOGICAL SCIENCE	1956 -
SCIENCE	
SCIENTIFIC AMERICAN	
SOIL CONSERVATION	1941 -
SOIL SCIENCE SOCIETY OF AMERICA	1958
SOIL SCIENCE	1964
SARRACENIA	
SYSTEMATIC ZOOLOGY	1949 -
TAXON	1951 -
TORREY BOTANICAL CLUB. BULLETIN	1938 -
WILDLIFE MANAGEMENT BULLETIN	1950 -
WILDLIFE MONOGRAPHS	1958 -
WILDLIFE REVIEW	1943 -
WILSON BULLETIN	1892 -

<u>NAME</u>	<u>YEAR-TO-DATE</u>
ZOOLOGICAL SOCIETY OF LONDON, PROCEEDINGS: SERIES A & B	1960 -
ZOOLOGICAL SOCIETY OF LONDON, SECTION AVES OF THE ZOOLOGICAL RECORD	1954 -
ZOOLOGICA	1965 -

LIST B Serials (Yearly, alternate year or infrequent publication) Available
on the Duluth Campus

ADVANCES IN APPLIED MICROBIOLOGY	Vol. 1 - 7
ADVANCES IN ECOLOGICAL RESEARCH	1, 2, 3
ADVANCES IN GENETICS	Vol. 7 - 13 1955 (1965)
ADVANCES IN PARASITOLOGY	Vol. 1, 2, 3 (1965)
ANNUAL REVIEW OF BIO-CHEMISTRY	Vol. 1
ANNUAL REVIEW OF ENTOMOLOGY	Vol. 1 - 11
ANNUAL REVIEW OF MICROBIOLOGY	Vol. 19 & 20 (1966)
ANNUAL REVIEW OF PLANT PHYSIOLOGY	Vol. 5 - Vol. 17 (1966)
ANNUAL REVIEW OF PHYSIOLOGY	Vol. 1 - 28 (1966)
THE BACTERIA	Vol. 1 - V
BIBLIOGRAPHY OF AGRICULTURE	
DISSERTATION ABSTRACTS	
INTERNATIONAL CONGRESS OF SOIL SCIENCES	(1960)
INTERNATIONAL REVIEW OF GENERAL AND EXPERIMENTAL ZOOLOGY	Vol. 1 & 2 (1964) (1966)
INTERNATIONAL ORNITHOLOGICAL CONGRESS	Vol. 8 -
INTERNATIONAL ZOO YEARBOOK	Vol. 3 - 6
NORTH AMERICAN FLORA	Vol. 1 - 34
SMITHSONIAN INSTITUTION ANNUAL REPORT	
SOCIETY FOR GENERAL MICROBIOLOGY (SYMPOSIA)	
SYMPOSIA ON QUANT. BIOLOGY	(all issues)

LIST C. Journals to be ordered for the Biology Library

ARCHIV. OF BIOCHEMISTRY & BIOPHYSICS	
ARCHIV. FUR MICROBIOLOGIE	
AUSTRALIAN J. OF BIOLOGICAL SCIENCES	
AUSTRAL. J. OF BOTANY	
AUSTRAL. J. OF ZOOLOGY	
BEHAVIOR (OLD-BRIT.J. OF ANIM. BEHAV.)	
BULL. OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY	
BIOMETRICS	
BRYOLOGISTS	
CANADIAN J. FISHERIES RES. BOARD	

NAME

YEAR-TO-DATE

FEDERATION PROCEEDINGS

HEREDITAS

ICHTHYOLOGICA, THE AQUARIUM JOURNAL

JOURN. OF CELL BIOLOGY

*JOURN. OF GENERAL VIROLOGY

JOURN. OF PROTOZOOLOGY

*JOURN. OF VIROLOGY

JOURN. OF ULTRASTRUCTURE RESEARCH

MADRONO

MICHIGAN BOTANIST

PHYTOMORPHOLOGY

PROTOPLASM

STAIN TECHNOLOGY

SVENSK. BOT. TIDSKR.

TROPICAL FISH HOBBYIST

"
ZEIT. FÜR ALLGEMEINE MIKROBIOLOGIE

"
ZEIT. FÜR TIERPSYCHOLOGIE

*NEW WITH 1967 YEAR.

C. C. No. 40 A

Dept. Approval 4-3-67

Div. Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request to add a Graduate Course

I. Catalog Description

Biology 190. Biochemical Genetics. Theoretical and experimental aspects of biochemical genetics pertaining to the concept of the gene, its nature, replication and the role of gene action in cellular differentiation. (3 cr; prereq. Biol. 70 or equiv; 3 hrs. lect.).

II. Course Outline.

Mutation and gene replication
Incorporation of unusual nucleotides & copy error
Point mutations
Metabolic control of mutations
Directed mutations
Genetic block of single step reactions
Qualitatively altered enzymes
Protein synthesis
Tryptophan synthetase
Some concepts of protein structure and allelic complementation
DNA base ratios & gene action
Genetic control of enzyme formation
Mutations affecting rates of enzyme formation
Position effect & controlling elements

III. Supporting information.

This is an important area of current investigation and a necessary course in the proposed graduate program in biology

IV. Instructor.

Staff

C. C. No. 40 B
Departmental Approved 4-3-67
Divisional Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request to add a graduate course.

I. Catalog description. Botany 118. Advanced plant taxonomy. Principles of plant classification; literature of systematic botany with emphasis on bibliographic tools; methods of collection, preservation, and study of vascular plants. (4 cr; prereq. 52 or #; 3 hrs. lect, 2 hrs. lab).

II. Course outline.

A. Plant classification.

1. Historical development divided into periods characterized by a) artificial, b) natural and c) phylogenetic approaches to classification.
2. Examination of the assumptions which are basic to systems of vascular plant classification.
3. Rules of nomenclature including application to selected problems.

B. Literature. A survey of selected biological literature with special emphasis on a) manuals, monographs and other works particularly important in plant identification; b) indices, abstracts and journals pertinent in monographic or floristic work; and c) the unusual diversity of sources of significant taxonomic literature occasioned by the fact that taxonomy is both a basic and a synthetic science.

C. Demonstration of discussion of the methods of collecting, preserving and studying vascular plants with special reference to the selection of methods appropriate to the nature of the problem to be solved. Field and herbarium work will be required including the preparation of a plant collection and the completion of a special problem selected to demonstrate the application of one or more of the special methods of taxonomy to the solution of a problem.

III. Supporting information.

The primary objectives of this course are:

- A. The preparation of students for independent study in the area of descriptive plant taxonomy.
- B. The development of necessary background which when supplemented by additional course work in areas such as cytology, biochemistry, and mathematics will enable the student to work independently in experimental plant taxonomy.
- C. The preparation of students in other disciplines to make effective use of those aspects of plant taxonomy which are basic to their own special studies.

The course will be developed largely on the basis of selected readings from current taxonomic literature.

IV. Instructor.

Paul H. Monson

C. C. No. 40 C

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request to drop Botany 53, Plant Anatomy, and to replace it with a new course Botany 153, Plant Anatomy.

I. Catalog description. Botany 153. Plant Anatomy. Origin, development and structure of tissue systems of vegetative and reproductive organs of vascular plants. (5 cr; prereq. Biol 1, 2; 3 hrs. lect, 4 hrs. lab)

II. Course outline.

1. Plant Body: Organs, tissues and cells.
2. Protoplast: Cell theory, protoplasmic components, non-protoplasmic components.
3. Cell Wall: Gross structure, chemical composition, microscopic and submicroscopic structure, formation.
4. Meristems and Differentiation: Classification, cytology and growth patterns of meristems, differentiation.
5. Apical Meristems: Vegetative shoot apex, leaf and branch origin, reproductive shoot apex, root apex.
6. Vascular Cambium: Location, cell types, arrangement and division.
7. Epidermis: Origin, structure, duration, multiple epidermis.
8. Parenchyma: Structure, origin, function.
9. Collenchyma: Structure, origin, function, location.
10. Sclerenchyma: Fibers and sclereids, structure, origin, function, location.
11. Xylem: Elements, primary xylem, secondary xylem.
12. Phloem: Elements, primary phloem, secondary phloem.
13. Secretory structures: External, internal, laticifers.
14. Periderm: Origin, characteristics, lenticels.
15. Stem: Origin, tissue systems, stele, primary and secondary growth.
16. Leaf: Origin, development, angiosperm and gymnosperm leaf, abscission.
17. Root: Origin, tissue systems, primary and secondary growth, transition zone.
18. Flower: Structure, origin, development.
19. Fruit and Seed: Ovule, embryogeny, endosperm, pericarp

III. Supporting information.

This course will replace Botany 53 and provide for a more intensive study of the subject. The new course will be available to advanced undergraduate students and also for graduate students to partially fulfill their degree requirements.

In addition to the reading required of the undergraduates, graduate students will be required to prepare a paper on an approved subject.

The text will be Esau, K. Plant Anatomy 2nd Ed. John Wiley

IV. Instructor.

John B. Carlson

C. C. No. 40 D
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. App. _____

To: The Curriculum Committee

From: Department of Biology, Division of Science and Mathematics.

Subject: Request for approval to drop Bot. 51 from the Biology curriculum and add Bot. 151.

I. Catalog description.

Bot. 151. Plant Physiology. A study of plant function with emphasis on the higher plants. Biochemical and physical aspects of plants, their growth, nutrition, metabolism and relationship to light, water and other environmental factors. (3 cr. prereq. Biol. 54 or consent of instructor. Bot. 151A must be taken concurrently by undergraduate students. Research paper required of graduate students, 3 hrs. lect.)

II. Course outline.

1. Plant cells and inclusions, properties of solutions, suspensions and colloidal systems.
2. Substances of which plants are made and their properties.
3. Inorganic nutrition.
4. Metabolism
 - a. enzymes
 - b. sources of energy: photosynthesis
 - c. release of energy
5. Nitrogen metabolism
6. Relation of plants to water and solutes.
7. Movement of solutes and water
8. Growth, development and environmental effects of plants.

III. Supporting information.

It is the wish of the Biology Department to offer Plant Physiology as a graduate course which will also be open to undergraduates. Graduate students will be required to submit research papers on certain aspects of plant physiology. In addition, they would be expected to do extensive outside reading in the areas covered and demonstrate a higher degree of proficiency than the undergraduates.

Text: Devlin, Plant Physiology, plus assigned reading.

IV. Instructor

George E. Ahlgren.

C. C. No. 40 E

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: The Curriculum Committee

From: Department of Biology, Division of Science and Mathematics.

Subject: Request for approval to add a laboratory course in plant physiology.

I. Catalog description.

Bot. 151A. Plant Physiology laboratory. Experimental basis for interpretation of certain physiological phenomena in plants, research problems, methods and techniques in plant physiology. (2 cr. prereq. Bot. 151, research problem required by graduate students), 6 hrs. lab.)

II. Course outline.

A lab manual along with experiments designed by the instructor will be used to demonstrate certain plant physiological phenomena. These experiments will involve the use of equipment, techniques and procedures commonly employed in plant physiological research. Written reports will be required which will describe materials and methods, results, and discussion and conclusions. Graduate students will be required to do a research problem in which some aspect of plant physiology is investigated, results written and submitted in a style acceptable to a scientific journal and presented orally to the class in a manner acceptable to a scientific journal and presented orally to the class in a manner acceptable at a scientific meeting.

III. Supporting information.

It is the wish of the Department of Biology to offer a graduate level laboratory course in plant physiology which will also be open to undergraduate students. This course will provide undergraduates with training in the principles of plant physiology along with an introduction to some of the methods and techniques used in plant physiological research. Graduate students will, in addition, gain experience in doing independent research by initiating and completing a research project which will necessitate library research, laboratory research with the associated compilation, interpretation and presentation of results.

IV. Instructor.

George E. Ahlgren.

C. C. No. 40 F

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: The Curriculum Committee

From: Department of Biology

Subject: Request for approval to add a graduate course to the Biology curriculum.

I. Catalog Description.

Biol. 135. Cell Metabolism. Structural organization and chemistry of the cell; particular emphasis on energy relationships, metabolic activities, pathways and control mechanisms in cellular metabolic activities. (5 cr., prereq. Biol. 54 or consent of instructor), 3 hrs. lect., 6 hrs. lab.)

II. Course Outline.

A. Lecture

1. Cell structure and organization
2. Chemical components of the cell
3. Biological energetics
4. Enzymes
5. Metabolic pathways
6. Synthesis of cellular components
7. Control mechanisms

B. Laboratory

Experiments will be done which provide the student with a basic understanding of some of the tools and techniques used in the study of cell metabolism. They will also be designed so that the student will better understand the scientific method and the experimental evidence for our knowledge of certain aspects of the cell. Graduate students will be required to do additional outside readings, submit a research paper and do an independent research project in the laboratory.

III. Supporting information.

It is the wish of the Biology Department to offer a graduate course in cell metabolism which will also be open to undergraduates. At the present time no course is offered which adequately prepares students in an understanding of the basic metabolic activities of the cell, the structure which forms the very basis of biology. This course will provide a basis for understanding the metabolism of the cell and some background in the methods used in the study of metabolism. A better knowledge of biology at the cellular level, we feel, is essential for an appreciation of biology as a whole.

IV. Instructor.

George E. Ahlgren

C. C. No. 40G
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request to change a course number from undergraduate to graduate.
Change Zool. 72 to number 172.

I. Catalog description.

Zoology 172. Ecology of Animal Populations. Concepts of population structure, growth, competition, predator-prey relationship, life tables and sampling; review of current literature. (3 cr; prereq. Biology 50 and #; 3 hrs. lect.).

II. Course Outline.

Concepts in ecology.
Methods of describing Theory & inferences in sampling.
Distribution of organisms in nature, and in laboratory populations.
Testing for pattern of distribution.
Limitations of different techniques employed in sampling of populations.
Factors involved in dispersal
Dispersal of organisms
Limiting factors
 Physical
 Other organisms
 interspecific & intraspecific competition
 parasite-prey relationship
 Other factors
Population growth
 Population structure
 Rate of natural increase
 Life tables
 Equilibrium, Fluctuation, Oscillation, Decline

III. Supporting information.

Course is being raised to graduate level because the nature of the material covered makes it more appropriate at this level. Actually, the course content will be raised and a prerequisite of a jr.-sr. course will be followed. The major source of reading will be from current journals. However, a text such as The Biology of Population by MacArthur & Connell will be used.

IV. Instructor.

B. O. Krogstad

C. C. No. 40 H

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request to add a new course as a companion laboratory course for
Zoology 172.

I. Catalog description.

Zool. 172A. Laboratory and field studies in animal populations.
(2 cr; prereq. concurrent registration in Zool. 172 or #; 4 hrs. lab).

II. Course Outline.

1. Physical measurements of Environment (1 session)
2. Sampling Techniques in different types of environment and analysis of data (8 sessions)
3. Limiting Factors
Effect of temperature, density and food on populations (4 sessions)
4. Environmental Preference - dispersal (2 sessions)
5. Gene fixation in a laboration population (3 sessions)

III. Supporting information.

As an opportunity to obtain field and laboratory experience in working with populations and data analysis.

The laboratory exercises will be in mimeograph form and provided by the instructor. Some reliance will be made on literature, also.

IV. Instructor.

B. O. Krogstad

C. C. No. 40 I
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request for approval to add a new course to the graduate offerings
in Biology.

I. Catalog description.

Bot. 156. General Mycology. Life histories, ecology, physiology, morphogenetic studies, control and practical uses of the fungi (4 cr. 2 hr. lect., 4 hr. lab; prereq. Chem through Organic or Cell Biol. or equiv. Strongly recommend MicB. 53)

II. Course Outline.

Course content will include -

- 1.) Descriptions of life history and morphology of major groups of fungi. Specific examples will be covered in the following for phylogenetic purposes.
 - (a) Phylum: Myxomycophyta
Class: Myxomyceteae
Class: Plasmodiophoreae
 - (b) Phylum: Eumycophyta
Class: Phycomycetes
Class: Ascomycetes
Class: Basidiomycetes
Class: Deuteromycetes
- 2.) Physiology and Control
 - (a) Growth Requirements
 - (b) Ecology
 - (c) Industrial uses
 - (d) Fungi as food
 - (e) Pathogenic fungi
 - 1) Plant
 - 2) Human & other animal
 - (f) Fungi used for antibiotics and mind drugs

Miscellaneous subjects:

1. Aggregation in slime molds
2. Yeast-Mold dimorphism
3. Nematode trapping fungi
4. Bio-assay organisms
5. Genetics

Laboratory sessions will be developed to cover the following categories:

- (a) Morphology and life history
- (b) Methods of isolation from natural source
- (c) Physiology and Genetics
- (d) Morphogenetical studies
- (e) Independent projects

III. Supporting information.

This course adds a basic area in the proposed graduate program in Biology.

There is no one text preference at this time. Reference texts and journals will be utilized.

IV. Instructor.

Staff

C. C. No. 40 J
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request for approval to add a new course to the graduate offerings
in Biology.

I. Catalog description.

Zoology 155. Animal behavior. Description of the known behavior of the various vertebrate and invertebrate phyla with emphasis on adaptive significance and the genetics and ontogeny of behavioral patterns. Special attention will be focused on mating, aggressive, nutritive, and nurturing behavior. Behavior related to ecology of animal populations will be presented. (3 cr.; prereq. Biol 1, A; 3 hrs. lect.)

II. Course Outline.

- A. Introduction of behavior categories (vocabulary)
- B. The development of behavior (critical periods and imprinting).
- C. Communication and orientation
- D. Social behavior, ethology and evolution
- E. Neural, hormonal and chemical control of behavior
- F. Behavior and Animal populations

III. Supporting information.

Reasons for adding the course:

This course is to be offered as a part of the proposed Master's program in the department of biology. Advanced undergraduates as well as graduate students could be expected to use this course. The graduate students would be required to do a research paper.

Behavior studies of infrahuman animals has had a great influence on interpretation in modern psychology. This course will contribute to the interdisciplinary approach to higher education. Students of social sciences as well as biological sciences could benefit from this course.

IV. Instructor

H. L. Collins

C. C. No. 40 X
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request for approval to add a new course to the graduate offerings in Biology.

I. Catalog description.

Zoology 155A. Animal Behavior. Laboratory analysis of animal behavior. Student projects will be assigned for demonstration of behavior principles to the class. (2 cr.; prereq. Biol. 1, A and concurrent or prior registration in 155A; 4 hrs. lab).

II. Course Outline

- A. Use of various species of animals to illustrate behavioral patterns. An emphasis on adaptive significance. Some of the demonstrations will be made by projects developed by the students.
- B. Movies will be used when necessary.

III. Supporting information.

This course is to be offered as part of the biology department's proposed Master's program. This course would be a continuation of Zoology 155B for the specialized student. It will offer training in planning and systematically completing a research project to be presented for the class.

IV. Instructor

H. L. Collins

C. C. No. 40 L

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Add a graduate course

I. Catalog description

Zoology 132. Ecology of Birds. Relationships of birds to their environment. Individual and group field and laboratory studies with an introduction to specific ornithological techniques. (4 cred.; prereq. Zool. 63, or equiv., 2 hrs. lect., 4 hrs. lab.)

II. Course Outline.

1. Ornithological Speciation
 - A. Morphological Taxonomy
 - B. The New Systematics
 - C. Paleontological Evidence
 - D. Avian Distribution
 - E. Presentation of findings
2. Avian Communities
 - A. Population dispersal
 - B. Inter- and Intra population relationships
 - C. The basis of Natural Selection
 - D. Social Behavior
 - E. Functions of plumages and plumage succession.
3. Flight
 - A. Origin
 - B. Aerodynamical Principles
 - C. Adaptation to Meteorological and Geographical Conditions
4. Techniques used in Ecological Studies.

III. Supporting information.

The course, built upon the basic biology and identification of an introductory course, will provide an opportunity to use this knowledge to study the relationship of a particular vertebrate population to its environment. The location of U.M.D. makes this course quite apt, because of the variety of bird habitat so accessible to the campus. The course also provides the additional ornithological background needed to continue further in the field.

Text materials - a series of paperbacks dealing with specific topics such as Tinbergius "Social Behavior in Animals", Laek's "Darwins Finches", Mayr's "Systematics and the Origin of Species", etc. It will be assumed

that the student will have retained a suitable ornithological text from his beginning course.

Pettingill's Laboratory Manual will be required.

IV. Instructor.

Pershing B. Hofslund

C. C. No. 40 M
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curricular Committee

From: Biology Department

Subject: Add a Graduate Course

I. Catalog description

Zool. 128 Experimental Embryology. Physiology and morphogenesis of germ cells; parthenogenesis; marking and grafting experiments on living embryos; tissue culture. (5 cr; prereq. Zool. 52, 53 and 5 cr. in Organic Chemistry; 3 hrs. lect. 6 hrs. lab.)

II. Course Outline

A. Lecture

1. Morphogenesis of gametes
2. Experimental analysis of sea-urchin development
3. Experimental analysis of annelid and mollusc development
4. Experimental embryology of insects
5. Experimental embryology of Ascidians
6. Interacting substances of eggs & sperm
7. Activation of the egg. Structural and biochemical changes.
8. Artificial parthenogenesis
9. Nucleus and cytoplasm in early development; cell division
10. Effects of genotype in early development
11. Morphogenetic potentialities in the blastoderm
12. Morphogenetic movements in gastrulation
13. Chemistry and metabolism of the gastrula
14. Experimental analysis of inductive systems
15. Differentiation in the later embryo
16. Regeneration

B. Laboratory

1. Oogenesis
2. Fertilization and cleavage in the frog
3. Hybridization
4. Artificial parthenogenesis
5. Effect of centrifugation on development
6. Role of lithium in the production of abnormalities in the embryo
7. Parabiosis
8. Extirpation experiments
9. Regeneration experiments with Planaria and frog.
10. Induction

III. Supporting Information.

Reasons for adding the course. To strengthen the offering in the field of experimental embryology at the graduate level.

Text: Waddington; Principles of Embryology Manual: Hamburger: A
Manual of Experimental Embryology.

IV. Instructor.

Rolf Huff

C. C. No. 40 N

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Request for approval to drop the current course, Biology 80, Limnology, which would be replaced by Biology 180 Limnology.

I. Catalog description.

Biology 180 Limnology. Biological, Chemical, and Physical aspects of lakes and streams. Extensive laboratory and field analysis of the ecological relationships between aquatic organisms and their environment. (4 cr.; prereq. general chemistry, Biol. 1, 2, Bot 54 or Zool. 73; 2 hrs. lect., 4 hrs. lab.)

II. Course Outline.

- A. Origins (lakes, ponds, streams, etc.)
- B. Physical aspects (thermal relations, solar relations, water movements, etc.)
- C. Chemical aspects (dissolved gases and solids in natural waters).
- D. Animal and plant inhabitants of inland waters. (aquatic populations and aquatic communities).
- E. Water pollution and abatement.

Laboratory will be a comparative study (based on field trips) of type lakes, ponds and streams with respect to the above outline.

III. Supporting information.

This course is to be offered as part of the proposed Master's program in the department of biology. Limnology is a harmonious mixture of chemical, physical and biological sciences. It gives the student of biology an opportunity to apply physical and chemical methods in a quantitative approach to aquatic biology. Studies in limnology create an understanding of the complexities and values in aquatic systems.

IV. Instructor.

H. L. Collins

C. C. No. 40-0
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Add a new course at the graduate level

I. Catalog description

Botany 150. Plant Ecology. Plant-environment relationships; local and North American communities; succession; abiotic factors and their measurement. (5 cr; prereq. General Chemistry, one quarter College Math., Plant Taxonomy, Plant Physiology, Biol. 50; 3 hrs. lect., 4 hrs. lab.)

II. Outline of course:

1. Introduction to the field of ecology
2. Succession and the Climax concept. Formations & associations
Monoclimax or polyclimax
3. Vegetational Analysis
 - a.) Communities and their analysis
 - b.) Continuous studies
 - c.) Gradient analysis
4. Vegetation of North America - rapid survey
5. The Soil factor
 - a.) Pedogenesis, profiles, and the soil groups
 - b.) Edaphology
 - 1) mechanical analysis
 - 2) soil moisture and aeration
 - 3) nutrients and pH
 - 4) organic matter
 - 5) ectocrine substances
6. Atmospheric factors
 - a.) Composition of the air.
 - b.) Vapor pressure deficit
 - c.) Precipitation, runoff, dew etc.
 - d.) wind
7. Radiation
 - A. Review of electromagnetic radiation

- B. The Light Factor
 - 1.) intensity
 - 2.) quality
 - 3.) duration
 - 4.) effects on plant behavior
- C. Temperature
 - 1.) extremes
 - 2.) regimes
 - 3.) effects on plant behavior
- 8. The Ecosystem approach
 - 1.) nutrient cycling
 - 2.) trophic levels, energy flow
- 9. Genecology - genotypes, phenotypes, biotypes, ecotypes
- 10. Radioecology - brief summary of what has been done
- 11. Ecology and human society

Laboratory. Though this will not be set apart as a separate time, some of the laboratory type activities follow:

- 1. field trips to local communities
- 2. calculation of community constants from data. i.e. density, frequency, dominance, importance value.
- 3. demonstration and/or use of apparatus for study of
 - a.) Soil
 - I.) Bonyoucos method
 - II.) Separation of sands
 - III.) Coleman block moisture determination
 - IV.) Organic matter determination
 - V.) pH determination: colorimetric and electric
 - b.) light
 - I.) Photometer
 - c.) temperature
 - I.) Max.-mins. Weather Bureau & Six's types
 - II.) hygrothermograph
 - III.) telethermometer and recorder
 - d.) atmospheric moisture
 - I.) psychrometer
 - II.) hygrothermograph
 - III.) Livingston atmometer

III. Supporting information.

The ecological approach to biology is strongly emphasized in the department. This course will expand the material given at the undergraduate level.

IV. Instructor.

Edward Flaccus

C. C. No. 40 P
Departmental Approval 4-3-67
Division Approval 4-28-67
C. C. Approval _____

To: Curriculum Committee

From: Biology Department

Subject: Add a new course at the graduate level

I. Catalog description.

Zoology 164. Fish biology - Biology of fish populations; Analysis of problems concerned with commercial and sport fisheries and their management. Laboratory analysis of methods for studying fish growth, food habits, population estimation and mortality rates. Field trips.
(4 cr.; prereq. Zool 64; 2 hrs. lect., 4 hrs. lab.)

II. Course Outline.

Lecture:

- A. Distribution
- B. Food and feeding
- C. Factors influencing reproduction and embryology
- D. Age and growth
- E. Fish populations
- F. Fish Pathology
- G. Fish culture
- H. Fish management

Laboratory:

- A. Collecting
- B. Age and growth analysis
- C. Food habit analysis
- D. Field Population techniques

Laboratory Report required of graduate students.

The report will be written according to the instructions to authors as found in current issues of Transactions of American Fisheries Society, except in matters of typing, underscoring, etc.

III. Supporting information.

This course is to be offered as a part of the proposed Master's program in the department of biology. The location of our campus is unique with respect to water availability and aquatic biology interests. The presence of state and federal research teams on Lake Superior and inland lakes and streams of this region provides an excellent opportunity for contact with aquatic investigations.

The course is to be taught from journals. A laboratory report is to be required of graduate students. The report will be designed as a publication for practice in scientific writing.

IV. Instructor.

H. L. Collins

C. C. No. 40 Q

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Department of Biology

Subject: Request for approval to add a graduate course to the
Biology curriculum

I. Catalog Description

Biol 101 f, w, s. Basic Botany and Zoology. To enable students to make up certain deficiencies in background course work. (1-9 cr; prereq. Biol 1,A, 2,B and Δ) Staff

C. C. No. 40 R

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Department of Biology

Subject: Request for approval to add a graduate course to the Biology curriculum

I. Catalog Description

Biol 298 f, w, s. Graduate Seminar. Reports on recent developments in biology and on research projects in the department. (1-3 cr; pre-req. Δ).

C. C. No. 405

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Department of Biology

Subject: Request for approval to add a graduate course to the Biology curriculum

I. Catalog Description

Zool 299 f, w, s. Graduate Research. (cr. ar; prereq. #)

C. C. No. 40 J

Departmental Approval 4-3-67

Division Approval 4-28-67

C. C. Approval _____

To: Curriculum Committee

From: Department of Biology

Subject: Request for approval to add a graduate course to the Biology curriculum

I. Catalog Description

Bot. 299 f, w, s. Graduate Research. (cr. ar; prereq. #).

Thank you
Shiley

Life Sciences Group Committee Meeting
(Agriculture-Biology)
June 1, 1967

Minutes taken by Mrs. McDonald

- ✓ 1. Proposed M.S. with major in Zoology (Plan A) at Duluth
Proposed M.S. with major in Botany (Plan B)

It was suggested that the Graduate Faculty in the departments of the behavioral, biological, and ecological areas on the Twin City Campuses review these proposals. It might be best to request additional information, in the way of sample or typical graduate programs showing the structure of the major and minor. It was suggested that the zoologists, botanists, and others get together and have a group review rather than prolong the decision over a long period.

It was agreed that the Duluth Graduate Faculty members in these areas (currently A-1 and A-2 status) be nominated for the A-3 status and that they assume the responsibility for defending or revising the proposals. During the discussion it was brought out that the Duluth area has certain facilities not available in the Twin City area, and conceivably Twin City students in these majors might carry on some activity in the Duluth area too.

Questions were raised about the Duluth majors - review of applications, programs, Graduate Faculty nominations and the like. It was made clear that Duluth is a part of the University of Minnesota, separated only geographically. All applications for admission to the Graduate School are reviewed and acted upon by the Graduate School. Student programs, petitions, Graduate Faculty nominations, and 200 level course approvals are considered by the appropriate graduate group committees. At least two of the group committees (Education and Language, Literature, and Art) have Duluth representatives who attend meetings and collaborate with the Twin City members on group committee matters. Physical Sciences may soon add a Duluth member. While geographical limitations exist the possibility of assigning a Duluth member to a Twin City student's examining committee (and vice versa) is being considered. (This has actually occurred in a few instances).

While department heads normally nominate an individual to the Graduate Faculty, this privilege is not restricted to them, nor to full members (B) of the Graduate Faculty. Also as Duluth majors are proposed, their counterparts in the Twin Cities are consulted.

2. Proposed Combination of the Agriculture and Biological Sciences Group Committees

These two group committees have been meeting jointly for several months and have considered a possibility of combining in the future. While no definite conclusion has been reached at this point, the experience has been rewarding. There are

These faculty
recommendations
are in & to be
considered by
of Biol G.C.S.
10/30/67

problems, of course, and these include the numbers of members (for too large a group can be unwieldy) and the possible overloading of a chairman who must take final action, assign examining committees, refer special problems to the Graduate School and the like.

A suggestion that these two committees be labeled Life Sciences Group Committee with a chairman and co-chairman (who would rotate in position) continue for a time. As the committees now stand, two members are concluding terms of service and some overlap in areas covered does exist so that the membership could be reduced rather easily.

(It was mentioned that someday, the possibility of including some of the basic sciences - now in the Medical Group Committee - might be considered.)

NOTE: At the Executive Committee meeting, it was decided that the two Group Committees would continue to meet together under the label of Life Sciences Group Committee, but with a chairman for Agriculture and a chairman for Biological Sciences. The Graduate School would still retain its basic 7 group committees, but these two groups would meet jointly and under one label.

SMED
with Dal. Biol.
MS Proposal

Name	Present Rank (Yr-PhD)	Publications				Grad.Sch. Advising Experience	Grad.Sch. Teaching	Present Grad.Sch. Status	Proposed Grad.Sch. Status	Recommendation
		# Sci. J.Pub.	Year of Last Pub.	# in Other Journals	# Abs.					
Odlaug, T.O.	Prof.Head (1940)	5	1966	3	4	7 PhD with Dr.Olson	Zoo.146	A-3	B	
Krogstad, B.O.	Prof. (1951)		1965	5			Nat.Sci. 101	A-2	A-3	
Carlson, J.B.	Prof. (1953)		1954	1				A-2	A-3	
Monson, P.H.	Assoc.Prof. (1958)		1960	4			Bot.112,113 115	A-2	A-3	
Flaccus, E.	Assoc.Prof. (1959)	3	1965	2				A-2	A-3	
Hofslund, P.B.	Prof. (1954)	(?)	1966	20					A-3	
Collins, H.L.	Asst.Prof. (1965)		1962	1					A-3	
Ahlgren, G.E.	Asst.Prof. (1966)	2	1965	3		Biol.151, 151A,135		A-3		
Fluegel, W.	Asst.Prof. (MS-55)	4	1965	1				A-3		

Name	Current Status	Field	New appointment in			New Status
			Biology	Botany	Zoology	
Odlaug, Theron	A-2	Zoology	XX		XX	^{revised request} A-3
Krogstad, Blanchard	A-2	Zoology	XX		XX	A-3 ✓
Flaccus, Edward	A-2	Botany	XX	XX		A-3 ✓
Monson, Paul H.	A-2	Botany	XX	XX		A-3 ✓
Carlson, John B.	A-2	Botany	XX	XX		A-3 ✓
Hofslund, Pershing	-	-	XX		XX	A-3 ✓
Collins, Hollie Lee	-	-	XX		XX	A-3 ²
Ahlgren, George E.	-	-	XX	XX		A-3 ²
Fluegel, Walter	-	-	XX	XX		A-3 ¹
Huff, Rolf E		Zoology			XX	A-3 JWS 1/12/68

I've enclosed new cards for Odlaug, Krogstad, Flaccus, Monson, and Carlson, for they should be signed by the nominator, so if you want to fill in the above information on the cards, you will not have to put it on this sheet.

ADDENDUM TO PROPOSAL TO ESTABLISH A MASTER OF SCIENCE PROGRAM
IN THE BIOLOGICAL SCIENCES ON THE DULUTH CAMPUS

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Facilities and equipment available	3
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Facilities and equipment available	4
(c) Plan A - Plant Taxonomy	5,6
(d) Plan A - Plant Ecology	7
(e) Plan A - Animal Ecology	8
Facilities and equipment available	8,9
(f) Plan A - Physiology	10
Equipment available	10
(g) Plan B - Biology	11
(h) Plan B - Biology for high school teachers	12
Facilities and equipment available	12,13

SOURCES OF FUNDS FOR RESEARCH EQUIPMENT

Application for funds for equipment, both outright grants and matching-funds grants, will be made from the following agencies:

National Science Foundation
National Institutes of Health
Atomic Energy Commission
Water Resources Research Center (University of Minnesota)
Graduate School (University of Minnesota)

The Department of Biology has received two matching-funds grants from the Instructional Scientific Equipment Program (Undergraduate) of the National Science Foundation. The Lake Superior Limnological Research Station (Lakeside Laboratory) is presently operating with equipment funds received from the Department of the Interior and the Water Resources Research Center.

FACULTY TIME INVOLVED IN A GRADUATE PROGRAM

With an average teaching load of 11-12 contact hours per week at the undergraduate level, plus a heavy load of advisees (40-65), time to administer a Master's program and to carry on research activity must be found by utilizing one or more of the following:

1. Single-Quarter Leave
2. Teaching Upper Division courses normally scheduled for two quarters in one quarter in order to leave a quarter free for research
3. Employment of additional staff
4. The use of Teaching Assistants to carry freshman laboratory sections which are now the responsibility of the senior faculty

**SUGGESTED PROGRAM OF COURSE WORK FOR STUDENTS INTERESTED IN
A MASTER'S DEGREE (PLAN A) WITH A MAJOR IN LIMNOLOGY**

		<u>MAJOR</u>	<u>MINOR</u>
	Biology 180 Limnology	4	
	Zoology 164 Fish Biology	4	
	Public Health 233 Water Quality Investigations & Research Techniques	6	
DULUTH	Public Health 234 Water Quality Research	6	
	Biology 298 Seminar	3	
ITASCA	Botany 152 Ecology of Freshwater Algae		5
	Botany 155 Freshwater Algae		5
	(or)		
ITASCA	Entomology 124 Biology of Immature Insects		5
	Entomology 128 Aquatic Entomology		5
	(or)		
DULUTH	Geology 140 Sedimentation		5
	Geology 175 Glacial Geology		5
	Total	23	10

FACILITIES & EQUIPMENT AVAILABLE FOR USE IN LIMNOLOGY

FACILITIES

Lakeside Laboratory
Two research vessels, 27' and 30'
Two 14' dinghys with outboard motors
Two 8' prams

EQUIPMENT (Partial Listing)

Whitney Underwater Daylight Meter
YSI Thermistemp Telethermometer with probes
Unitron Inverted Microscope
Bathythermographs
Bathykymograph
Reversing Thermometers
Mansen Water Bottles
Kennerly Samplers
Weston Light Meter
Submarine Photometer
YSI Kettering Radiometer and Recorder
Recording Fathometers
Gurley Current Meter
High Speed Plankton Samplers
Continuous Plankton Recorders
Clarke-Bumpus Plankton Nets
Wisconsin Plankton Nets
Power Winches
B.O.D. and Microbiological Incubators
Autoclaves
SCUBA Diving Gear
Bottom Corers and Dredges
Underwater Camera
Foerst Centrifuges
Picker Scintillation Counter
Gilson Photosynthetic Respirometer
DK-2A Ratio-Recording Spectrophotometer
Kjeldahl Nitrogen Units
Phase-contrast microscopes

COOPERATING AGENCIES

National Water Quality Standards Laboratory

The ore carriers, **CASON J. CALLAWAY** and **SEWELL AVERY** of United States Steel's Pittsburgh Fleet to tow continuous plankton recorders through Lake Superior and Lake Michigan to obtain plankton samples and water samples for productivity studies.

**TYPICAL PROGRAM FOR M. S. CANDIDATE
(PLAN A) WITH MAJOR INTEREST IN PLANT TAXONOMY**

Major - Botany

Bot. 118	Adv. plant taxonomy	4 cr.
Bot. 150	Plant Ecology	5 cr.
Bot. 153	Plant Anatomy	5 cr.
Biol. 298	Seminar	2 cr.
Bot. 116	Summer Flora of Minnesota (to be taken at Itasca Biol. station)	5 cr.

Total 21 cr.

Minor - Zoology

Zool. 172a	Ecol. of Animal Populations	3 cr.
Zool. 172b	Ecol. of Animal Populations Lab.	2 cr.
Biol. 180	Lismology	4 cr.

Total 9 cr.

Collateral Field

Math. 67-68-69	Computer programming	3 cr. each
-to be taken in lieu of foreign language		

Total 9 cr.

Student proposes a research program centering on the problems of the taxonomy and distribution of the genus Carex as it occurs in the acid bogs and bog lakes of Northern Minnesota.

Major equipment and facilities available to this student:

- Olga Lakeia Herbarium (UMD) with over 33,000 accessions.
- Univ. of Minn. Herbarium (Mpls.) with nearly 600,000 accessions.
- Complete plant collecting, drying and mounting facilities.
- Small boats with trailer and motor.
- Research microscopes and ample work space in the herbarium.
- Greenhouse and plant growth chambers for studies requiring controlled environment.

**TYPICAL PROGRAM FOR M. S. CANDIDATE
(PLAN A) WITH MAJOR INTEREST IN PLANT TAXONOMY**

Major - Botany

Bot. 118	Adv. Plant Taxonomy	4 cr.
Bot. 118	General Cytology	5 cr.
	-to be taken on Mpls. campus	
Bot. 125	Morphogenesis	5 cr.
	-to be taken on Mpls. campus	
Bot. 150	Plant Ecology	5 cr.
Biol. 101	Basic Botany and Zoology	2 cr.
	-to remedy a deficiency in Genetics	
Biol. 171	Evolution	3 cr.
Biol. 298	Seminar	2 cr.
	<u>Total</u>	26 cr.

Minor - Chemistry

Chem. 103	Qualitative Organic Anal.	(3)cr.
BioC 141	General biochemistry	3 cr.
BioC 145	General biochemistry lab	3 cr.
	-BioC to be taken on St. Paul campus	
	<u>Total</u>	9 cr.

Student proposes research on the constancy of certain vegetative features which are used in the classification of species in the genus Potamogeton.

Major equipment and facilities:

As per preceding proposal plus:

Complete equipment for embedding, sectioning, and studying plant material.

**TYPICAL PROGRAM FOR M. S. CANDIDATE
(PLAN A) WITH MAJOR INTEREST IN PLANT TAXONOMY**

Major - Botany

Botany 118	Adv. plant taxonomy	4 cr.
Botany 153	Plant Anatomy	5 cr.
Botany 156	Mycology	3 cr.
Biol. 180	Limnology	4 cr.
Biol. 190	Biochemical genetics	3 cr.
Biol. 298	Seminar	2 cr.
	Total	21 cr.

Minor - Zoology

Zool. 123	Adv. Insect Biology	4 cr.
Zool. 172a	Ecol. of Animal Populations	3 cr.
Zool. 172b	Ecol. of Animal Populations Lab	2 cr.
Geology 175	Glacial Geology	5 cr.
	Total	14 cr.

SAMPLE M.S. PROGRAM PLAN A. BOTANY-ECOLOGY

Major - Botany

			<u>Credits</u>
Bot.	118	Advanced Plant Taxonomy	4
Bot.	150	Plant Ecology	5
Bot.	151a	Plant Physiology	3
Bot.	151b	Plant Physiology Lab.	2
Biol.	135	Cell Metabolism	<u>5</u>
			19

Minor - Zoology

Zoo.	172a	Ecology of Animal Populations	3
Zoo.	172b	Ecology of Animal Populations Lab	2
Zoo.	155a	Animal Behavior	3
Zoo.	155b	Animal Behavior Lab	<u>2</u>
			10

Correlated Fields

Forestry	158	Theory and Practice in Environmental Measurement (Itasca)	5
Geol.	175	Glacial Geology	<u>3</u>
			8

Research

Bot.	299	Problem in Plant Ecology - Thesis research	6
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EXAMPLE OF PROGRAM FOR M.S. IN ZOOLOGY (PLAN A) WITH MAJOR
INTEREST IN ECOLOGY

Major: Zoology

Zool 172, 172A	Ecology of Animal Populations	(5)
Zool 164	Fish Biology	(4)
Zool 155, 155A	Animal Behavior	(5)
Biol 298	Seminar	(3)
Biol 119	Limnology	(5)
(To be taken at University of Minnesota Biological Station, Lake Itasca, Minnesota)		
Total		22

Minor: Botany

Botany 150	Plant Ecology	(5)
Botany 151, 151A	Plant Physiology	<u>(5)</u>
Total		10

OR

Geology

Geol 175	Glacial Geology	(5)
Geol 145	Stratigraphy	<u>(5)</u>
Total		10

Available equipment related to area of ecology:

- Photometer
- Hygrothermographs
- Telethermometer
- Psychrometer
- Livingston Anemometer
- pH meters
- Laboratory recorder
- Calculating machines (2)
- 1620 computer
- Constant temperature rooms (2)
- Drying oven
- Muffle furnace
- Artificial stream equipment
- Limnological equipment (see area of limnology)
- Fish scale roller press
- Boats
- Bottom samplers
- Berlese funnel
- Use of N. E. Experiment Station facilities, Duluth
- Talmadge "40"- departmental natural history area nearby

INDEX

Apparatus

B. & L. Spectronic - 20 (Colorimeter-Spectrophotometer) - 3
Telethermometer - 11 channel thermistor
Infra-red gas analyser
Beckman DU Spectrophotometer (Chemistry)
Muffle furnace for ignition
Drying ovens
Chart recorders - 3
Soiltest Battery Soil Water Meter
Hygrothermographs - 3
Humidity meter, resistance type
Six Max-Min thermometers
Bouyoucos Soil hydrometers
Soil sieves
Rain gauge
Geologists type altimeter
Abney
Plane table (Engin.)
Pantograph
Fluorimeter
6" base optical range finder
anemometer

Facilities available

Greenhouse
Ecology Research Lab
Northest Experiment Station
Talmaege R. "40"
University of Minnesota Lake Laboratory
Cloquet Forest

**M.S. IN BIOLOGY (PLAN A) WITH MAJOR INTEREST
IN PHYSIOLOGY**

Major: Biology

Bot 153	Plant Anatomy	(5)
or		
Zool 101	Histology	
Bot 151	Plant Physiology	(3)
Bot 151A	Plant Physiology Lab	(2)
Biol 135	Cell Metabolism	(5)
Biol 298	Seminar	(2)
Biol 110	General Physiology	(3)
BioChem 141	Carbohydrate, Lipids, Proteins and Nucleic Acids	(3)
To be taken on Minneapolis and St. Paul Campus		
		23
Total		

Minor: Chemistry

Chem 140-141-142	Physical Chemistry	12
OR		
Organic Chem. choose from 103, 111, 112, 113, 114, 115		

Available equipment relative to areas of physiology:

pH meters, research quality (2)
 Refrigerated centrifuge
 Warburg respirometer
 Colorimeter-spectrophotometer
 Infra-red gas analyzer
 Scintillometer
 Radio-isotope detector & counter
 Chromatographic equipment, paper and thin layer
 Germinators
 Incubators
 Balances, triple beam torsion and analytical
 Mixers, vortex and Waring
 Laboratory recorder
 Electronic kymograph
 Water baths
 Refrigerators, freezers
 Constant temperature rooms
 Muffle oven
 Drying oven

TYPICAL PROGRAM FOR M. S. CANDIDATE
(PLAN B) WITH MAJOR INTEREST IN BIOLOGY

Major - Biology

*Biol.	171	Evolution	3 cr.
*Biol.	180	Limnology	4 cr.
Biol.	298	Seminar	3 cr.
*Bot.	151a	Plant physiology	3 cr.
*Bot.	151b	Plant physiology lab.	2 cr.
Bot.	116	Summer flora of Minnesota	5 cr.

-(to be taken at Itasca Biological Station)

Three papers in starred courses 9 cr.

Total 29 cr.

Collateral Field - Zoology

Zool.	115	Adv. natural history of invertebrates and fishes	5 cr.
- (to be taken at Itasca Biological Station)			
*Zool.	155a	Animal behavior	3 cr.
*Zool.	155b	Animal behavior lab.	<u>2 cr.</u>

Total 10 cr.

Collateral Field - Education

Ed CI	113	High School curriculum	3 cr.
Ed CI	184	Supervision of Student teaching	3 cr.

Supporting work

Ed. Psych	140	Instruments and techniques of measurement	<u>3 cr.</u>
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Total 9 cr.

PROGRAM TOTAL 48 credits

**SAMPLE PROGRAM: (PLAN B) MASTERS PROGRAM FOR A HIGH SCHOOL
BIOLOGY TEACHER WHO DESIRES TO STRENGTHEN HIS PREPARATION
FOR TEACHING B. S. C. S. GREEN VERSION HIGH SCHOOL BIOLOGY**

	<u>Course</u>	<u>Major Field</u>	<u>Cognate Field</u>
Biology 180	*Limnology	4	
Biology 171	*Evolution	3	
Biology 298	Seminar	3	
Zoology 132	*Ecology of Birds	3	
Zoology 155a	*Animal Behavior	3	
Zoology 155b	*Animal Behavior Laboratory	2	
Zoology 172a	*Ecology of Animal Populations	3	
Zoology 172b	*Ecology of Animal Populations Lab.	2	
Zoology 164	*Fish Biology	4	
Botany 116	Summer Flora of Minnesota		5 (Itasca)
Botany 138	Freshwater and Wetland Ecology		5 (Itasca)
Botany 150	*Plant Ecology		5
Earth Science 110	Earth Science for Teachers		3 (Geology)
*Plan B papers to be written in three of these courses		_____	<u>3</u>
Total Credits		27	27

If a graduate student would choose to write his papers for Ecology of Birds, Animal Behavior and Fish Biology, such materials and facilities would be available to him:

- Portable tape recorders
- 24" parabolic reflector
- 40" parabolic reflector
- 16 mm. Bolex Movie camera with zoom lens
- 35 mm. slide camera with separate lenses
- Bird blinds
- Spotting scopes
- Binoculars
- Bird Collection of over 1900 specimens representing 87 of the families listed in VanTyne and Berger
- Sound library of over 30 records and tapes dealing with bird sounds
- Seines, nets, etc. for fish collections
- Fish scale press
- Stream kits
- Various limnological sampling devices

Suitable habitats within 10 minute walk and ½-hour drives to cover such major habitats as city parks, major flyways, lake shore, river edge, deciduous forest, conifer forest, bog, sand dunes, cultivated fields, swamps, etc. and we are within two hour drives of three (federal, state, and private) refuges.

A research room and an aquarium room are available for setting up indoor studies, and renovation of the present greenhouse is contemplated for the provision of an aviary.

The department has a tract of forested (with a stream) land available for certain studies.

It is possible that a certain part of the Northeast Experiment Station will be available for our use, and that through cooperation, space and equipment of the Limnological Station and the Water Quality Lab might be available.

Should the program become effective, grants will be sought for the purchase of a sound analyzer, and for the setting up and use of a portable radar set.

SMD
FEB 14 1968

OFFICE OF THE DEAN

UNIVERSITY OF MINNESOTA, DULUTH
DIVISION OF SCIENCE AND MATHEMATICS · DEPARTMENT OF BIOLOGY
DULUTH, MINNESOTA 55812

Feb. 13, 1968

Dean Bryce Crawford, Jr.
Graduate School
University of Minnesota
321 Johnston Hall
University of Minnesota
Minneapolis, Minnesota

Dear Dean Crawford:

On December 26, 1967, Dr. Dwain Warner and Dr. C. M. Stowe, Co-Chairmen of the Life Science Group Committee addressed a letter to you with certain recommendations relative to the proposed Master's degree programs in Biology, Botany, and Zoology at Duluth. I wish to comment on each point in the order in which these points were made in the letter:

a. Reasons for request

- (1) To serve the need of students locally (e.g. teacher training)

Reference was made in the proposal that Plan B in Biology would provide a means whereby area high school teachers of Biology could avail themselves of the opportunity to take graduate work leading to a Master's degree. In addition, Plan B would enable those students, not necessarily teachers, an opportunity of obtaining a degree with a broader base in course work in the biological sciences than is normally possible under Plan A.

- (2) To provide a local source of trained people (e.g. teachers)

The department feels that students who obtain a Master's degree on the Duluth Campus will find employment opportunities not only in secondary teaching but at the Junior College level as well. In addition, those with the research experience provided for under Plan A might well consider a career in a number of fields such as those now developing at the National Water Quality Standards Laboratory here in Duluth.

- (3) To improve undergraduate opportunities for course enrichment

Generally, the graduate courses which we have proposed will be available to our junior and senior undergraduates. This will provide the means by which they may experience a greater in-depth approach to a number of areas in biology as well as an opportunity for more individual work.

(4) To attract and hold superior staff

We have had, for some time, a strong and competent faculty in biology and have been able to recruit and retain excellent people although we have been able to offer them contact only with an undergraduate program to date. It is certainly true that the existence of a graduate program in a department is a definite attraction to many staff members, particularly those in the younger age groups. Opportunity and time for research through reduced teaching loads, smaller classes, and financial support have definite appeal and these factors will be of great importance as we look for new faculty for the department in the future.

(5) To study more intensively the local environment

The area immediately around Duluth, and in many instances on the campus itself, provides a source of materials and opportunities for teaching and research that is outstanding. Field experience in limnology, animal and plant ecology, and plant taxonomy, for example, have been developed in such varied environments as Lake Superior and its North and South shore tributary streams, bogs, forest stands, and the like. These have already been used extensively for many years and will continue to be utilized to the fullest degree.

b. Facilities and staff presently available

(1) Staff description (including present course loads, current research activities, areas of research interest)

This information has already been submitted in the original proposal, in the pages attached to each nomination for graduate appointment of the faculty, and in supplementary data submitted to the Group Committee. Today, I have sent to Dr. Warner additional information having to do with teaching loads and committee responsibilities of the faculty of the Department of Biology.

(2) Teaching, research, and office space allocations in the new building.

Reference is made to this in the proposal. In addition, members of the Group Committee who met on the Duluth Campus at one of their regular meetings personally visited the facilities of the department and had the opportunity of a first-hand acquaintance with the teaching and research areas.

(3) Major equipment available

A list of major items of equipment was submitted with the proposal

(4) Field facilities

This was included in the proposal

(5) Interactions with other departments and outside groups

We expect a close association with other departments such as those of Chemistry and Geology. We would anticipate, for example, that most of our Master's candidates registered in Plan A would take a substantial amount of their work in chemistry since this bears directly on the modern trend toward a molecular approach to biology. We would hope that a Master's degree program in the Department of Geology emphasizing Pleistocene geology would utilize graduate offerings in the Biology Department which are relative and pertinent.

Opportunities for cooperation with the staff and use of special items of equipment at the National Water Quality Standards Laboratory will be utilized. These will include the possibility of faculty research appointments, summer research for students, and joint appointments between the Laboratory and the Biology Department.

(6) Special opportunities for graduate study and staff and student research in the Duluth region

Reference is made to this in the preceding section (5). There is an additional research and training outlet at the Lake Superior Limnological Research Station here in Duluth. This is an operation which Dr. Theodore A. Olson and I conduct as a training and research program in field operations and research techniques having to do with water quality investigations on Lake Superior. In addition to short-term trainees (one or two summer sessions) we presently have nine pre-doctoral students working in various areas.

This facility, which includes a lakeside laboratory, two fully equipped launches, and a great deal of excellent and modern research equipment, is available for use by qualified students and staff.

c. Sample curricula for each M.S. degree plan

This information has been submitted some time ago in the form of a supplement.

d. Vitae for proposed Graduate Faculty (more complete than previously supplied. Include copies of representative publications, previous grant support, covering letters of support, etc.)

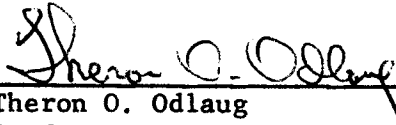
This information is covered in the original proposal and the supplement, together with the most recent material sent to Dr. Warner. A list of publications has been submitted previously but not the actual papers themselves--these can be sent to you.

Page #4

e. Needs of the proposed new program

I have requested Provost Darland to write to you in support of this point and he has agreed to do so.

Sincerely yours,



Theron O. Odlaug
Professor & Head

T00:ep

cc: Dr. Dwain W. Warner
Dr. C. M. Stowe
Dr. T. W. Chamberlin
Dr. R. W. Darland