Interdisciplinary study

The Graduate School provides for joint degrees. Members of the Mathematics Department are willing to work with members of intellectually compatible departments to design a plan of study for an interdisciplinary Ph.D. program suited to students with appropriate qualifications and ambition. There has been one joint Ph.D. in Mathematics and Chemical Engineering. There is a joint Ph.D. program in Mathematics and Philosophy that has become established— one student has completed the program, a second is approaching completion, and others are also pursuing the program.

Joint Ph.D. in Mathematics and Philosophy

1 Overview

Logic and the foundations of mathematics are ancient subjects that originated in a joint enterprise between ancient philosophy and mathematics. The fruitful interaction of these two disciplines has continued to characterize the development of logic and the foundations of mathematics throughout their long and rich histories. In keeping with this tradition, researchers in the Mathematics Department and the Philosophy Department at Notre Dame offer a joint Ph.D. in the general areas of logic and the foundations of mathematics.

Two basic principles govern the joint degree. The first is that it is a single, interdisciplinary degree rather than two separate degrees. The second is that it calls for a choice of emphasis. Each student designates one of the disciplines the primary and the other the secondary, with the curricular emphasis to be placed on the primary discipline. The description below is for students whose primary discipline is mathematics.

The joint program requires more by way of training than the ordinary Ph.D. in either of the participating departments. Since, however, it is a single degree and not two degrees, it does not require the sum of the ordinary degree requirements for both departments. While an ordinary Ph.D. in mathematics is normally completed within five years, six to seven years is a reasonable estimate for the joint degree.

2 Specific Description

2.1 Election of Primary and Secondary Departments

A student in the joint program, whose primary discipline is mathematics, will be admitted through the Mathematics Department, will do the majority of his/her work in that department and will derive the majority of his/her financial support from it. The student must also, in due course, apply and be admitted to the Philosophy Department for pursuit of the joint degree. Admission by the

Philosophy Department to the joint program signifies only admission to pursue the joint degree. It does not signify admission to pursue the regular Ph.D. in philosophy. Admission as a regular Ph.D. student in the Philosophy Department may, of course, be sought.

2.2   Advising

Each student in the joint degree program will have two advisors, one from the logic faculty of the primary department, the other from the logic faculty of the secondary department. Choice of advisors will be mainly the student's prerogative, though it should be approved by the Director of Graduate Studies in each department.

2.3   Course Work

Ph.D. students in mathematics are ordinarily required to take basic courses in four areas. Students in the joint program will be required to take only three, including logic and algebra. Which particular courses are to count as satisfying these requirements is a decision to be made by the Director of Graduate Studies in the Mathematics Department. Ordinary Ph.D. students in mathematics are required to take a total of 36 hours of basic and advanced courses. Students in the joint program are required to take 24. This will include at least one advanced course in logic and at least one advanced course in another area of mathematics.

Students in the joint program are also required to take 24 credit hours in the Philosophy Department—as compared with 46 for the usual philosophy Ph.D. The 24 credit hours include a minimum of twelve hours in topics in philosophical logic and the philosophy of mathematics. Ordinarily, at least nine of these will be from seminars in the Philosophy Department. Of the remaining twelve hours, at least six should be in courses designed to give the student broad historical training and training in that area of the history of philosophy in which he/she did not take the written candidacy examination. The others should be in areas outside logic and its contiguous areas (e.g. the philosophy of language and the history of analytic philosophy). The particular choice and distribution of all courses is to be approved by the philosophy advisor and the Director of Graduate Studies in the Philosophy Department.

2.4   Examinations

Regular Ph.D. students in mathematics take an oral candidacy examination in which they must demonstrate mastery of three basic areas of mathematics and one advanced topic. Students in the joint program, on their oral candidacy examination in mathematics, must demonstrate mastery of two basic areas of mathematics and one advanced topic, selected with the approval of the mathematics advisor and the Director of Graduate Studies in the Mathematics Department. Students in the joint program who wish to take the full

mathematics oral candidacy examination may do so. Regular Ph.D. students in mathematics must attempt the oral candidacy examination by January of the second year, and must pass it by the end of the second year. Students in the joint program follow the same schedule, passing the oral candidacy examination in mathematics by the end of the second year of graduate study. The examination committee will include the mathematics advisor, one other mathematician representing each basic area, and a fourth mathematician or philosopher.

On the philosophy side, students must pass one of the two written candidacy examinations in the history of philosophy, and they must do so by the end of the summer following their second year in the joint program or their third year of graduate studies (whichever they and their philosophy advisor choose). The choice of which of the written candidacy examinations a given student will take is determined by the Director of Graduate Studies in the Philosophy Department, in consultation with the student and the philosophy advisor. Regular Ph.D. students in philosophy are required to pass an oral candidacy examination prior to commencing work on their dissertations. Students in the joint program are not required to take an oral candidacy examination in philosophy.

2.5   Written Work Sample and Dissertation Proposal

Students in the philosophy Ph.D. are ordinarily required to submit a sample of written work in their fifth semester. Students in the joint program will submit their sample of written work no later than the fifth semester. This sample is to be evaluated using the usual standards. Following satisfactory completion of examinations and written work samples, students should submit a written dissertation proposal to be evaluated and approved by the philosophy advisor. The exact time of submission of this proposal should be a matter of mutual agreement between the philosophy advisor and the Director of Graduate Studies in the Philosophy Department. The Graduate School requires, however, that students have their dissertation proposals approved by no later than their eighth semester of graduate studies.

2.6   Dissertation

Since the program yields a single degree, there is just one dissertation. The dissertation may, however, be divided into distinct parts. It will be co-directed by the advisor from the primary department and the advisor from the secondary department. It should have both significant mathematical and significant philosophical content and should be of such quality as to be suitable for publication in a good professional journal. Approval by both advisors is required for acceptance of the dissertation. The examination committee for dissertations will consist of the two co-advisors plus three additional members—two named by the Mathematics Department, one named by the Philosophy Department.

2.7 Evaluations of fitness to continue

Ordinarily, the Philosophy Department makes two determinations of fitness to continue in its Ph.D. program. One follows initial course-taking and evaluation of the written work sample. The other follows completion of the written candidacy exams. Progress decisions for students in the joint program are made according to a different schedule and on somewhat different grounds. One would follow completion of five or six graduate courses in philosophy and evaluation of the written work sample. In exceptional cases, the philosophy advisor, in consultation with the Director of Graduate Studies in Philosophy, might petition for a change in this schedule.

The other evaluation follows completion of (i) the portion of the written candidacy examination in philosophy for which the student sits, and (ii) completion of a significant portion of the course work and/or examinations in the Mathematics Department. In exceptional cases, the mathematics advisor, in consultation with the Director of Graduate Studies in Mathematics, might petition for a change in this schedule. The philosophy advisor should decide the order in which these two evaluations are to proceed. Deviations from the pattern described above may be necessary in some cases, and then an alternative scheme should be determined by joint consultation between the philosophy advisor and the Director of Graduate Studies in Philosophy.

In the Mathematics Department, the number and timing of determinations of fitness to continue in the joint program should be made by joint agreement of the mathematics advisor and the Director of Graduate Studies in the Mathematics Department. So, too, should the specific qualifications to be taken as evidence for such fitness.

3 Financial Support

As mentioned above, it is reasonable to expect the joint degree to require six to seven years for completion. Assuming a six-year model, with good progress on the part of the student, the primary department would provide support for five of those years, and the secondary department for one. In addition, the secondary department would provide whatever summer support is customary for students preparing for its candidacy examinations. For a student whose primary discipline is mathematics, the exact form of the secondary support (e.g. stipend for teaching, or fellowship) will be determined by the Director of Graduate Studies in the Philosophy Department, in consultation with the philosophy advisor.