Scholarship in the Department of Mathematics

Mathematics Department Mission Statement

The mathematics department at Seattle Pacific University seeks to provide excellent instruction to enable our students to be competent in the mathematics required for their chosen fields, and to share our expertise with the community through service and leadership.

Part 1: The Types of Scholarship:

The Department of Mathematics includes faculty and courses that fit into two broad fields: Mathematics and Mathematics Education. Within the field of Mathematics, some faculty members are involved in Pure Mathematics while other faculty members are involved in Statistics or Applied Mathematics. The department values scholarship on the part of its faculty; however, the types of scholarship and the kinds of public scholarly products are distinctly different for faculty in each of these fields and/or areas of emphasis.

Context

Traditional scholarship in mathematics involves proving new mathematical theorems. It can literally take years of full-time work to attempt to prove a single theorem that may in the end not be solvable. Consequently, most new discoveries and publications come from researchers who are associated with full-time research programs at major research universities. In November, 2002, the Society for Industrial and Applied Mathematics journal, *SIAM News*, reported that of those mathematicians who are published, 42.7% have only one publication and the median number of publications is two. The data includes publications in journals in the mathematical sciences since 1940 and does not address the fact that many academic mathematicians have no publications at all. It is particularly difficult for pure mathematicians at non-research institutions to become published. Although it is desirable to have faculty involved in pure mathematics with publications, it is likely that many pure mathematicians will have only their dissertation results published. Applied mathematics, statistics, and mathematics education are fundamentally different fields from pure mathematics.

The four types of scholarship as defined in the *Faculty Employment Handbook* are described below as related to the varying fields within the department.

1. Scholarship of Discovery

a. <u>In the area of Pure Mathematics,</u> scholarship of discovery involves original research which means proving new mathematical theorems*. Research results are directed to faculty within the academy and to mathematicians and associated scientific professionals outside the academy.*

b. In the areas of Statistics and Applied Mathematics, scholarship of discovery involves original research which again means proving new theorems or developing new methodologies. *Research results are directed to faculty within the academy and to mathematicians and associated scientific professionals outside the academy.*

c. In the area of Mathematics Education, scholarship of discovery involves original research that contributes and adds to the general knowledge and skill base of the mathematics education profession. *For example, research could be conducted regarding cultural and sociological factors that positively or negatively impact mathematics achievement. Research results are directed to both mathematics education and general education faculty within the academy, to mathematics teachers in K-12 settings, and to policy makers.*

2. Scholarship of Teaching

a. In the area of Pure Mathematics, scholarship of teaching involves sustained inquiry into instructional practices in and student learning of mathematics content of college courses that focus on mathematics. *For example, different methods of teaching a particular topic in calculus could be investigated to determine which is more effective. Research results are directed to mathematics faculty in colleges and universities.*

b. In the areas of Statistics and Applied Mathematics (as with Pure Mathematics), scholarship of teaching involves sustained inquiry into instructional practices in and student learning of mathematics content of college courses that focus on statistics or applied mathematics. *For example, different methods of teaching a particular topic in statistics could be investigated to determine which is more effective. Research results are directed to mathematics faculty in colleges and universities.*

c. In the area of Mathematics Education, scholarship of teaching involves sustained inquiry into instructional practices in and student learning of 1) mathematics content both at the K-12 and college levels and 2) mathematics education methods for both pre-service and in-service teachers. *For example, different methods of teaching probability in the elementary grades could be investigated to determine which is more effective. Research results are directed to mathematics faculty in colleges and universities and to mathematics educators.*

3. Scholarship of Application

a. In the area of Pure Mathematics, professors are not involved in the scholarship of application.

b. In the areas of Statistics and Applied Mathematics, scholarship of application involves using one's expertise to address problems which arise in other fields. This type of scholarship usually occurs in the context of

consultation to researchers in other fields, either in the academy or in industry. *For an academic example, statistical support could be given to studies or research in other disciplines. The results would be directed to professionals within the discipline being served. An industrial example would be an applied mathematician providing support to an engineering team developing a new product. For proprietary reasons, the target audience for such results would necessarily be limited.*

c. In the area of Mathematics Education, scholarship of application involves applying a known concept, instructional strategy or educational model for the improvement of 1) teaching mathematics at the K-12 grade levels or 2) teaching mathematics content or mathematics methods to pre-service and in-service teachers. *For example, the National Council of Teachers of Mathematics' model of five process standards could be incorporated into an instructional resource book for elementary school teachers. The applications are directed to mathematics education faculty and to K-12 mathematics educators.*

4. Scholarship of Synthesis

a. In the area of Pure Mathematics, scholarship of synthesis involves reworking (whether for clarification or consolidation) an existing theory, exploring connections between topics within the area of pure mathematics, or investigating implications that results in pure mathematics have for other disciplines. *For example, one could explore the epistemological implications of the incompleteness theorems of mathematical logic. The results could be directed to mathematics faculty and to faculty in the related fields.*

b. In the areas of Statistics and Applied Mathematics, scholarship of synthesis involves investigating connections within the field of Statistics or within the area of Applied Mathematics and connections of these fields to other disciplines. *For example, a statistician could collaborate with researchers in another field to produce a methodological paper or book discussing appropriate application and interpretation of statistical techniques for research in that field. The results could be directed to statistics faculty or to faculty in the collaborating discipline.*

c. In the area of Mathematics Education, scholarship of synthesis involves investigating connections within the field of mathematics education and across other disciplines such as educational psychology, brain research, and sociology as it pertains to PreK-12 student learning and to pre-service and in-service teacher learning at the college level. *For example, mathematics education experts could collaborate with mathematics content experts to develop a more effective way to teach inquiry-based mathematics. The conclusions or discussion could be directed to mathematics and mathematics education faculty.*

Part 2: Scholarly Products:

Those products of scholarly activity that are most highly esteemed are distinguished by two characteristics: a significant level of external review and either breadth or depth of potential impact. To aid evaluation of scholarly activity, types of products are divided into the three general categories described below. The lists indicate the level at which a "typical" product of each type might fall. Within each category, contributions can vary in importance, degree of review, or impact, so a general ranking of products within a category is not possible. In fact, activities could move up or down among categories, depending on the level of external review and the breadth or depth of potential impact. For example, most contributed talks at mathematics conferences are not subjected to significant peer review. As a result, contributed talks typically fall in the lowest category. However, when such talks are subjected to careful peer review, they would move up to category B. Similarly, developing mathematical software would typically be in the lowest category, but if the software is widely used, has significant impact in the field, or is subjected to careful external review, it would move to a higher category. Since they can vary greatly in scope and impact, published curriculum materials could also be in category A. Consulting in mathematics, statistics, or mathematics education could fall in any of the three categories, depending on the scope and impact of the project. It is the responsibility of the department to validate the levels claimed for individual scholarly products. The department will also be responsible for evaluating any products submitted which are not on the list.

The mathematics department believes that it is very important to have pure mathematicians as members of the faculty, but they should not have to become experts in new fields, such as applied mathematics or mathematics education, in order to become published. Since we value a broad spectrum of scholarly activities as described below, in light of the previous discussion of the difficulty of publication in mathematics, we expect that substantial activities in categories B and C will substitute for traditional peer reviewed publication for promotion decisions.

Categories of Scholarly Products

A. Products in this category have significant peer review and/or significant impact potential. These would include:

   - Books, either texts or popularizations, which have been commercially published.
   - Refereed journal articles, whether as sole author or coauthor
   - Inclusion in refereed proceedings of conferences
   - Being a principal investigator for a successful significant grant.

   There are other accomplishments that, while not strictly speaking being products, nonetheless should be taken as evidence of excellence in scholarship. These would include receiving a national award from one of

the professional organizations (such as MAA, AMS, SIAM, NCTM) and being invited to give an address at a national meeting.

B. Products in the second category generally have less external review and less breadth or depth of potential impact and may include:

- Invited addresses at conferences
- Publication of a problem solution in a refereed journal
- Closely refereed contributed talks
- Published curriculum materials
- Completion of a grant application as principal investigator
- Published book reviews
- Piloting aspects of courses/consulting with textbook authors
- Statistical or applied mathematical support for refereed publications in other disciplines

It is expected that approximately three products from this category would be considered equivalent to one from category A.

C. Products in the third category are also highly valued by the department as evidence of continued involvement in mathematics. As these often have little peer review, approximately two of these activities would be considered equivalent to one of category B, and it is expected that evidence would be provided of the quality of the activity (as described above.) The following would generally fall into this third category:

- Refereeing an article for a journal
- Development of mathematically related software
- Submission of a correct problem solution to a journal
- Publication in a non-refereed journal
- Contributed talk at a conference
- Submission of a paper for publication
- Significant contribution to a grant proposal
- Monographs for local consumption
- Unpublished book review (for publisher)
- Lectures to the SPU Community

Peer Review of Scholarly Products

Products from category A have significant external review as a matter of course. When multiple items from categories B and C are submitted as part of an application for promotion, a rationale for their placement and an evaluation of the quality of the products should be included. This may include letters of support or evaluation.

In the case of contributed talks, submission of full conference proceedings is appropriate when available. If there are no full conference proceedings, the following are the acceptable ways to evaluate the quality of the talks.

- The talk may be attended by a department member who will review the quality of the talk.
- The talk may be attended by an outside specialist who will review the quality of the talk. The choice of the specialist must be approved by the department.
- A video/ written transcript of the talk may be presented to the department for review.
- The talk may be presented in a departmental seminar for review.

In the case of consulting on projects that involve proprietary information that precludes traditional peer-review, a letter of evaluation from the client would be appropriate.

Part 3: Departmental expectations

1. Promotion to Associate Professor

The usual expectation will be that a candidate for promotion to Associate Professor should have one publication in a refereed journal. In special cases (for example if one has been away from one's doctoral field for an extended period) an equivalent product or set of products listed in part 2 could be used. In addition, it will be expected that at least five other products (from any category) will also be submitted. The intention is that these products demonstrate involvement with a mathematical community outside of the department.

2. Promotion to Professor

The expectation will be that the candidate should demonstrate the equivalent of at least two products from the A category listed in part 2 which have been produced after promotion to associate professor. The emphasis here is on equivalence since the particular combination appropriate for an individual will vary depending on one's specialty. For example, as mentioned in the statement on context, a pure mathematician will typically have products in categories B and C rather than A. In addition, it is expected that the candidate will show evidence of ongoing involvement in the broader mathematical community.