Chapter 6
Promotion, Tenure, and Evaluation (PT&E)

6.1 Introduction

This chapter describes the policy and procedures for Faculty evaluation at all ranks in the Department of Mathematics. Evaluation indicators are outlined in Section 6.4.3. Criteria and procedures for evaluations related to promotion and tenure are outlined in Sections 6.3, 6.5.2, 6.4.1, and 6.4.2. Procedures for the annual faculty evaluation are outlined in Section 6.5.1

6.2 References

1. SBHE Policies 605.1, 605.2, 605.4, 605.5
2. NDSU Policies 350.1, 352, 350.2, 350.4, 353, and
3. College of Science and Mathematics Policy and Procedures for Promotion and Tenure Evaluation

6.3 Promotion, Tenure, and Evaluation Committee

The PTE Committee consists of three members. Only tenured faculty members who have completed three years of full-time appointment with the university are eligible for election to the PTE Committee. Faculty holding administrative appointments as defined by NDSU policy 352 Section 5.3 are not eligible for election. Faculty members are not eligible to serve on the PTE Committee in a year where a current or former immediate family member applies for tenure and/or promotion: parent by birth or adoption, spouse, partner, son or daughter by birth or adoption, stepchild, brother or sister by whole or half blood or by adoption, brother-in-law, sister-in-law, or son-in-law or daughter-in-law.

The term of the PTE Committee assignment is one calendar year, beginning on June 1st. Elections are held in spring semester for the committee to serve the following term.

Nominations can be made by any member of the faculty. A minimum of three nominations must be made. Unless otherwise decided by the department, preferential ballot is used. Following the election, the Committee members will elect a Committee Chair and report the results of the election to the Chair of the Department.

PTE committee members are required to complete NDSU's PTE committee training, when available.

6.4 Criteria and Indicators

6.4.1 Criteria for Tenure and/or Promotion from Assistant Professor to Associate Professor

The indicators for these criteria are given in Section 6.4.3.

1. **Research.** The candidate must exhibit a strong, independent research program.

2. **Teaching.** The candidate must demonstrate a record of excellence as an instructor in all courses taught by that instructor and successful advising of students.

3. **Service.** The candidate must contribute to the governance of the department, the college, the university, and/or the profession.

4. **Collegiality.** The candidate must interact collegially with other faculty members.

6.4.2 Criteria for Promotion from Associate Professor to Full Professor

The level of performance for promotion to professor substantially exceeds that required for promotion to Associate Professor. There must be a recognizable growth in leadership capabilities and overall professional standing. The indicators are outlined in Section 6.4.3.

1. **Research.** The candidate must exhibit a strong, independent, sustained research program.

2. **Teaching.** The candidate must demonstrate a sustained record of excellence in teaching, advising, and related instructional activities. In addition, the candidate will take a leadership role in improving the teaching, advising and other instructional activities of the department, college, and/or university.

3. **Service.** The candidate must contribute to and play a leadership role in the governance of the department, the college, the university, and/or the profession.

4. **Collegiality.** The candidate must interact collegially with other faculty members.

6.4.3 Evaluation Indicators

Research

1. The primary research indicator has been and continues to be peer-refereed[1] research articles accepted for publication. A modifier that may be used for measuring quality of a peer-refereed research article is the perceived quality of the journal[2] in which the paper appears.

2. A secondary research indicator is the solicitation of external support for the research program. A faculty member who has successfully obtained grant support need not continue to apply while their grant is ongoing. The impact of grants on other activities[3] may be considered as evidence of quality research.[4] (It is expected that every faculty member submits a research and/or teaching grant proposal to an external agency on average at least once every two years, including collaborative proposals as a PI or co-PI.) Evaluations of research will not be affected negatively by unsuccessful attempts to seek external funding.

3. For tenure and/or promotion applications, a secondary research indicator is the evaluation of the candidate's research accomplishments by external reviewers.

4. A secondary research indicator is presentation and participation in professional meetings and invitations to other institutions for research collaborations[5]. Factors that may be used in evaluating this measure will include: the length and type of the talk and

---

[1] The publication of non-refereed papers and non-research papers will play neither a primary nor a secondary role in evaluating a faculty member's research.

[2] Because the quality of journals/conference proceedings/book chapters can be uneven, refereed papers in journals, conference proceedings, or peer-reviewed book chapters will be considered on a case-by-case basis with the potential for consultations with people both within the department and externally.

[3] Such as: support for students, REU grants, conference grants, etc.

[4] By external we are considering ND EPSCoR, NSF, NSA, the Simons Foundation, Department of Education, and other granting agencies. Internal grants may include Instructional Development Grants through the Provost's Office, Departmental and College Sources, and/or funds through other NDSU entities.

[5] It is assumed that invitations for speaking in seminars and colloquia at other institutions are potentially collaborative, even if such collaboration is not presently resulting in publishable work.

the type of meeting/collaboration. Additionally, receiving funds to travel (either from the University[6] or from external sources) may also be used as an indicator.

5. A secondary research indicator is successful mentoring of graduate students. However, in accord with the 2005 AMS statement "Directing Ph.D.Theses"[7] , tenure-track faculty are not expected to supervise graduate students. Evaluations of research will not be affected by an absence of graduate students.

6. Awards for research papers, research presentations, and research programs may also be used as a secondary research indicator.

7. The list of secondary indicators is not intended to be exhaustive and faculty may present further activities for consideration.

Teaching

1. The primary teaching indicator is quality of instruction measured through review of regularly scheduled courses taught by the faculty member. This review may include: a review of narrative summaries produced in a peer review of teaching; observations from classroom visits by the Chair; a review of student comments from SCES forms; numerical data resulting from the annual SCES evaluations. Faculty members are expected to engage in peer review as described in Section 11 of the Faculty Handbook of the Mathematics Department.

2. A secondary teaching indicator is participation in teaching development activities. This may include participation in pedagogical luncheons and teaching seminars both locally and otherwise. Other activities may include development, assessment, and/or maintenance of innovative teaching strategies.

3. A secondary teaching indicator is active participation in assessment activities for the department. This should include, at minimum, working with the assessment committee to facilitate their activities. In addition, continued ongoing assessment of student learning is expected, as described in Sections 11 of the Faculty Handbook of the Mathematics Department.

4. A secondary teaching indicator is solicitation of support for teaching related activities from external and/or internal sources[8]. It is expected that every faculty member submits a research and/or teaching grant proposal to an external agency on average at least once every two years, including collaborative proposals as a PI or co-PI.) Evaluations of teaching will not be affected by unsuccessful attempts to seek funding.

5. A secondary teaching indicator is successful supervision of undergraduates in their senior seminar project.

6. A secondary teaching indicator is leading graduate seminars and/or graduate reading courses.

7. Awards for teaching may also be used as a secondary teaching indicator.

---

[6] This includes travel money provided through competitive programs from local sources such as the Provost's travel grants, the NDSU development foundation, and others.

[7] See Appendices.

[8] By external we are considering ND EPSCoR, NSF, NSA, the Simons Foundation, Department of Education, and other granting agencies. Internal grants may include Instructional Development Grants through the Provost's Office, Departmental and College Sources, and/or funds through other NDSU entities.

8. The list of secondary indicators is not intended to be exhaustive and faculty may present further activities for consideration.

Service Activities

1. The primary service indicator will be the participation in service activities as assigned by the Chair. Factors that may be used in evaluating department service assignments include willingness to participate and successful completion of the assigned task. In committees that involve multiple people it is also important that each individual is contributing appropriately. The Chair may evaluate this through discussions with members of the committee and/or others in the department.

2. Serving in college and university committees is encouraged and is valued as a secondary measure in evaluating service. For probationary faculty, having no service in college or university committees will not be a dispositive factor in evaluation of service.

3. A secondary service indicator is service to the profession. Some factors which will be used in determining this include: participating in reviewing of research papers and grant proposals, participating in committees for national societies, membership on editorial boards for professional journals, and/or organizing conferences and/or special sessions at conferences.

4. A secondary service indicator is participation in outreach activities. Types of outreach activities[9] include (but are not limited to): engaging students and/or teachers from area schools in mathematical activities; working with area schools to enhance student preparedness for college; assisting in established outreach activities[10]; engaging the broader community in mathematical discussion.

5. A secondary service indicator is serving on graduate student committees across campus and assisting students and faculty across campus requesting technical or professional information.

6. Awards for service may also be used as a secondary service indicator.

7. The list of secondary indicators is not intended to be exhaustive, and faculty may present further activities for consideration.

Collegiality

1. A faculty member will contribute to a positive work environment through cooperation and collaboration with others by developing and maintaining good working relationships with other faculty, staff, employees, and students.

2. On annual evaluations, collegiality is evaluated as "Satisfactory" or "Not satisfactory". The evaluation "Not satisfactory" must describe specific lapses.

6.5 Procedures and Guidelines

6.5.1 Procedure for the Annual Faculty Evaluation

1. The Chair of the Department performs an annual evaluation of all faculty members. The annual evaluation process normally starts by mid-January and is completed by May 1. Evaluation will be done in terms of each faculty member's position description and

---

[9] In outreach activities the faculty member should be acting as a representative of the Math Department.
[10] This includes assisting faculty members whose service assignment includes the indicated activity, e.g., Sonia Kovalevsky Day, the Math-In, the Tri-College math exam, Governor's School, science fair judging, etc.

encompasses the areas of instruction, research, and service as outlined in Section 6.4.3. The time allocation of each faculty member to each of these areas is described in her/his position description.

2. During each academic year the Chair of the Department will also meet with each probationary faculty member to discuss her/his progress toward promotion/tenure. The Chair of the Department will provide in the evaluation report an outline of progress toward promotion/tenure.

3. Each faculty member submits to the Chair of the Department an updated List of Goals and Accomplishments summarizing his/her contributions in each of the areas of evaluation outlined in Section 6.4.3. The length and content of the list will be determined by the Chair of the Department who will notify the faculty members in a timely manner.

4. The Chair of the Department will develop an evaluation report for each faculty member. This report will be based on the list of goals and accomplishments, and other relevant evidence in regards to the faculty member's position description and assignments over the year in the areas outlined in Section 6.4.3.

5. Each faculty member receives a copy of her/his own evaluation, signed by the Chair of the Department. The faculty member has the right to request a meeting with the Chair. Any such meeting must take place within 14 calendar days of receiving a copy of his/her evaluation. After this meeting the faculty member has one week in which he/she may prepare a letter in response to the evaluation report of the Chair.

6.5.2 Procedure for Pre-Tenure Review

1. Under normal circumstances, during the third year of continuous service, the PTE Committee will conduct a pre-tenure review. Each faculty member will be assessed in the areas outlined in Section 6.4.3 for evidence of potential success in application for tenure.

2. During the pre-tenure review year, the candidate will present to the Chair of the Department and the PTE Committee his/her portfolio prepared in accordance with the NDSU Guidelines for Promotion and Tenure and Section 4.2 of the College of Science and Mathematics Policy for Promotion and Tenure Evaluation. The portfolio needs to be submitted to the Chair (with copies to the Committee members) at least two months in advance of the due date set by the College of Science and Mathematics.

3. The PTE Committee shall prepare a pre-tenure review report; independently the Chair of the Department shall prepare his/her pre-tenure report. In accordance with college policy Committee and Chair may discuss the candidate's application. Signed copies of these are provided to the candidate at least 14 calendar days before the portfolio is due at the Dean's office. It is the candidate's responsibility to add these copies to the portfolio.

4. In accordance with NDSU Policy 352.6.4, the candidate will have 14 calendar days to append a response to the reports from the Chair and from the PTE Committee.

5. The candidate shall forward the portfolio to the Dean of the College of Science and Mathematics and the College PTE Committee, according to the timeline provided by the Dean's office.

6. It is the responsibility of the candidate to ensure that all college and university deadlines for the portfolio are met.

6.5.3 Guidelines for Applications for Tenure and Promotion Together or Separately

1. The most common case is the promotion from Assistant Professor to Associate Professor with tenure. There is no mechanism to tenure an Assistant Professor without promotion.

2. Although consideration for promotion from Assistant Professor to Associate Professor will normally accompany consideration for tenure, a candidate who exceeds the criteria of Section 6.4.1 may be considered for early promotion (by which we mean promotion not coinciding with a corresponding application for tenure).

3. For a candidate who is already an Associate Professor by reason of recent appointment or early promotion, the criteria for tenure are those outlined in Section 6.4.1. For a candidate who is already a Professor by reason of recent appointment or early promotion the criteria for tenure are those outlined in Section 6.4.2.

6.5.4 Procedure for Tenure and/or Promotion Review

1. The identification of candidates is done in accordance with College policy (see Section 4 of Policy and Procedure for Promotion and Tenure, College of Science and Mathematics), or by request from the candidate.

2. Candidates should be evaluated according to the criteria and indicators from Section 6.4.

3. The candidate must submit the names of at least six individuals to serve as external referees no later than June 1st of the summer prior to the academic year of decision/deliberation. The Chair of the Department and the Department PTE Committee may suggest other referees and they must approve the selected referees. At least 3 letters are to be solicited for the candidate's portfolio. All of the solicited letters that are provided to the Chair will be included in the candidate's portfolio. Referees will be informed of the ND Open Records law when letters are solicited. Every effort will be made to ensure that 3 letters are included in the portfolio, including soliciting other letters if necessary. In the event that fewer than 3 letters are provided an explanation should be included in the Chair's Promotion and Tenure report.

4. The candidate shall prepare a portfolio in accordance with the NDSU Guidelines for Promotion and Tenure and Section 4 of the College of Science and Mathematics Policy for Promotion and Tenure Evaluation. It must include all of the relevant material, including all of the candidate's annual reviews by the Chair of the Department (or the Dean of the College for any years in which the faculty member going up for promotion and/or tenure served as Department Chair). (Course syllabi should not be included in the portfolio.)

5. The portfolio shall be submitted to the Chair (with copies to the Committee members) at least two months in advance of the due date set by the College of Science and Mathematics. If the faculty member being considered for tenure and/or promotion is the Chair of the Department the portfolio will be submitted to the Chair of the Department PTE Committee.

6. Following the Department's deliberation on the candidate's case, from which the candidate and any others with a conflict of interest are excluded, the Chair of the Department will circulate an anonymous ballot to all voting members of the department requesting each voting faculty member to vote "yes" or "no" to the question(s) of tenure and/or promotion. The candidate for promotion and/or tenure, first-year faculty, faculty undergoing the tenure/promotion process during the same year, and faculty with a conflict of interest as defined in NDSU Policy 352.5.5 are not eligible to participate in the discussion nor to vote. This vote of the faculty is considered to be advisory to the departmental PTE committee. If the faculty member being considered for

tenure/promotion is the Chair of the Department, the Chair of the Department PTE Committee will circulate the ballot and tabulate the results.

7. A voting faculty member will be one who has an at least 50% full time, tenure-track/tenured position in the Department of Mathematics and who has been in such a position for at least one full academic year. In the situation when a faculty member is unable to participate in the voting process, due to unavoidable circumstances such as leave, illness, or conflict of interest, she/he will not be considered a voting faculty member for the purposes of tallying the vote. Conflict of interest will include, but not be limited to, being the spouse or partner of the person being considered for promotion and/or tenure (see also NDSU Policy 352-5-5).

8. To determine the advice of the faculty an election quota will be used. To calculate the quota, multiply the number of eligible voting faculty members by 2/3 and round up to the nearest whole number. If the number of yes votes is greater than or equal to the quota, the advice of the voting faculty will be in favor of tenure and/or promotion. If the number of yes votes is less than the quota, the advice of the faculty will be against tenure and promotion.

9. Following the advisory vote of the voting faculty, the Department PTE Committee will meet in private to discuss the candidate's tenure and/or promotion. At the conclusion of this meeting, the committee will vote on the candidate's tenure and/or promotion. If at least two members of the committee vote in favor of tenure and/or promotion, the Committee will recommend tenure and/or promotion.

10. The PTE Committee will prepare a Promotion and Tenure report; independently the Chair of the Department will prepare a Promotion and Tenure report. In accordance with College policy the Committee and Chair may discuss the candidate's application. Signed copies of these reports are provided to the candidate at least 14 calendar days before the portfolio is due at the Dean's office. It is the candidate's responsibility to add these copies to the portfolio. If the faculty member being considered for tenure/promotion is the Chair of the Department then the chair/head evaluation shall be performed by a current or former faculty member who has had experience as a chair/head but is not currently a direct report of the individual being evaluated. The dean, in consultation with the candidate and the departmental PTE committee chair, shall select the individual that will provide the evaluation (see also College PTE Policy 4.5.2.1).

11. In accordance with NDSU Policy 352.6.4, the candidate will have 14 calendar days to append a response to the Chair and PTE Committee reports.

12. The candidate shall forward the portfolio to the Dean of the College of Science and Mathematics and the College PTE Committee, according to the timeline provided by the Dean's office.

13. It is the responsibility of the candidate to ensure the completeness of the portfolio and that all college and university deadlines for the portfolio are met.

6.6 Appendix

Included are relevant copies of the AMS statements regarding the culture of the discipline of mathematics from http://www.ams.org/profession/leaders/culture/.

2004 Statement
The Culture of Research and Scholarship in Mathematics:
Joint Research and Its Publication

The culture of joint research and its publication differs among disciplines, and this essay is meant to explain that culture for mathematics. In most areas of mathematics, joint research is a sharing of ideas and skills that cannot be attributed to the individuals separately. The roles of researchers are seldom differentiated (in the way they are in laboratory sciences, for example). Determining which person contributed which ideas is often meaningless because the ideas grow from complex discussions among all partners. Naming a "senior" researcher may indicate the relative status of the participants, but its purpose is not to indicate the relative merit of the contributions. Joint work in mathematics almost always involves a small number of researchers contributing equally to a research project.

For this reason, mathematicians traditionally list authors on joint papers in alphabetical order. An analysis of journal articles with at least one U.S. based author shows that nearly half were jointly authored. Of these, more than 75% listed the authors in alphabetical order. In pure mathematics, nearly all joint papers (over 90%) list authors alphabetically.

These traditions differ from other areas of scholarship, especially those that frequently involve large numbers of researchers working on a single research project. In areas of mathematics that are more closely associated to such areas, the culture and traditions may blend together.

While these traditions are well-known to mathematicians, they are often misunderstood by other scholars whose traditions differ. Occasionally, this works against young mathematicians—especially those with names near the end of the alphabet.

2005 Statement
The Culture of Research and Scholarship in Mathematics:
Directing Ph.D. Theses

In some disciplines, directing dissertations is an integral part of a research program for every scholar, both young and old. In mathematics, however, this is not the case; it is unusual for a young (untenured) mathematician to direct Ph.D. students. As in other disciplines, a pre-tenured mathematician must focus on establishing a research program, including the publication of his or her research. Helping an advisee mature into an original researcher is labor-intensive and, unlike in the laboratory sciences, does not necessarily further the advisor's own research program. In addition, the advisor provides students with problems which, in many instances, he or she would otherwise solve and publish.

There is no tradition of joint publication of dissertation work, even when the advisor makes a substantial contribution, and this means fewer publications for the advisor -- something that may be a liability when facing a tenure review. In a recent review of new mathematics Ph.D.'s from mid-2003 to mid-2004, at most 3% of the advisors were untenured even though the untenured (but tenure-eligible) faculty account for 16% of the total tenure-eligible faculty in doctoral mathematics departments. The overwhelming proportion of tenured faculty among thesis advisors is not the case in some other disciplines, where young researchers are expected to attract large numbers of graduate students to demonstrate the vitality of their research program.

Thus, there are subject-specific cultural reasons for mathematics faculty who are facing tenure decisions not to have advised any thesis students. While these facts are well known to mathematicians, they are often misunderstood by other scholars who carry out research in a different culture.

2006 Statement
The Culture of Research and Scholarship in Mathematics:
Rates of Publication

Mathematics is often considered as part of the physical and natural sciences, but its publication practices differ from these other disciplines in several fundamental ways. Mathematicians tend to publish at rates

that are modest compared to some other sciences. The majority of mathematical research is published in refereed research journals rather than conference proceedings or books. The mathematical literature is spread among a wider collection of journals than in most related fields. And, since an article typically represents a mature treatise on a mathematical question, and since mathematics research is not considered time-sensitive, delays in publication are common.

Even some of the best young mathematicians publish relatively few papers. A study of the 40 mathematicians winning Sloan Fellowships in 2005-2006 shows that 70% published an average of two or fewer articles per year in the five years preceding their award. Even more senior mathematicians have modest publication rates. Of the 22 mathematicians receiving Guggenheim Fellowships from 2002-2006, half published an average of two or fewer articles per year in the five years preceding their award. These two groups represent an exceptional group of highly productive mathematicians. Of the 274 publications by these Guggenheim Fellows, 75% were in refereed journals. Only three publications were books. In fact, of all items covered by Mathematical Reviews in the years 2001-2005, fully 80% were from refereed journals.

When judging the work of most mathematicians, the key measure of value for a research program is the quality of publications rather than rate. The information above about those who have won prestigious awards strongly supports this view.

2008 Statement
The Culture of Federal Support for Academic Research in Mathematics[11]

Academic research in mathematics, like research in engineering and the life, physical, and computer sciences, is financially supported by foundations, industry, and the Federal government. Approximately 70% of the external funding available for academic research in these fields comes from the Federal government, down somewhat from 80% thirty years ago. Most Federal funding for mathematical research comes from the National Science Foundation (NSF), the Department of Defense, the Department of Energy, and the National Institutes of Health. The NSF accounts for nearly 70% of the Federal support for academic research in the mathematics, and is the only agency that supports all branches of the mathematical sciences.

Amongst doctorate holders employed in academia, 66% of mathematicians describe research as a primary or secondary activity, quite like the 68% of physical scientists, and the 70%of computer and life scientists who make such a report. Nonetheless, a much smaller proportion of academic mathematicians are supported by the Federal government. In 2006, across all fields of science, 46.9%of those employed in academia received Federal support for their research: 56.3%of physical scientists, 43.9%of computer scientists and 57.9% of life scientists, as compared to 34.8% of mathematicians.

As compared to other natural sciences, there is also a large disparity in the per capita level of funding available to mathematicians. In FY2006, across all fields of science and engineering, the Federal government provided about $260,000 per academic researcher. By field, this breaks down to $360,000 per academic researcher in Computer Science, $140,500 per academic researcher in the Physical Sciences, and $430,000 per academic researcher in the Life Sciences. By contrast, in 2006 the Federal government provided about $47,000 per academic researcher in Mathematics.1

---

[11] In these calculations the numerator comes from Appendix table 5-4: Expenditures for academic R & D, by field, and the denominator from the "Research" section of Appendix table 5-26: S&E doctorate holders employed in academia reporting teaching or research as primary or secondary work activity, by type of position and degree field: 1973–2006. Both tables are found in the NSF report: Science and Engineering Indicators 2008, found online at http://nsf.gov/statistics/seind08/pdfstart.htm.

When compared to other fields of science and engineering, opportunities for external funding in mathematical sciences are very limited. The vast majority of mathematicians receiving Federal support have just one, single investigator, NSF grant. These grants typically provide salary support for one, or two summer months, and some funds for travel. Almost no support is available for course release time, and there is limited support for graduate students, post-docs or equipment. Many well respected, productive mathematicians receive little or no external support for their research.

2009 Statement
The Culture of Research and Scholarship in Mathematics:
Citation and Impact in Mathematical Publications

A scientist's publication record is the basic ``statistic'' on which promotion, salary and funding decisions are made. In many fields the number of citations to a work, the order of authorship, and impact factor of the journal, are used as proxies for expert evaluation. For a variety of reasons, mathematicians have not embraced the impact factor as a reliable indicator of a journal's quality. Indeed, there are documented cases where unscrupulous editors have dramatically inflated the impact factors of entirely undistinguished journals; in one case the IF exceeded that of all journals published by SIAM, save for the SIAM Review.[12]

As in many other things, the cultural norms within mathematics are quite different from those in other fields of science. For example, the authors of a mathematical paper are almost always listed alphabetically by surname; all authors are assumed to have made substantive intellectual contributions to the work.

Several issues combine to require careful consideration of publication cultures before understanding and using citation statistics in Mathematics. Mathematics articles tend to be longer, including more detail and exposition (to allow readers to reconstruct arguments with ease), and to be more idiosyncratic in approach (including special examples, and new proofs of known results) than in other disciplines; this requires longer writing times. They also tend to require a longer period to read and digest properly; both refereeing times and first citation times can be an order of magnitude longer.[13]

Citations tend to be focused and targeted to specific required results rather than being used as a broad survey of the field. It is becoming increasingly common for papers on the oft-used, but unrefereed, preprint archive, arXiv.org, to be accepted as citations in published work. Citations of unpublished, but well known, manuscripts have been accepted in mathematical journals for decades, which may also contribute to the lower level of citations to published work. Relative to other fields of science, all of these factors tend to shorten the publication list and citation statistics of senior mathematicians.

These citation practices may contribute to the relatively low impact factors of even the most prestigious mathematical journals, as compared to those in other fields.[14] Other reasons for this disparity are the relatively small size of the mathematical community, that many core mathematical journals are not included in the computation of the impact factor,[15] and the fact that 90% of the citations for a

---

[12] See Integrity under attack: the state of scholarly publishing, Douglas N. Arnold, SIAM Review, December 2009.
[13] In 1992, the average time to publication in math journals was 600 days. H.A. Abt, Publication practices in various sciences, Scientometrics, Volume 24, Number 3 / July, 1992, DOI 10.1007/BF02051040, Pages: 441-447.
[14] The highest IFs for Math journals are about 2.5, as compared to 15 for Science and Nature, and 35 for New England Journal of Medicine.
[15] Citation Statistics, a report of the IMU-ICIAM-IMS, by Robert Adler, John Ewing, and Peter Taylor, June 2008. Available at http://www.ams.org/ewing/Documents/CitationStatistics-FINAL-1.pdf

mathematical paper occur more than two years after its publication, (and therefore are not counted in the IF).[16]

As in other fields, there is a fairly good consensus within the mathematical community of the relative merits of most major journals; this ranking plays a much larger role in assessing the publication record of an individual than the IFs of the journals. While a mathematician's publication record is considered in determining his/her standing, much greater weight is placed on the substance of the work itself, and its impact on the subject, as assessed by experts within the field, than on the number of citations to that work, and the IFs of the journals in which it appears.

2012 Statement
The Culture of Research and Scholarship in Mathematics:
The Structure of Graduate Programs

Although mathematics is very closely associated with the natural sciences, the structure of mathematics graduate programs differs from those of other scientific disciplines in several fundamental ways. These include the transition from coursework to research, the advisor's role, and funding sources.

Due to the richness and maturity of the mathematical sciences, graduate students typically require two to three years of post-baccalaureate course work before reaching the frontiers of the discipline, choosing an advisor, and beginning dissertation research. During the years of coursework, beginning graduate students typically are advised via departmental structures – such as a committee, a vice chair, or a nominal faculty advisor - rather than a dissertation advisor or major professor.

The role of the dissertation advisor of a mathematics graduate student differs from that of an advisor in the natural sciences, especially laboratory sciences. It is often the case that the student's dissertation work is independent work, which broadly supports the advisor's research direction but may not contribute directly to the advisor's current research project. Accordingly, dissertation advisors are sometimes coauthors of publications arising from doctoral theses, but not always. Advising a graduate student in mathematics may not contribute to the advisor's research output to the same degree as it does in other sciences.

Degree program requirements for undergraduate majors in science and engineering create high demand for mathematics instruction taught in lecture/recitation format, and therefore a high demand for graduate teaching assistants. On the other hand, federal agencies support a smaller fraction of active researchers in the mathematical sciences compared to the physical and biological sciences[17]; the awards support a smaller proportion of graduate students[18] and rarely provide more than partial support[19]. Consequently, mathematics students are typically supported as teaching assistants by the department rather than as research assistants by the major professor[20].

---

[16] For example, the two-year 2006 IF of the Annals of Mathematics, arguably the most prestigious journal in the field, is 2.43, while the four-year IF is 4.28, and the 25-year IF is 24.82.

[17] See http://www.nsf.gov/statistics/seind12/append/c5/at05-22.pdf,
http://www.nsf.gov/statistics/seind12/append/c5/at05-24.pdf

[18] See http://www.nsf.gov/statistics/seind12/append/c2/at02-06.pdf

[19] Based on average award size, see http://dellweb.bfa.nsf.gov/awdfr3/default.asp

[20] Data from the National Center for Science and Engineering Statistics (NCSES). See table
http://www.nsf.gov/statistics/seind12/append/c2/at02-05.pdf

2013 Statement
The Culture of Research and Scholarship in Mathematics:
Undergraduate Research in Mathematics

The role of undergraduate research in mathematics has features which distinguish it from similar activities in other disciplines. These differences should be understood in evaluating the participation of mathematics departments and individual mathematicians in undergraduate research.

Both demand and opportunities for undergraduate research (UR) in mathematics have increased steadily in recent years, and there is currently much excitement in the mathematics community about supporting these types of activities[21], which include independent study on research projects during the academic year; organized and externally supported research activities during the summer; and informal summer research experiences run by individual faculty. These can be a powerful way to draw students into mathematics. Simultaneously, there is growing pressure from universities on faculty in all STEM disciplines to engage undergraduates in research, in order to recruit, and then retain, the best students.

One salient aspect of UR activities is that it primarily is a teaching effort on the part of faculty, not a research one.[22] Undergraduate research in mathematics is not an automatic side effect of faculty research and is usually a major undertaking for a faculty member. It usually takes 2-3 years to bring PhD students from a solid knowledge of the undergraduate curriculum to a level at which they can, even with considerable supervision, engage in mathematical research; bringing an undergraduate to the forefront of research is very unusual. Opportunities for such UR are unevenly distributed across subfields. While some UR activities have been spectacularly successful in having students participate in truly original research, and such outcomes are highly appreciated by the discipline, this is not considered the norm.

A related issue is that there is a difference between mathematics and laboratory disciplines, where students at various levels of knowledge and competency can contribute to a faculty member's own research program. In mathematics, such positive effects on faculty productivity, although not unknown, are rare.

In summary, UR requires concentrated and highly time-consuming faculty effort, which comes in addition to the duties of teaching, advising, and faculty research, and which often does not further the faculty member's research agenda. This means that, in deciding whether or not to supervise undergraduate students in research, a faculty member will need to weigh the benefits (to the students, the institution and possibly themselves) against the costs to their other professional obligations.

---

[21] See http://www.ams.org/notices/201208/rtx120801112p.pdf. The documents http://www.ams.org/programs/edu-support/undergrad-research/PURMproceedings.pdf and http://www.ams.org/programs/edu-support/undergrad-research/REUproceedings.pdf provide a non-exhaustive list of research experiences for undergraduates programs and information about how they run.

[22] Much of this Statement is informed by the responses to a CoProf survey. Of the department chairpersons contacted, 72% stated that undergraduate research is viewed as primarily a teaching effort, 16% as primarily a research effort, and 12% did not state an opinion