College of Science and Technology Guidelines for Promotion and Tenure Reviews

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I. Scope and Purpose

These collegial guidelines are intended to supplement the provisions of the Collective Bargaining Agreement between Temple University and the Temple University Association of University Professionals that pertain to promotion and tenure, and the Guidelines for Review of Promotion and Tenure Applications issued by Temple University. These collegial guidelines are not intended to alter any provision of the Collective Bargaining Agreement or the university guidelines, and therefore do not include, repeat, or paraphrase any provision of those documents. These collegial guidelines provide a description of disciplinary expectations and metrics that are intended to preserve the integrity of the discipline, to advance the mission of the college, and to sustain the excellence of the college's faculty. These collegial guidelines are intended for use by

1. Candidates preparing applications for promotion and tenure.
2. Departmental and collegial Promotion and Tenure committees in their review of the candidates' applications.
3. The University Promotion and Tenure Committee and the Provost in their review of recommendations forwarded by the College.

Any provision of these collegial guidelines not in compliance with the Collective Bargaining Agreement or with any present or future guidelines issued by Temple University is void and will be superseded by the appropriate provisions of those documents.

II. Criteria common to all CST departments

A. Teaching

Outstanding performance in teaching is a primary criterion for promotion and for tenure to any rank. For teaching in regularly scheduled courses, the level of performance is determined by the following kinds of evidence:

1. Course and teaching evaluations reports.
2. In-class evaluations by departmental and/or collegial faculty.
3. Student comments.
4. Examples of course and classroom innovations provided by the candidate.
5. Presentations by students such as posters or papers at competitive or scholarly

meetings.

6. Participation in University-sponsored mentoring programs or other special instructional venues.

Success in the training of undergraduates, graduates, and postgraduate fellows is also an important measure of teaching ability. Faculty are expected to mentor Masters and Doctoral students. Such performance may be evidenced by supervision of research experiences for undergraduates, by supervision of Graduate Teaching Assistants and Research Assistants, by supervision of students in Independent Study and individual project courses, by supervision of completed graduate degrees, and by peer-reviewed publications authored by students or postgraduate fellows.

B. Research

Outstanding performance in research is also a primary criterion for promotion and tenure. Candidates for tenure are expected to have established independence in determining the area, aims, and methods of their research, as shown by success in obtaining funding as principal investigator, publishing as sole author or lead author, or other means appropriate to the discipline. For either promotion or tenure, the candidate is expected to provide evidence of an outstanding research program, as determined by the following metrics:

1. Publications authored by the candidate in high quality peer reviewed journals or other appropriate venues.
2. Success in obtaining appropriate external funding to carry out the research program.
3. Active participation at national and international meetings and symposia.
4. External evaluations of the research program by established experts in the candidate's field.

External reviewers are nominated by the Department in consultation with the candidate for approval by the Dean's Office. Typically, for tenure, at least 8 external reviewers letters are sought, with 3 reviewer names submitted by the candidate and at least 5 submitted independently by the Department. For promotion to Professor, at least 10 external reviewers letters are sought, with 3 reviewer names submitted by the candidate and at least 7 submitted independently by the Department. If the number obtained exceeds a maximum set by University guidelines, permission will be sought to include them in the review.

The threshold for promotion to Professor is higher than for tenure and promotion to Associate Professor. Promotion to Professor requires sustained excellence in research. For promotion to Professor, the candidate should be recognized as an authority in their area(s) of research. Evidence of a nationally and internationally recognized research program is expected.

The application of metrics 1, 2, and 3 varies with the discipline. Of particular importance to the evaluation of research are the differences among disciplines in the necessity and availability of funding, the role of the author in multiple-author publications, the usefulness of citation analysis and journal impact factors, and the importance assigned to presentations at meetings. Some of these variants for each department in the College of Science and Technology are discussed in Section III below.

C. Service

In compliance with the Collective Bargaining Agreement, service is not primary in evaluation of applications for promotion or tenure.

Assistant Professors in the College of Science and Technology typically carry a reduced service load, so that their effort during the tenure probationary period can be concentrated on teaching and research. Candidates for tenure and/or promotion to Associate Professor, however, should have a record of service, usually at the departmental level, that demonstrates both willingness and ability to perform successful service after tenure. Examples of expected service are participation in such departmental activities as faculty and/or student recruiting and departmental seminars.

The candidate for promotion to Professor is expected to have a sustained and productive record in departmental service. Such service may include participation on departmental committees, including chairing some of the committees. Participation in college and university committees is also expected. Active membership in professional societies is particularly important, as such activities enhance the visibility of the department and the college.

III. Application of metrics for the evaluation of research

As noted in II.B above, the application of metrics for research varies among the disciplines of the College of Science and Technology. Quantitative measures of the reputation of journals, citation frequencies, publication rates, and funding levels are useful, but cannot substitute for the informed judgment of qualified members of the discipline. This section discusses some of the variances among the disciplines. The details of this section will be updated as appropriate to reflect changes in the disciplines and the indices used.

A. Publications

The candidate for either promotion or tenure in all departments is expected to have published in high-quality peer-reviewed journals. For **most departments**, journal quality can be estimated by the Journal Impact Factor (JIF). However, care must be taken in using the JIF. *Nature* and *Science* are prestigious journals where important results are published, but these journals are for the Science community at large, and the JIF may not be useful for a given discipline.

For **Computer and Information Sciences**, in general, journals are still more prestigious than conference proceedings, but are often avoided due to the slow review process.

For **Earth and Environmental Science**, ISI catalogs only major journals and does not catalog many specialty journals, special publications, books, or other modes of research dissemination important in Geology. For example, articles in the Geological Society of America's (GSA) and American Association of Petroleum Geology's (AAPG) Special Publications, and U.S. Geological Survey Publications, also important in Geology, are not indexed by ISI (these must be evaluated separately by the department). Because Geology is a relatively small field, JIFs tend to be lower than in some other sciences.

For **Mathematics**, ISI information about mathematical journals is not particularly useful. There is some degree of correlation between the JIF and the perceived quality of the journal, but since ISI does not segregate by sub-discipline, this correlation may be misleading. For example, the highest ISI Impact Factor for a mathematics journal is for *Annals of Mathematics* (2009 data) with 4.174, but Journal of Algebra, the premier specialist journal in algebra, has an Impact Factor of only 0.632. The majority of journals have Cited Half-life > 10.0. The top three Immediacy Index ratings are 1.500, 0.875, and 0.692. The respected specialist journal *Topology* has an Immediacy Index of 0.000, and the respected specialist journal *K-theory* has no Immediacy Index listing.

For **Physics,** *Nature Physics* and *Physical Review Letters* allow for a relatively rapid publication of significant results with a limited number of pages permitted. These two journals have the highest impact factor among all physics journals, which is 15.49 for Nature Physics and 7.328 for Physical Review Letters. There is another letter format journal, *Physics Letters*, an Elsevier publication, which has an impact factor of about 5. Lengthy physics papers are often published in *Physical Review* A-E, which have impact factors between 2.4 and 4.9.

B. Meetings and conference proceedings

In **all disciplines** in the College of Science and Technology, the candidate for tenure is expected to participate actively at professional meetings and symposia, as evidenced by presentation of papers, posters, and invited plenary lectures. Invited lectures are a particularly important measure of how the scientific community views the candidate's research program. The candidate for promotion to Professor is typically expected to have been invited to participate in national and international meetings, and symposia. Conference proceedings are a venue for publication with varying values for different disciplines.

For **Computer and Information Sciences**, conferences are a major forum for publishing research results. As a standard practice, submitted papers are rigorously reviewed by at least three reviewers, and the review process takes between two and five months. The acceptance rate at major computer and information science conferences ranges between 10% and 30%. Papers in the top 2 or 3 conferences in each field of research are widely considered the most prestigious and increase authors' visibility in the field.

For **Earth and Environmental Science**, some specialties use proceedings regularly as a mode of publication (for example geophysics and geochemistry), and in these areas the papers are reviewed and become important references. Each area of Earth and Environmental Science also has different specialty journals.

In **Mathematics**, the typical venue of publication is refereed periodicals. The time between submission and print tends to be long; for the best general journals, both submission to acceptance and acceptance to print range from 7 months to over a year. Publications in serials specializing in proceedings of conferences are usually refereed, but delivery of a paper at a meeting is usually not restricted to those that have undergone a previous refereeing process.

For **Physics**, conference proceedings are a recognized form of publication, but without the same prestige and impact as refereed journals. What is important is that the contribution was invited rather than contributed. Invited contributions (especially written versions of plenary talks) are a sign of peer recognition for the impact of the work in the field. They are usually given more time for the address and more pages for the proceedings.

C. Number of papers

Expected publication rate also varies by discipline.

In **Biology**, the publication rate significantly varies as a function of sub-discipline, and reflects the specific nature and type of investigation and methodology. The publications of the candidates should be carefully evaluated with respect to excellence in quality as well as number. Typically for assistant professors there is a lag-time before the first publications of research accomplished as an independent investigator. Therefore, the total number of such publications appearing within the tenure-probationary period will be carefully considered, rather than applying a rate per se.

In **Chemistry**, a typical expectation is that the candidate for tenure should have a minimum of six publications within the evaluation period and that he/she is the corresponding author (on papers with multiple authors the initiator is usually the corresponding author and designated by an asterisk by his/her name).

In **Computer and Information Sciences**, an average rate is about two or three papers in reputable journals or refereed conferences per year.

For **Earth and Environmental Science**, with a masters program only, the publication rate is somewhat less, typically one per year or every other year. Considerable effort is given to preparing undergraduate and Masters students to present abstracts at meetings.

In **Mathematics**, the expected rate of publication is one to two papers per year in good professional journals. This rate, however, varies with the mathematical sub-discipline.

D. Citations

For **most disciplines** in the College of Science and Technology, citation counts for tenure review may not reliably indicate the quality of the work, because the candidate's publications may have appeared too recently to be frequently cited. The number of citations of mature publications gives a good sense of the importance of the work, and a significant journal citation count is an important requirement for promotion to Professor. Work that is 4 to 5 years old should have an acceptable number of citations (excluding self citations) to be judged as meeting a criterion of minimal quality.

For **Computer and Information Sciences**, Google Scholar is a commonly used tool. Moreover, the h-index is gradually gaining acceptance as one of the indicators for both the productivity and impact of the published work.

For **Earth and Environmental Science**, at present, ISI citation counts are not an adequate measure of research productivity or importance, because (as discussed above), several important modes of research dissemination are not indexed by ISI. Again, each area of Earth and Environmental Science also has different specialty journals.

Citation counts for **Mathematics** tend to be low compared to other disciplines. Their usefulness is primarily to provide positive evidence of extraordinarily important work if the count is high (>20 for a 10-15 year old paper), while lower numbers do not necessarily reflect poor quality. This is due to the highly specialized nature of mathematical research. A. Wiles's 1994 paper proving Fermat's last theorem, which is probably the most famous accomplishment in mathematics in the last century, had a citation count of 351 in February 2011. For a further comparison, the most highly cited paper of Efim Zelmanov, who won the Fields Medal (mathematics' most prestigious award) in 1990, is 62. Moreover, it is not hard to find mathematicians with distinguished named professorships at elite universities whose most highly cited papers have 30-40 citations.

As an example in **Physics**, here is a table of categories based upon work in high energy/particle and nuclear physics:

Renowned Papers (500+ citations)
Famous Papers (250-499 citations)
Very Well-Known Papers (100-249 citations)
Well-Known Papers (50-99 citations)
Known Papers (10-49 citations)
Less Known Papers (1-9 citations)
Unknown Papers (0 citations)

Therefore a paper in this sub-discipline needs at least 10 citations to be considered as known.

E. Multiple authorship of publications

The role of the author in multiple-author papers is important in determining the degree of independence of the tenure candidate. The conventions for indicating that role vary by discipline, but there are usually no fixed rules. For that reason, it is important that the candidate for promotion or tenure provide information explaining his or her authorial role. Some examples of this variation are given below.

In **Biology**, the first author is often the person who has done most of the work; the last author is often the one who mentored or led the study. Therefore these two positions may indicate a higher level of responsibility for the work. The corresponding author is also considered significant in the study. Rarely, on occasion, the corresponding author is neither the first nor the last author.

In **Chemistry**, as noted above, the initiator is usually the corresponding author and is designated by an asterisk beside his or her name.

In **Computer and Information Sciences**, a single-author paper is unusual, and a paper with more than five authors is also unusual unless an interdisciplinary topic is addressed, when teams of up to 10 authors are common. Usually, the first author contributes the most. In many cases, an advisor or senior faculty is placed as the last author. Consequently, there are no clear guidelines about author order. Junior faculty are encouraged to carry out independent research with advisees, as well as engaging in collaborative research with colleagues.

In **Earth and Environmental Science**, long author lists are less common, and typically everyone contributes significantly to papers. If there are more than 4 authors, the contribution of individual authors should be described. Author order varies. A faculty member may place a student as first author although most of the writing and design of the project was conducted by the faculty member (Masters students typically get a job before papers are submitted).

In **Mathematics** journals, authors are listed alphabetically, and are held equally responsible for the contents. The usual expectation is that all authors contribute equally. It is rare to have articles with more than three authors; most have one or two.

In **Physics**, when the number of authors is small (roughly, less than 10), all have contributed significantly to the work. In some fields, the list of authors is larger, especially in the fields of high energy, nuclear physics and plasma physics, where the size of the collaboration is often larger than fifty individuals. Usually most authors have contributed one way or another to the success of the experiment; however, when a smaller core of people has been leading the analysis effort, more research is required to identify the leaders of the experiment. Spokespersons are people who are responsible for the idea and have a full understanding of the physics of the experiment as well as its technical aspects. They are usually invited speakers at conferences. In large collaborations, it is important to see whether a given author is asked to speak as an invited guest at national and international conferences.

F. Funding

Both the necessity and the availability of funding must be considered in evaluating the candidate's scholarly achievement.

In **Biology** and **Chemistry**, success in obtaining competitive peer-reviewed external funding for the candidate's research program is expected. In these departments, it is unlikely that a candidate would be recommended for tenure without significant external funding.

Research in **Computer and Information Sciences** requires funding but most often does not require expensive equipment and technicians. As a consequence, typical grants in computer science are relatively modest, with the main cost component being funding for the PIs and graduate research assistants.

In Computer and Information Sciences, NSF provides approximately 82 percent of the total federal support for basic research at academic institutions in the field, although other federal funding agencies, including DOD, NIH, DOE, NASA, NIST, and others, also offer competitive grants. NSF and other federal agencies provide special competitive grants for junior faculty, including CAREER and Young Investigator Awards. With a few exceptions, industrial grants are weighted less.

In **Earth and Environmental Science**, external funding through grants or contracts is generally necessary for research and support of graduate students.

In **Mathematics**, funding is desirable but not critical for conducting research. It is extremely rare for a PI's mathematics research to be supported by multiple simultaneous external grants.

In **Physics**, funding in support of experimental research is critical. Funding is highly desirable in theoretical physics, but not critical.

For promotion to Professor in departments where funding is critical, continued success in obtaining competitive, peer-reviewed external funding is expected. Departments would like to see the successful renewal of those grants obtained prior to tenure, and the acquisition of new grants.

The availability of funding varies with the discipline and the area, and some types of competitive funding are more prestigious than others.

In **Biology**, the amount of individual grant awards can vary as a function of sub-discipline. For example, NIH grants for biomedical research are typically larger in amount than NSF grants for basic biological research. However, the prestige of federally funded grants is uniformly high across these agencies, reflecting intense competition for limited funds. Government agency awards also are usually greater in amount than awards from private foundations, but the latter awards also can be comparably prestigious, due to high application rates and limited pools of funds.

For **Chemistry**, funding from federal agencies is considered to be more prestigious than funding from industrial grants or contracts because of the competitive nature of federal grants, and because of the public dissemination of the results.

For **Earth and Environmental Science**, funding sources include national agencies (e.g., NSF, DOE, NASA, Departments of Interior, Agriculture, or Justice), national or state surveys or protection agencies (e.g., EPA, PaDEP, NJDEP), mining or resource extraction companies (e.g., Chevron, Schlumberger, Petroleum Research Fund), or other private sources (e.g., William Penn). These funding sources are given relatively equal weight in P and T evaluations at the department level. Amounts of funding in geology are often small, with average grants or contracts less than $100,000 per year (AGI, 2011), and may be dependent on the area of specialization. Although a Ph.D. program has recently been approved, it has not yet been implemented. The level of funding available for non-doctoral programs is generally less than for doctoral programs. Collaborative grants tend to be common.

Sources of funding for **Mathematics** research are limited. Most mathematics research is supported by the NSF, with a small number of sub-disciplines supported by other agencies. (For instance, the NSA supports research in mathematical areas it deems critical for its national security mission.) NSF standard grants in mathematics currently fall into the range of $100K to $150K for a three-year grant. Other agencies offer different levels of support, some lower and some higher.

For **Physics,** funding can range from amounts of $50,000 per P.I. per year in theoretical physics to $500,000 per year in experimental physics. NSF, DOE, DOD, and NIH are all well regarded Federal agencies to fund physics research or physics-related interdisciplinary research.