Departmental Specific Scholarship Standards
Department of Bioengineering

Effective June 2015

PREAMBLE

The Santa Clara University Faculty Handbook (3.4.2) states

"Because the nature of teaching, scholarship or artistic creativity, and service differs in some respects among academic disciplines, the faculty of the college, schools, and division develop, adopt, and publish their respective clarifications of the three criteria. Candidates for tenure or promotion are referred to these publications, as amended from time to time, for a detailed explanation of the standards and procedures by which they will be evaluated."

In accord with the Faculty Handbook, discipline-specific standards for tenure and promotion have been developed by departments or disciplinary areas to clarify the criteria and guidelines for promotion and tenure review for both candidates and evaluators. These standards should inform and guide, but not dictate, the professional review of a candidate's portfolio. As noted in the Handbook, the standards may be revised from time to time to reflect changes and refinements within the discipline.

In this document, the guidelines describe standards for scholarship within the Department of Bioengineering applicable to the evaluation of candidates for tenure and for promotion to the ranks of Associate Professor and Professor. Disciplinary and sub-disciplinary measures of quality, including specific forms of evidence, are described, including information about appropriate venues, productivity, and impact.

DISCIPLINE DESCRIPTION

Bioengineering is a highly interdisciplinary field that encompasses a broad range of sub-disciplines. The bioengineering faculty carry out research at the interfaces of engineering, physical sciences, life sciences and medicine. The National Institute of Health (NIH) defines the field of bioengineering as follows:

> *Bioengineering integrates physical, chemical, or mathematical sciences and engineering principles for the study of biology, medicine, behavior, or health. It advances fundamental concepts, creates knowledge for the molecular to the organ systems levels, and develops innovative biologics, materials, processes, implants, devices, and informatics approaches for the prevention, diagnosis, and treatment of disease, for patient rehabilitation, and for improving health* [1].

The Department educates students in three specialization tracks of bioengineering, namely medical devices, biomolecular engineering, and pre-med tracks, and prepares

them to contribute positively to the advancement of bioengineering with the ultimate goal of improving the quality of life and health. Reflecting on this goal, our scholarship standards encompass relevant technical advances, innovative applications, and effective communication of these scholarly endeavors, as detailed below.

FORMS OF EVIDENCE

Scholarly work must be original, rigorous and of high quality, demonstrating clear goals, adequate preparation, appropriate research methods, and significant results [2]. Scholarship within bioengineering typically encompasses fundamental, applied and translational research that includes innovative technology, experimental work, numerical modeling, and novel analyses of experimental and clinical data. The best work is recognized as significant, is influential within academia, may be influential in practice, and contributes to the realization of the School of Engineering's vision and mission.

Applied and translational research along with inter- and multi-disciplinary research is valued as highly as fundamental research. Furthermore, there is no requirement that the body of work displays a single unifying theme; eclectic accomplishments are valued without prejudice, as long as the entire body of scholarly work demonstrates expertise within a bioengineering sub-discipline.

Suitable venues for communicating bioengineering scholarship include peer-reviewed journals, monographs/books, book chapters and peer-reviewed conference proceedings (listed in the order of significance).

Publication in highly regarded peer-reviewed journals provides an indirect and objective basis for establishing that a publication is rigorous, significant, and of high quality. In the absence of legitimate reasons to the contrary, the Department values rigorously peer-reviewed journal publications above other publications. While faculty members are encouraged to attend and participate in relevant conferences, publication in peer-reviewed journals is generally preferred over conference proceedings. However, publication in peer-reviewed specialty conferences may be valued in cases where original results must be disseminated in a timely fashion. An often-used strategy is to publish early or incomplete results in important conferences, followed by publication of the complete work in a highly regarded journal.

While impact at national and international levels is valued over impact at the local or regional levels, work that has substantial impact at any level is also recognized. Some consideration may be given to journal impact factors, article citation counts, recognizing that these provide an objective basis for evaluating scholarly impact, but that norms may vary greatly among sub-disciplines of bioengineering, given its highly interdisciplinary nature. Highly regarded journals that are specific to disciplines may also be identified according to the SCImago Journal Rank (SJR) indicator, which accounts for both the number of citations received by a journal and the importance or prestige of

the journals where such citations come from (http://www.scimagojr.com) [3-5]. Some examples of quality journals that are recognized as tier 1 (Q1) & tier 2 (Q2) publications are listed in the appendix for multi-disciplines and several related sub-disciplines of bioengineering. This list only included representative journals that bioengineering faculty might consider for their work.

Impact on the discipline is also recognized by professional organizations (e.g., awards, distinguished invited lecturer status, or an elected fellow).

It is noteworthy that the Department currently does not have a Ph.D. program. Department faculty will typically conduct research on their own, and/or with the participation of undergraduates and MS students, or in collaboration with colleagues on SCU campus or at other institutions. Collaboration is encouraged providing that the candidate demonstrates abilities to conduct independent research and make significant contributions to the work, whether as sole-author, co-corresponding author or as a contributor in a multi-author publication. The participation of undergraduate and graduate students in a research study is valued as it contributes positively to the development, experience and problem-solving capabilities of our students and is thereby recognized as part of a candidate's teaching accomplishments.

The Department recognizes that funding is vital for some forms of research, whereas it plays a lesser role in other areas. Success in attaining external funding is not a criterion for evaluation of scholarship success or impact. However, success in securing competitive National or International funds may demonstrate a candidate's ability to develop compelling proposals on important and topical areas of research and development.

External reviewers who are competent in areas of the candidate's discipline/sub-discipline are asked to provide evaluations on the rigor, originality, and impact of the candidate's scholarly contributions, the prestige and appropriateness of the publication venues, and the value of non-publication contributions.

A candidate for tenure and promotion to Associate Professor must produce a sufficient quantity of scholarship to allow its quality to be assessed and to suggest a commitment to and a record of high-standard scholarship.

A candidate for promotion to Full Professor that is based on making distinguished scholarly contributions must establish a substantial body of work as an Associate Professor that has demonstrated excellence, impact, and recognition in the profession.

Some attributes that might impact negatively on the Department's view of scholarship include a lack of significant peer-reviewed publications or lapses in scholarly integrity (such as a lack of enforcement and poor record of safe practices in the conduct of laboratory work, and complicity in reporting fraudulent results).

UPDATES & REVISIONS

This document is to be reviewed and possibly revised by the Bioengineering Department every five years. This current version of the document was approved by the Department and finalized on May 27, 2015.

REFERENCE

[1]. NIH. Bioengineering/Biomedical Engineering definition (1997). Available from www.becon.nih.gov/bioengineering_definition.htm

[2]. Glassick, Charles E., Mary Taylor Huber, and Gene I. Maeroff (1997). Scholarship Assessed-Evaluation of the Professoriate, Jossey-Bass, Inc. Publishers.

[3]. Borja González-Pereira, Vicente P. Guerrero-Bote, "A new approach to the metric of journals' scientific prestige: The SJR indicator." Journal of Informetrics. Volume 4, Issue 3, July 2010,
Pages 379–391.

[4]. Loet Leydesdorff, "How are new citation-based journal indicators adding to the bibliometric toolbox?." Journal of the American Society for Information Science & Technology. 2009. http://arxiv.org/pdf/0909.4457.pdf

[5]. Matthew E. Falagas, Vasilios D. Kouranos, Ricardo Arencibia-Jorge, and Drosos E. Karageorgopoulos*. Comparison of SCImago journal rank indicator with journal impact factor." *The FASEB Journal* • Life Sciences Forum. Vol. 22 August 2008. Pages 2623-2628.

Appendix: A Representative List of Journals in Related Areas of Bioengineering (Retrieved from: http://www.scimagojr.com)

Subject Area: Biomedical Engineering

	Title		SJR	H index
1	Nature Biotechnology	Q1	8.666	265
2	Biomaterials	Q1	3.004	196
3	IEEE Transactions on Medical Imaging	Q1	1.665	131
4	Physics in Medicine and Biology	Q1	1.205	113
5	IEEE Transactions on Biomedical Engineering	Q1	0.789	107
6	Annual Review of Biomedical Engineering	Q1	3.558	80
7	Journal of Biomedical Materials Research - Part A	Q1	1.016	78
8	Journal of Biomechanical Engineering	Q2	0.668	77
9	Annals of Biomedical Engineering	Q1	0.812	73
10	Medical Image Analysis	Q1	1.651	69
11	PACE - Pacing and Clinical Electrophysiology	Q1	0.966	69
12	Geochemistry, Geophysics, Geosystems	Q1	2.156	61
13	Journal of Biomaterials Science, Polymer Edition	Q2	0.555	60
14	Transactions of the ASABE	Q2	0.55	60
15	Acta Biomaterialia	Q1	1.614	56
16	Medical and Biological Engineering and Computing	Q2	0.664	56
18	Physiological Measurement	Q2	0.521	53
19	Biomedical Microdevices	Q1	0.871	52
20	Photomedicine and Laser Surgery	Q2	0.627	51
21	Journal of Biomedical Materials Research - Part B Applied Biomaterials	Q1	0.755	47
22	Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine	Q2	0.527	47
23	Nanomedicine	Q1	1.403	43
24	International Journal of Artificial Organs	Q2	0.462	38
25	Tissue Engineering - Part A.	Q1	1.649	38
26	Bio-Medical Materials and Engineering	Q2	0.37	34

Subject Area: Multidisciplines

	Title		SJR	H index
1	Nature	Q1	14.747	768
2	Science	Q1	10.618	739
3	United States	Q1	5.473	485
4	PLoS One	Q1	1.512	101
5	Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences	Q1	0.905	71

Subject Area: Acoustics/Speech

	Title		SJR	H index
1	Journal of the Acoustical Society of America	Q1	0.716	105
2	IEEE Transactions on Audio, Speech and Language Processing	Q1	1.613	83
3	Acoustics, Speech and Signal Processing	Q2	0.485	65

Subject Area: Analytical Chemistry

	Title		SJR	H index
1	Analytical Chemistry	Q1	2.289	218
2	Journal of Chromatography A	Q1	2.015	147
3	Electrochimica Acta	Q1	1.415	129
4	Analytica Chimica Acta	Q1	1.536	112
5	Biosensors and Bioelectronics	Q1	2.084	106
6	Sensors and Actuators, B: Chemical	Q1	1.253	105
7	Electrochemistry Communications	Q1	1.98	100
8	Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences	Q1	1.015	99

Subject Area: Biomedical Engineering (continued)

	Title		SJR	H index
27	IEEE Transactions on Nanobioscience	Q2	0.405	33
28	BioMedical Engineering Online	Q2	0.385	30
29	Critical Reviews in Biomedical Engineering	Q2	0.389	30
30	International Journal for Numerical Methods in Biomedical Engineering	Q1	0.787	30
31	Journal of Tissue Engineering and Regenerative Medicine	Q1	0.986	29
32	Journal of Biomaterials Applications	Q1	0.673	28
33	Polymer Chemistry	Q1	1.765	28
34	Tissue Engineering - Part B: Reviews	Q1	2.436	28
35	Journal of Biomedical Nanotechnology	Q1	1.44	27
36	Regenerative Medicine	Q1	0.76	26
37	IEEE Transactions on Biomedical Circuits and Systems	Q1	1.508	25
38	Biotechnology and Bioprocess Engineering	Q2	0.531	24

Subject Area: Biophysics

	Title		SJR	H index
1	FEBS Letters	Q1	1.848	185
2	Biochemical and Biophysical Research Communications	Q2	1.049	180
3	Biophysical Journal	Q1	1.923	177
4	Analytical Biochemistry	Q2	0.801	133
5	Proteins: Structure, Function and Genetics	Q1	1.754	131
6	Current Opinion in Chemical Biology	Q1	3.684	121
7	Archives of Biochemistry and Biophysics	Q1	1.131	115
8	Medical Physics	Q1	1.309	113
9	Biochimica et Biophysica Acta - Bioenergetics	Q1	2.283	111
10	Biochimica et Biophysica Acta - Biomembranes	Q1	1.526	110
11	Annual Review of Biophysics	Q1	7.896	109
15	Biochimica et Biophysica Acta - Proteins and Proteomics	Q1	1.453	96

Subject Area: Analytical Chemistry (continued)

	Title		SJR	H index
9	Rapid Communications in Mass Spectrometry	Q2	0.886	94
10	TrAC - Trends in Analytical Chemistry	Q1	2.062	94
11	Analyst, The	Q1	1.316	92
12	Talanta	Q1	1.254	92
13	Analytical and Bioanalytical Chemistry	Q1	1.184	89
14	Electroanalysis	Q2	0.95	84
15	Journal of Pharmaceutical and Biomedical Analysis	Q1	1.057	75

Subject Area: Biochemistry

	Title		SJR	H index
1	Journal of Biological Chemistry	Q1	2.723	372
2	Annual Review of Biochemistry	Q1	21.509	210
3	Trends in Biochemical Sciences	Q1	7.693	200
4	FASEB Journal	Q1	2.5	198
5	Biochemical Journal	Q1	2.494	185
6	FEBS Letters	Q1	1.848	185
7	Biochemical and Biophysical Research Communications	Q2	1.049	180
8	Biochemistry	Q1	1.732	177
9	Free Radical Biology and Medicine	Q1	1.732	167
10	Journal of Neurochemistry	Q1	1.754	162
11	Tetrahedron	Q2	1.133	158
12	Organic Letters	Q1	2.804	149
13	Molecular Biology and Evolution	Q1	3.957	145
14	FEBS Journal	Q1	1.658	139
15	BioEssays	Q1	2.424	135
16	Analytical Biochemistry	Q2	0.801	133

Subject Area: Clinical Biochemistry

	Title		SJR	H index
1	Bioinformatics	Q1	4.223	204
2	Free Radical Biology and Medicine	Q1	1.732	167
3	Clinical Chemistry	Q1	2.093	142
4	American Journal of Physiology - Cell Physiology	Q1	1.643	125
5	Electrophoresis	Q1	1.196	125
6	Journal of Cellular Physiology	Q1	1.608	118
7	Bioconjugate Chemistry	Q1	1.814	111
8	Crystallography	Q1	12.003	100
9	Lab on a Chip - Miniaturisation for Chemistry and Biology	Q1	2.094	98
10	BioTechniques	Q2	0.894	91
11	Analytical and Bioanalytical Chemistry	Q1	1.184	89
12	Cell and Tissue Research	Q1	1.143	87
13	Clinica Chimica Acta	Q2	0.795	86
14	Cellular Microbiology	Q1	2.428	85
15	Molecular and Cellular Biochemistry	Q2	0.799	85
16	Journal of Biomedical Optics	Q1	1.024	77

Subject Area: Medicine- OtoLaryngology

	Title		SJR	H index
1	Laryngoscope	Q1	0.755	93
2	Head and Neck	Q1	1.11	77
3	Otolaryngology - Head and Neck Surgery	Q1	0.872	75
4	Otology and Neurotology	Q1	1.15	65
5	Ear and Hearing	Q1	1.719	63
6	International Journal of Oral and Maxillofacial Surgery	Q1	0.834	59
7	Annals of Otology, Rhinology and Laryngology	Q1	0.876	56
8	Acta Oto-Laryngologica	Q1	0.697	53

Subject Area: Physiology

	Title		SJR	H index
1	Circulation	Q1	6.258	429
2	Physiological Reviews	Q1	15.156	228
3	Circulation Research	Q1	4.775	224
4	Journal of Neurophysiology	Q1	2.188	165
5	Spine	Q1	1.447	156
6	Journal of Physiology	Q1	2.1	153
7	Annual Review of Physiology	Q1	9.129	146
8	Human Reproduction	Q1	2.172	145
9	American Journal of Physiology - Heart and Circulatory Physiology	Q1	1.52	131
10	American Journal of Physiology - Endocrinology and Metabolism	Q1	2.005	130

Subject Area: Medicine- OtoLaryngology (continued)

	Title		SJR	H index
9	Audiology and Neuro-Otology	Q1	1.537	50
10	Journal of Voice	Q1	0.746	48