PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Brandon T. Ruotolo, associate professor of chemistry, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of chemistry, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2004	Texas A&M, College Station
B.S.	1999	St. Louis University, St. Louis

Professional Record:

2015 – present	Associate Professor, Department of Chemistry, University of Michigan
2009 – 2015	Assistant Professor, Department of Chemistry, University of Michigan
2004 – 2009	Post-doctoral Associate and Waters Research Fellow, Cambridge University

Summary of Evaluations:

Teaching – Professor Ruotolo has taught four different courses since his last promotion: Chem 246/7, Chem 447, Chem 647, and Chem 646. Student evaluations for Chem 447 and 647 have been almost completely above four. Student evaluations for Chem 246/7 are in the range of 3.68-4.14, which is comparable to other fine professors teaching this course. By stepping into so many different courses over a two-and-a-half-year period, he has shown remarkable willingness to take on courses that are needed by the department. His overall evaluations have been good. Professor Ruotolo has directed eleven undergraduate students in his research lab and his graduate students have all been in demand for good positions.

Research – Professor Ruotolo is an analytical chemist specializing in developing mass spectrometry methods for determining structural properties of proteins, proteins bound to drugs, protein-protein complexes, and misfolded proteins, such as those involved Alzheimer's Disease. He has developed and applied several new methods in this space. He developed new reagents that enhance the ability to break down proteins in the gas phase to allow structural determination, a process called "top down proteomics." Similarly, he has developed methodology for cross-linking proteins and determining their native interactions in cells. He has developed a technique called "collisional induced unfolding" in which he measures the gas-phase unfolding of proteins as progressively larger amounts of energy are put into the molecules. This experiment allows determination of the stability of different parts of the protein and how it is affected by chemical modifications and drug binding. This information is valuable for better understanding how drugs affect target proteins and to characterize proteins that are used as drugs ("biotherapeutics"). The creativity, significance, and quantity of his research have been excellent.

Recent and Significant Publications:

"Chemical probes and engineered constructs reveal a detailed unfolding mechanism for a solvent-free multi-domain protein," with J. D. Eschweiler and R. M. Martini, *Journal of the American Chemical Society*, 139, 2017, pp. 534-540.

"Structure-mechanism-based engineering of chemical regulators targeting distinct pathological factors in Alzheimer's disease," with M. W. Beck, et al., *Nature Communications*, 7, 2016, p. 13115.

"Ion mobility-mass spectrometry analysis of crosslinked intact multiprotein complexes: Enhanced gas-phase stabilities and altered dissociation pathways," B. M. Samulak, et al., *Analytical Chemistry*, 88, 2016, pp. 5290–5298.

"CIUSuite: A quantitative analysis package for collision induced unfolding measurements of gas-phase protein ions," J. D. Eschweiler, et al., Anal. Chem. (2015), 87, 11516-11522.

Service – Professor Ruotolo has served reliably on several important departmental committees, most notably the Long-range Planning Committee and a faculty search that resulted in an important hire. He has taken the lead in improving the mass spectrometry facility. Several new hires have requested him as mentor. Besides a high level of internal service, Professor Ruotolo has been active in service to his field, including organization of a conference for mass spectrometry that brought 116 scientists to Ann Arbor, including many of the leading players in the field. Overall, his service has been excellent.

External Reviews:

Reviewer (A)

"In brief, Brandon is a highly talented scientist who has established both a national and international reputation for research excellence. He is well-funded and well-published, has a large and active research group, and still manages to carry a substantial service load."

Reviewer (B)

"Dr. Ruotolo is both an established and continually rising star in the area of development of new ion mobility native mass spectrometry methods primarily for characterization of proteins and protein complexes in the context of structural biology. … In addition to his outstanding scientific achievements, Dr. Ruotolo has proven to be an active leader in the ion mobility and mass spectrometry communities. … I would rank him in the top 10% of analytical professors seeking promotion."

Reviewer (C)

"…I have always found Brandon to be an energetic and positive member of the discipline. Just one example is his recent organization of a very well received conference on native mass spectrometry. Overall, I rate Brandon Ruotolo to be an accomplished, creative expert in ion mobility techniques, and a world leader in the arena of native mass spectrometry."

Reviewer (D)

"…without question he has emerged as a leading figure in the general area of structural biology through the use of cutting edge mass spectrometry techniques. This is in my opinion the most exciting new area to make use of the power of mass spectrometry analysis and Brandon's development of collision energy scans …is breathtakingly beautiful – and certainly worthy of promotion. Brandon's creativity is high."

Reviewer (E)

"Prof. Ruotolo has an excellent reputation and has been well recognized amongst his peers. …I would place him in the top quartile [in his cohort] nationally. …Brandon has lots of ideas and the results is high productivity. He combines…someone who is deeply knowledgeable about the fundamentals of mass spectrometry, with software development skills…and with strong biological knowledge."

Reviewer (F)
"Brandon ranks among the best of the mass spectrometrists [in his cohort] who are working in biophysics and biochemical applications of mass spectrometry. … He is highly published, sufficiently funded, and is educating graduate students. His work is imaginative, and his papers well written. His career slope is on upswing."

Reviewer (G)
"In my opinion, Brandon Ruotolo is an excellent candidate for promotion to Professor. Clearly, he has developed a world-class research program and he has embraced collaborations both with UM researchers but also from around the world. Groups seek to collaborate with Brandon because of the quality of his work and also because of the special insight that he can deliver to the problem. … The fact that at least two mass spectrometry vendors are trying to incorporate his CIU method into their instrument platforms indicates the widespread adoption of the technique. … Brandon is in the top echelon relative to his peers at the same career stage."

Reviewer (H)
"The research also shows a high level of creativity and the ability to think at a chemical/ molecular level. …[he] has a clear ability to develop integrated approaches to bring meaning to sets of data that others might not develop as fully; the scholarly impact is high because he not only sees the big picture but paints it in a manner that makes it highly accessible to others. … His publication record is outstanding and his funding record is strong."

Summary of Recommendation:
Professor Ruotolo has developed new techniques to determine many aspects of protein structure with relevance to biological chemistry, pharmaceuticals, and protein misfolding diseases. He has taught a wide variety of courses well and provided important service through improvement of technical services, mentoring, and leading a faculty search. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Brandon T. Ruotolo be promoted to the rank of professor of chemistry, with tenure, College of Literature, Science, and the Arts.

Andrew D. Martin, Dean
Professor of Political Science and Statistics
College of Literature, Science, and the Arts

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