

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

Paul M. Zimmerman, assistant professor of chemistry, College of Literature, Science, and the Arts, is recommended for promotion to associate professor of chemistry, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2010	Stanford University
B.S.	2005	University of California, Berkeley

Professional Record:

2012 – present	Assistant Professor, Department of Chemistry, University of Michigan
2010 – 2012	Post-doctoral Associate, University of California, Berkeley

Summary of Evaluations:

Teaching – Professor Zimmerman has a strong teaching record, which includes a graduate course (taught three times) and an undergraduate course (taught four times). For a physical chemistry course (CHEM463), he innovated the use of the theme of sustainability to teach thermodynamics and kinetics, thus relating the abstract concepts to timely, real world problems. His student evaluations have all been above 3.8 and 4.3 for Q1 and Q2. These scores equal or exceed the evaluations received by other professors teaching the same courses and are within the range of other successful teachers. Professor Zimmerman has worked with three undergraduate students and fourteen graduate students in his research program. The number of graduate students is impressively large, especially for a theoretical chemist. He has been an extremely popular choice among the physical chemistry students and has attracted students from other areas of chemistry as part of his collaborative research.

Research – Professor Zimmerman is a theoretical physical chemist who is interested in how to use quantum mechanical (QM) theory to predict reactions and reaction mechanisms; determine electronic structure of molecules; and help design materials that harvest energy from light. Because QM equations are intractable to solve for nearly all realistic chemical systems, Professor Zimmerman has developed approximations and tools that enable the theory to be practically applied to his target research areas. The most exciting work has been his Zstruct and Growing String simulation methodology that allows one to predict the mechanisms of complex organic chemistry reactions. His method has been successfully used in a host of applications on a wide range of reaction types providing clarity and understanding to experimental results. His new method of electronic structure prediction is a promising breakthrough for accurate calculation of structure and properties of molecules at a fraction of the computational cost of existing methods. He has published over 30 papers from Michigan, including a collaborative study in *Nature* and an impressive five research articles in the *Journal of the American Chemical Society* or *Angewandte Chemie*, both of which are top tier chemistry journals.

Recent and Significant Publications:

“Incremental full configuration interaction,” *Journal of Chemical Physics*, 146, 2017, p. 104102.

“Experimental and computational assessment of reactivity and mechanism in C(sp³)-N bond-forming reductive elimination from Palladium(IV),” with I. M. Pendleton, et al., *Journal of the American Chemical Society*, 138, 2016, pp. 6049-6060.

“Highly active nickel catalysts for C-H functionalization identified through analysis of off-cycle intermediates,” with A. J. Nett, et al., *Journal of the American Chemical Society*, 137, 2015, pp. 7636-7639.

“Automated discovery of chemically reasonable elementary reaction steps,” *Journal of Computational Chemistry*, 34, 2013, pp. 1385-1392.

Service – Professor Zimmerman has served on several important departmental committees, including graduate student recruiting and twice on faculty search committees. For the university, he is on the Steering Committee for the Michigan Institute for Computational Discovery and Engineering. He has also been active for his field by hosting the 21st Midwest Undergraduate Computational Chemistry Consortium (MU3C) Conference and co-organizing the Midwestern Theoretical Chemistry Conference.

External Reviews:

Reviewer (A)

“...Paul is an expert in molecular electronic structure (quantum chemistry) with a broad spectrum of big developments in the field. ...[he] has developed very powerful reaction mechanism discovery tools that are at the top of the field regarding sophistication. I believe these tools will be widely employed and that the impact of his work will continue to grow...”

Reviewer (B)

“I believe that Professor Zimmerman excels in all areas in which one would expect excellence as an assistant professor, with a very balanced record of accomplishment. ... He appears to be an excellent researcher, as measured by his publication output, its impact, and his funding success in competitive venues. I believe you have a star on your faculty in Professor Zimmerman...”

Reviewer (C)

“...Professor Zimmerman has had an *outstandingly* productive...career at Michigan. ... Considering other faculty [in his cohort] in the U.S. with roughly similar interests, I would say that Professor Zimmerman stands very much in the front ranks.”

Reviewer (D)

“...he has developed a very powerful way to search for novel reaction pathways automatically. These contributions would already justify promotion to tenure. ...Prof. Zimmerman has written 5 papers with 5 different experimentalists in 5 different fields, for each of which he extracts novel mechanisms and uses these mechanisms to suggest new experiments. This is really impressive research. ... you have a rapidly rising superstar on your faculty...”

Reviewer (E)

“To my knowledge, Paul Zimmerman was the first person to devise an *efficient* procedure to intentionally search for unexpected chemical reactions. ... Although several capable research groups are actively working in this area of automated reaction search...Zimmerman has

maintained a significant lead over his competitors. He is clearly the world leader in this subfield...”

Reviewer (F)

“In a baseball nutshell, Paul has taken the research opportunity that Michigan has provided, and hit it out of the park. He has made substantive contributions to electronic structure theory, to computational methodologies for the study of catalysis and reaction mechanism, and to specific chemical applications to numerous complex systems...”

Reviewer (G)

“Zimmerman is among the top rank of untenured faculty in his field. ... He is well-supported and aggressive about seeking funding. ... I believe he has made important impacts in his field and will prove to be an outstanding member of the Michigan faculty in the future.”

Reviewer (H)

“Overall, Zimmerman seems to have been productive and has definitely established his ability to provide theoretical support to experimental projects. He has been able to modify a number of methods for reaction path searches and recast them in the context of discovery tools.”

Summary of Recommendation:

Professor Zimmerman has developed new approaches to predict chemical reactions and properties in silico that enable accurate elucidation of reaction mechanisms, design of reactions, and design of molecules with desired properties. He has consistently provided high quality instruction, including fresh approaches that relate chemistry to important societal issues, to both undergraduate and graduate students. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Assistant Professor Paul M. Zimmerman be promoted to the rank of associate 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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