

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

Heather A. Carlson, assistant professor of medicinal chemistry, College of Pharmacy, and assistant professor of chemistry, College of Literature, Science, and the Arts, is recommended for promotion to associate professor of medicinal chemistry, with tenure, College of Pharmacy, and associate professor of chemistry, without tenure, College of Literature, Science, and the Arts.

Academic Degrees:

B.S.	1991	North Central College, Naperville, Illinois (<i>Magna Cum Laude</i>)
M.S.	1992	Yale University
Ph.D.	1997	Yale University

Professional Record:

2002-present	Faculty Associate, Bioinformatics Graduate Program
2001-present	Faculty Associate, Biophysics Research Division
2001-present	Assistant Professor of Chemistry, College of Literature, Science, and the Arts
2000-present	John Gideon Searle Assistant Professor of Medicinal Chemistry and Assistant Professor of Medicinal Chemistry, College of Pharmacy, University of Michigan
1997-2000	Postdoctoral Fellow, University of California, San Diego

Summary of Evaluation:

Teaching. Dr. Carlson is an extremely dedicated and gifted teacher, who is very responsive to the needs of her students. She participates fully in the graduate professional and graduate curricula at the College of Pharmacy and also contributes to the teaching programs in the Department of Chemistry and the Biophysics Research Division. Dr. Carlson has refined her teaching approach in the pharmacy graduate professional curriculum over the last few years in response to the needs of her students, shifting from a memorization-based approach to one that emphasizes key concepts, critical thinking, and problem solving. The results have been phenomenal, and her student evaluation ratings are among the best in the College. Dr. Carlson was chosen by the graduate professional students for a teaching award this past year in the College of Pharmacy.

Dr. Carlson applies a similar approach in her graduate sections on computer-aided drug design and proteomics, where she has placed the emphasis on learning key concepts and using available tools and resources to evaluate structural data and drug target potential for specific proteins. This very "hands-on" approach has been very successful and well-received by her students. She also is an excellent mentor for graduate students and postdoctoral research fellows. She currently mentors eight Ph.D. students from various departments at the University. She also mentors research rotation students and serves on preliminary and doctoral examination committees within the Department of Chemistry, as well as in Medicinal Chemistry. She is held in very high regard by her students, and their accomplishments reflect the excellent training they have received under her direction.

Dr. Carlson's growth as a teacher during her first few years at the University has been outstanding and is worthy of high praise. It is clear that she is responsive to the students' needs and wishes, while still maintaining high expectations. Her emphasis on critical thinking and problem solving cultivate the most important skills that students need to refine.

Research. Dr. Carlson's research productivity and impact have been very strong during her initial years in the College. She takes a multidisciplinary approach to her work, and her achievements in computational chemistry/drug design have been focused in two key areas. The first is the breakthrough approach of incorporating protein flexibility in computations of protein-ligand interactions (the MPS Pharmacophore Method), a concept she conceived and developed as a postdoctoral research fellow.. This approach has tremendous potential. The second area in which Dr. Carlson has had a significant impact is through the development of her database of protein-ligand complexes (Binding MOAD). This database will serve as an important internal resource for assessing methodological advancements of her own group as well as being a potentially invaluable aid to the drug design community as a whole.

Since 2002, Dr. Carlson has published 13 papers on her independent research, with three more under review. These papers have appeared in prominent journals and have attracted considerable attention, one being highlighted in *Nature Reviews Drug Discovery* (2004) and one in *C&E News* (2005). She is highly sought after for seminars and symposium talks, having given over 20 external presentations since 2000, including invited lectures at national American Chemical Society and Gordon conferences. Dr. Carlson has also been quite successful in securing external funding to support her research, which includes federal support and a Beckman Foundation Young Investigator Award.

Recent and Significant Publications:

- X-J Tan, HA Carlson. Docking studies and ligand recognition in foloypolyglutamate synthetase. *J. Med. Chem.*, **submitted**.
- RD Smith, L Hu, JA Falkner, ML Benson, JP Nerothin, HA Carlson. Exploring protein-ligand recognition with Binding MOAD. *J. Mol. Graphics Model.*, **in press**.
- JY Kravitz, VL Pecoraro, HA Carlson. Quantum mechanics/molecular mechanics calculations of the Vanadium Dependent Haloperoxidase. *J. Chem. Theory Comput.*, **in press**.
- L Hu, ML Benson, RD Smith, MG Lerner, HA Carlson. Binding MOAD (Mother of All Databases). *Prot. Struct. Func. Bioinformatics*, **2005**, 60, 333-340.
- H Zhong, HA Carlson. Computational Studies and Peptidomimetic Design for the Human p53-MDM2 Complex. *Prot. Struct. Func. Bioinformatics* **2005**, 58, 222-234.
- KL Meagher, HA Carlson. Incorporating protein flexibility in structure-based drug discovery: Using HIV-1 protease as a test case. *J. Am. Chem. Soc.*, **2004**, 126, 13276 - 13281.
- LM Sandvoss, HA Carlson. Conformational behavior of α -proline oligomers. *J. Am. Chem. Soc.* **2003**, 125, 15855-15862.
- KL Meagher, LT Redman, HA Carlson. Development of polyphosphate parameters for use with the AMBER force field. *J. Comput. Chem.* **2003**, 24, 1016-1025.

Service. Dr. Carlson has demonstrated a strong commitment to professional service within the University, as well as nationally. She serves on several important committees at the College of Pharmacy, serves as an alternate to the University Senate, and is an active member of the

Chemistry Department. Since 2001, she has played a critical role in the Department of Medicinal Chemistry, serving as the director of graduate recruiting. This is a highly time consuming but critical task that greatly impacts the success of the graduate recruitment effort, and she has done an excellent job at this. She also actively participates in student and faculty recruitment efforts and in the visiting lecturer program within the Department of Chemistry.

Dr. Carlson is active on the national level, having recently organized a large symposium, with 36 invited talks, for the 225th National American Chemical Society Meeting in 2003, for which her responsibilities encompassed fundraising, program planning, and allocation of travel grants. She has also been active in the review of manuscripts for many journals and serves as an associate editor for *Annual Reports in Computational Chemistry*. Dr. Carlson has been increasingly called upon to lend her expertise to grant review. She has served as an ad hoc reviewer for the National Science Foundation and the American Chemical Society and has served on several special emphasis panels for the National Institutes of Health. Dr. Carlson has been an excellent citizen of the University and her profession.

External Reviewers:

Reviewer A: "Dr. Carlson has established a significant national reputation, and a nontrivial international one as well..."

Reviewer B: "In my opinion, Heather Carlson is an outstanding scientist [of her generation] with an excellent background; highly recognized for her contributions to drug design..."

Reviewer C: "Carlson is clearly the 'full package,' demonstrating excellence in research, teaching, and service."

Reviewer D: regarding the MPS Pharmacophore approach: "[Dr. Carlson] took a step that I can only call *brilliantly creative*, she conceived of, implemented, and demonstrated the promise of what is now called the 'dynamic pharmacophore model'."

"In addition to her stellar work in research, Dr. Carlson has proven to be highly motivated and exceptionally gifted as an educator."

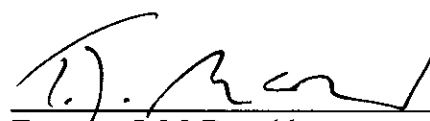
Reviewer E: "Dr. Carlson is an outstanding scientist [of her generation] who will make a strong impact in the molecular recognition/molecular modeling field."

Summary of Recommendation:

Dr. Carlson is a highly regarded researcher and educator who has made key contributions to developing a strong interdisciplinary academic computational chemistry program at the University of Michigan. She is an accomplished investigator with a national reputation who has inexhaustibly contributed to the teaching, research, and service missions of the University. It is with the support of the Promotion Review Committee and the Executive Committees of the College of Pharmacy and College of Literature, Science, and the Arts that we enthusiastically recommend her for promotion to associate professor of medicinal chemistry, with tenure, in the College of Pharmacy and associate professor of chemistry, without tenure, in the College of Literature, Science, and the Arts.



Frank J. Ascione
Dean, College of Pharmacy



Terrence J. McDonald
Dean, College of Literature, Science, and the Arts

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