Approved by the Regents
May 19, 2011

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

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

Academic Degrees:

Ph.D.	1997	Yale University, New Haven, CT (physical chemistry)
M.S.	1992	Yale University, New Haven , CT (physical chemistry)
B.S.	1991	North Central College, Naperville, IL (mathematics, chemistry, and physics)

Professional Record:

2006-present	Associate Professor of Medicinal Chemistry, with tenure, College of Pharmacy, University of Michigan
2006-present	Associate Professor of Chemistry, without tenure, College of Literature, Science, and the Arts, University of Michigan
2001-2006	Assistant Professor of Chemistry, College of Literature, Science, and the Arts, University of Michigan
2000-2006	Assistant Professor of Medicinal Chemistry, College of Pharmacy, University of Michigan

Summary of Evaluation:
Teaching: Professor Carlson is a very dedicated educator who has an outstanding teaching record at the University of Michigan. She actively participates in didactic teaching of professional students. Her success in this area is particularly impressive because she is a non-pharmacist educating pharmacy students. She uses an innovative approach, incorporating an emphasis on critical thinking and problem solving skills, which has been extremely successful. As course coordinator for one of our medicinal chemistry courses, she spent considerable time in reorganizing and modernizing the content, as well as identifying the most qualified people on campus to teach each of the topics. Her commitment to professional students is acknowledged by student evaluations of her teaching and their selection of her for the Pharmacy Student Appreciation Award for Excellence in Teaching in 2005. In addition to her education of professional students, Professor Carlson has also been an excellent teacher for graduate students. She recently served as course coordinator for our graduate student presentation course in medicinal chemistry. Under her leadership, this course was totally revamped to raise the standard of the students' presentations and increase the quality of papers reviewed, and a new quantitative measure was established to assess the students' performance. This assessment tool is now used by at least one other department outside of the College of Pharmacy. For her overall performance as an educator, Professor Carlson was the recipient of the College of Pharmacy's Teaching Excellence Award in 2007. She is also an excellent mentor to pharmacy and graduate students in medicinal chemistry, chemistry, biophysics, and bioinformatics. Professor Carlson's positive impact through mentoring is reflected in the success of her students, who have won numerous local and national awards including, two American Chemical Society Medicinal Chemistry Fellowship awards.

Research: Professor Carlson has made outstanding contributions to the scientific community. Her achievements in computational chemistry/drug design and the development and curation of her database of protein-ligand complexes have had a significant impact. Her publications in high-impact journals have been outstanding and several times have attracted wider, national attention as pivotal works in her field and have even been featured as cover articles. Her work is highly cited, and she has received numerous invitations to present her work. She has been selected as a Novartis Lecturer and is the recipient of numerous prestigious awards including: an NSF Career Award; the Corwin Hansch Award; and the Wiley International Journal of Quantum Chemistry Young Investigator Award. Her funding has been quite exceptional with major grants from both the NIH and NSF, and she was the first person in the College of Pharmacy to receive a U-type NIH grant. The real importance of this award is that researchers from other departments and colleges on campus have been brought together for a common research focus. This accomplishment under her leadership has highlighted the role of the College as a center for collaboration for drug product research and discovery.

Recent and Significant Publications:

HA Carlson, RD Smith, NA Khazanov, PD Kirchhoff, JB Dunbar Jr, ML Benson. Fundamental differences between high- and low-affinity complexes of enzymes and non-enzymes. *J. Med. Chem.* 2008, *51*, 6432-6441.

MG Lerner, KL Meagher, HA Carlson. Automated clustering of probe molecules from solvent mapping of protein surfaces. *J. Comput.-Aided Mol. Des.* 2008, *22*, 727-736.

KL Damm, PMU Ung, JJ Quintero, JE Gestwicki, HA Carlson. A poke in the eye: Inhibiting HIV-1 protease through its flap-recognition pocket. *Biopolymers* 2008, *89*, 643-652.

AL Bowman, Z Nikolovska-Coleska, H Zhong, S Wang, HA Carlson. Small molecule inhibitors of the MDM2-p53 interaction discovered by ensemble-based receptor models. *J. Am. Chem. Soc.* 2007, 129, 12809-12814.

KL Damm, HA Carlson. Exploring experimental sources of multiple protein conformations in structure-based drug design. *J. Am. Chem. Soc.* 2007, *129*, 8225-8235.

KL Damm, HA Carlson. Gaussian-weighted RMSD superposition of proteins: A structural comparison for flexible proteins and predicted protein structures. *Biophys. J.* 2006, *90*, 4558-4573.

RD Smith, L Hu, JA Falkner, ML Benson, JP Nerothin, HA Carlson. Exploring protein-ligand recognition with Binding MOAD. *J. Mol. Graphics Model.* 2006, *24*, 414-425.

L Hu, ML Benson, RD Smith, MG Lerner, HA Carlson. Binding MOAD (Mother of All Databases). *Prot. Struct. Func. Bioinformatics* 2005, *60*, 333-340.

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.

Service: Professor Carlson has compiled an excellent service record to the University and her profession which is very consistent with her rank as an associate professor. She has worked on several College of Pharmacy committees and currently serves on the College's Executive Committee and Pharm.D. Admissions Committee. She was a member on 50 Ph.D. thesis committees, and has served on one tenure review committee. During her time as director of recruiting for Medicinal Chemistry, she was successful in increasing both the number and quality of the students admitted to the program and developed several recruiting procedures which are still in place in the department. She is also involved in activities within the Department of Chemistry, the Biophysics Graduate Program, and the Bioinformatics Graduate Program. Professor Carlson is a dedicated citizen of her profession, serving on special emphasis panels and as a reviewer for the NIH, NSF and American

Chemical Society. She recently organized a symposium for the 240th National American Chemical Society Meeting (2010). She serves on the editorial boards of two professional journals and is an ad hoc reviewer of 24 professional journals. The data resources she has developed and maintained through her research serve as valuable resources to the scientific community, which is a significant contribution.

External Reviewers:
Reviewer A: "Another positive aspect of her work is that a number of these papers are collaborative in nature, providing evidence of significant breadth in her research interests as well as her ability to contribute to the types of large-scale projects that are now required to move science forward in the genomic era…."

Reviewer B: "The overall impact of this work has been significant….it is clear that peer review panels at both NIH and NSF (where applications are subjected to considerable scrutiny by knowledgeable reviewers) have been enthusiastic about the quality of work….adjectives like 'excellent' and 'outstanding' certainly fit the work that Dr. Carlson has done so far…."

Reviewer C: "Dr. Carlson's research…has been well-conceived and has attracted significant attention, strong journal citations, and ongoing NIH funding…Dr. Carlson has undertaken a major effort, funded by a unique U01 grant from the NIH, to develop a community data resource....It has the potential to advance the field substantially and Dr. Carlson has made an excellent beginning with her data collection efforts….Dr. Carlson's teaching appears to be another real strength."

Reviewer D: "… Prof. Carlson's work has had a major positive impact on the field…with her research well known and acknowledged in the field…. I would estimate Prof. Carlson's standing to be in the top 15% of researchers in structure-based drug design…."

Reviewer E: "Dr. Carlson has developed an excellent research program….Also impressive is Dr. Carlson's leadership on the U01 program….her ability to obtain that funding speaks to her status in the field….I am impressed by Dr. Carlson's career progress to date….I am highly confident that Dr. Carlson will expand her reputation as a leader in the field of computer-aided drug design…."

Reviewer F: "Dr. Heather Carlson is a great expert on ligand binding, drug discovery and design…. Dr. Carlson contributes actively to the scientific community….Her efforts with the Binding MOAD is extremely impressive and of great value for the entire scientific community."

Reviewer G: "She has an outstanding publication, in first-rate international journals and an outstanding record of National funding. This track-record is complemented by an excellent record of teaching and service….she has made seminal contributions…."

Reviewer H: "Here her contribution is very significant….this research direction represents a highly useful and much appreciated service to the community…."

Reviewer I: "Dr. Carlson's track record…speaks clearly to her independence and very significant growth trajectory…. It is quite clear that Dr. Carlson is a very effective and dedicated teacher and mentor….I continue to be very impressed with Dr. Carlson's accomplishments thus far, and I fully expect a continuing upward trajectory….I would rank Dr. Carlson among the very best academic scientists at this stage of her career."

Summary of Recommendation: Professor Carlson is an outstanding scholar whose performance in teaching, research, and service is exemplary. She has demonstrated a strong commitment to furthering the objectives and goals of the University of Michigan, is a dedicated teacher, and is a recognized leader in her field. It is with the enthusiastic support of the Executive Committees of the College of Pharmacy and College of Literature, Science, and the Arts that we recommend Heather A. Carlson for promotion to professor of medicinal chemistry, with tenure, College of Pharmacy, and professor of chemistry, without tenure, College of Literature, Science, and the Arts.

Frank J. Ascione
Dean, College of Pharmacy

Terrence J. McDonald
Arthur F. Thurnau Professor, Professor of History and Dean, College of Literature, Science, and the Arts

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