Approved by the Regents
May 19, 2011

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

Udo Becker, associate professor of geological sciences, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of geological sciences, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	1995	Virginia Polytechnic Institute and State University
B.S./M.S.	1992	Universität Bayreuth
B.S./M.S.	1990	Universität Bayreuth and the University of East Anglia

Professional Record:

2002 – present	Associate Professor (tenured in 2007), Department of Geological Sciences, University of Michigan
1997 – 2002	Assistant Professor, Department of Geosciences, Universität Münster
1995 – 1996	Research Associate, Manchester University

Summary of Evaluation:

Teaching – Professor Becker's record is most notable for the amount of teaching that he has done, the total number and the different courses he has taught in the last five years. All of his courses require that students complete projects for which they must learn to use various analytical instruments. Professor Becker has been fully engaged with the mentoring of graduate students in geological sciences and numerous students across Michigan's campus.

Research – Professor Becker is a mineralogist who studies the thermodynamic and kinetic properties of minerals and nanoparticles, with a focus on mineral surfaces. He uses surface-sensitive analytical tools (e.g., atomic force and scanning tunneling microscopes) combined with molecular dynamic computations to understand the reactivity of mineral surfaces, most especially with water. Professor Becker's research is highly interdisciplinary, with an emphasis on environmental issues that range from heavy metal transport from mining sites, bio-mineralization mechanisms, and optimizing repository materials for high-level radioactive waste. He publishes in a diverse suite of journals including those in the earth sciences, environmental sciences, engineering, dentistry, and physics. He is continually developing new collaborations across Michigan's campus and most recently developed new projects with colleagues in the Department of Civil and Environmental Engineering.

Recent and Significant Publications :

"Nanoscale manipulation of the properties of solids at high pressure with relativistic heavy ions," with M. Lang, et al., *Nature Materials*, 8(10), 2009, pp. 793-797.

"Computational study of the effect of pressure on the Ti-in-zircon geothermometer," with E.D.A. Ferriss and E. Essene, *European Journal of Mineralogy*, 20(5), 2008, pp. 745-755.

"Growth and surface characterization of sputter deposited molybdenum oxide thin films," with C. V. Ramana, et al., *Applied Surface Science*, 253, 2007, p. 5368-5374.

"High pressure structural changes in pyrochlore $Gd_2Zr_2O_7$," with F. X. Zhang, et al., *Physical Review B*, 76, 2007, 214104.

Service – Professor Becker's departmental service has included the Executive, Graduate Student Admissions, and Undergraduate Advising committees, in addition to a search committee for the geomicrobiology faculty position. At the University level, he has served on the Senate Assembly and on Rackham's Predoctoral Fellowship Award Committee. He is currently associate editor for *Geochemical Transactions*, and has been associate editor for *Geochmica et Cosmochimica Acta* and *American Mineralogist*. He has consistently engaged in outreach activities, including the Michigan Math and Science Scholar Program.

External Reviews:

Reviewer (A)

"…Udo's research portfolio includes more than this one research area [mineral surface geochemistry]. His work on actinide materials is absolutely first rate… …he has more than cleared the high bar set by the University of Michigan for promotion to Full Professor."

Reviewer (B)

"The record is impressive for all the right reasons. … His research represents the main stream of geochemistry, and perhaps the most useful form of geochemistry in that he is concerned about predicting which phases are stable under a given set of conditions. … He is certainly among the top 15% or so and is a solid, well-respected scientist."

Reviewer (C)

"…the volume and quality of his published work is strong; the majority is published in journals of good international standing and a significant proportion in these of the highest impact. His work is well cited and indeed has the level of recognition appropriate for a full professor. His work is also well funded by a variety of funding agents."

Reviewer (D)

"Becker is active in a number of 'hot' areas of research… His approach centers on computational methods that model structures and energetic of systems. With the advent of mature computational packages, these programs are becoming tools of the trade. … It is expected that the usefulness and popularity of these methods will only increase in the future."

Reviewer (E)

"He has become a world leader in both surface geochemistry and computational mineralogy. He publishes profusely in a number of different first-rate journals in several different fields. … He has established a strong experimental surface science program to complement his theoretical studies. He is well funded… Udo has shown a strong commitment to teaching…creating a number of new courses in his many areas of expertise."

Reviewer (F)

"…of all scientists that I know [in Udo's generation]…and in Udo's field of expertise, I know of no others that exceed Udo's pure intelligence and ability. …Udo is fully capable with both the

very difficult theoretical calculations, and the equally difficult microscopic/spectroscopic measurements and interpretations."

Reviewer (G)
"…[his current] studies are characteristically careful and thorough and show how a deep understanding of atomic-level physics and chemistry may influence…our understanding of geological processes. Of Udo's previous work, I would highlight his studies of the proximity effect in surface reactions, which continues [sic] to suggest new research directions."

Reviewer (H)
"Udo Becker is one of the most accomplished and highly regarded early to mid career scientists working on the properties and reactivities of minerals and nanoparticles and their surfaces. One of his great strengths is that he is both a talented experimentalist and someone who has an excellent grasp of computational approaches…"

Summary of Recommendation:
Professor Becker is a scientist of international standing. He is also an enthusiastic and tireless teacher, and a valued citizen. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Udo Becker be promoted to the rank of professor of geological sciences, with tenure, College of Literature, Science, and the Arts.

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

May 2011