

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering

Approved by the Regents

May 15, 2008

Thomas H. Zurbuchen, associate professor of atmospheric, oceanic and space sciences, with tenure, Department of Atmospheric, Oceanic and Space Sciences, and associate professor of aerospace engineering, without tenure, Department of Aerospace Engineering, College of Engineering, is recommended for promotion to professor of atmospheric, oceanic and space sciences, with tenure, Department of Atmospheric, Oceanic and Space Sciences, and professor of aerospace engineering, without tenure, Department of Aerospace Engineering, College of Engineering.

Academic Degrees:

Ph.D. 1996 University of Bern, Physics, Bern, Switzerland
M.S. 1992 University of Bern, Physics, Mathematics, and Astronomy, Bern, Switzerland

Professional Record:

2005 – present	Associate Professor (with tenure), Department of Atmospheric, Oceanic and Space Sciences, University of Michigan
2003 – 2005	Associate Professor (without tenure), Department of Atmospheric, Oceanic and Space Sciences, University of Michigan
2002 – 2003	Senior Associate Research Scientist, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan
1998 – 2002	Assistant Research Scientist, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan
1996 – 1998	Research Fellow, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan

Summary of Evaluation:

Teaching: Professor Zurbuchen's demonstrated commitment to teaching is exceptional, and surpasses the standards expected for a professor. In particular, he has gone to great lengths to successfully involve students in "outside-the-classroom" teaching via practical engineering design experiences gained from special projects. The extent of his commitment to this practical hands-on component of teaching is impressive and is matched by few, if any, faculty in the College. He has directly worked with 57 undergraduate students on such projects, including 18 UROP students and 10 REU students. At any given time, he has had 10-15 undergraduate students working on research projects under his supervision. At the same time, he has worked with 39 masters-level students on practical research and engineering design projects, serving as advisor or co-advisor for their work. The projects conducted as part of the M.Eng program reflect Professor Zurbuchen's passion for combining classroom teaching with hands-on design experience. His production of Ph.D. students is excellent; he has graduated or is now advising 15 Ph.D. students. In addition to his exceptional commitment to teaching "outside the classroom," Professor Zurbuchen has a solid record of traditional "inside-the-classroom" teaching. He has developed three new courses during the past three years, and has been central to the revitalization of the successful Masters of Space Engineering program in AOSS and AERO. He has developed two design-oriented courses, AOSS 582 and AOSS 583, in which students under his supervision lead teams in high-level project design of a space system, incorporating modern methods of concurrent engineering, manufacturing, marketing and finance, etc. His approach to merging technological aspects of these courses, such as propulsion, orbit design, and space environment, with practical aspects such as project management methods and the financial and political factors involved in such systems, is an exceptionally strong addition to the College's curricular offerings.

Research: Professor Zurbuchen is a prime example of a new breed of very successful professors. While he is widely recognized as a leading expert in solar wind composition research, a primary strength is his leadership ability. It is very clear from the outside letters that he is recognized as a leader in solar-heliospheric physics. Thomas came to Michigan 11 years ago with a fresh Ph.D. from the University of Bern. His talent and leadership became obvious from the first day he set foot in the Space Research Building. Shortly after his arrival he took over leadership of the Fast Imaging Plasma Spectrometer (FIPS) instrument development at Michigan. With little help from the PI, he was instrumental in the successful completion of the hardware phase. Today the Messenger spacecraft with the FIPS instrument onboard is less than a year away from reaching Mercury and starting the exploration of the Hermean space environment. Today, most space physics experiments are carried out by large collaboration teams. Typical instrument suites are complex, expensive and they involve highly specialized sensor technologies and sophisticated electronics. In addition, size, power and telemetry are very limited. Over the last decade Professor Zurbuchen has developed a state-of-the-art sensor development laboratory for ion mass spectrometry and established strong collaborations with university, non-profit and government laboratories. He became a “permanent” member of a plasma consortium (with Berkeley and Colorado), and more recently he took over the leadership of this group. He was part of several large, multi-institutional instrument proposal teams. It is highly unusual for someone under 40 to reach this stage in their career, but Thomas is a truly exceptional leader. In recognition of his exceptional accomplishments, Professor Zurbuchen received the Presidential Early Career Award for Scientists and Engineers (PECASE).

Recent and Significant Publications:

- Zurbuchen, T. H., A new view of the coupling of the Sun and the heliosphere, *Annu. Rev. Astron. Astrophys.*, 45, pp. 297-338, 2007.
- Gilbert, J. A., T. H. Zurbuchen, and L. A. Fisk, A new technique for mapping open magnetic flux from the solar surface into the heliosphere, *Astrophys. J.*, 663, pp. 583-591, 2007.
- Korreck, K. E., T. H. Zurbuchen, S. T. Lepri, and J. M. Raines, Heating of heavy ions by interplanetary coronal mass ejection driven collisionless shocks, *Astrophys. J.*, 659(1), pp. 773-779, 2007.
- Zurbuchen, T. H., Heliospheric physics: Linking the Sun to the Magnetosphere, *Space Sci. Rev.*, 124, pp. 77-90, 2006.
- Ko, Y.-K., J. C. Raymond, T. H. Zurbuchen, P. Riley, J. M. Raines, and L. Strachan, Abundance variation at the vicinity of an active region and the coronal origin of the slow solar wind, *Astrophys. J.*, 646 (2), pp. 1275-1287, 2006.
- Manchester, W. B., IV, and T. H. Zurbuchen, Are high-latitude forward-reverse shock pairs driven by CME overexpansion?, *J. Geophys. Res.*, 111, A05101, doi:10.1029/2005JA011461, 2006.
- von Steiger, R., and T. H. Zurbuchen, Kinetic properties of heavy solar wind ions from Ulysses-SWICS, *Geophys. Res. Lett.*, 33, L09104, doi:10.1029/2005GLO024998, 2006.
- Fisk, L. A. and T. H. Zurbuchen, Distribution and properties of open magnetic flux outside of coronal holes, *J. Geophys. Res.*, 111 (A9), 28, 2006.

Service: Professor Zurbuchen's service contributions are truly outstanding. He has served on an NRC decadal review and on other NRC committees. He has also served on major committees for NASA and other agencies. Much of this service has involved the core activities that formulate national strategy in space science, thus having a very high intellectual impact. Within the university, he has done far more than his share. He has served on two university-wide committees, nine College of Engineering committees, and numerous departmental committees. His exceptional service activities were recognized when he was awarded the Service Excellence Award by the College of Engineering in 2005. He played a leading role in the effort by the College to develop an entrepreneurship program and recently was appointed as the first director of the Center for Entrepreneurship within the College.

External Reviewers:

Reviewer A: "Of all the many recommendations that I have been asked to provide during my thirty years in science, this is the one that I feel most strongly about, because Thomas is one of the best space physicist [sic] that I have ever met. I believe that he is certainly the best of his generation."

Reviewer B: "In his generation, he is a leader in the art of measuring the ion composition in heliosphere plasmas."

Reviewer C: "He is today the most visible member of his [cohort] of solar wind physicists."


Reviewer D: "I think highly of his commitment and his interest in developing state-of-the-art instrumentation for space applications. He appears to be creative and is evidently very much involved with his students."

Reviewer E: "In-situ space research has become a very bureaucratically complicated and highly competitive enterprise in the last couple of decades. Professor Zurbuchen's accomplishments are quite impressive and bode extremely well for the continuation of frontier space and solar plasma experimental research at Michigan. In fact, I believe that in terms of present Michigan faculty, he will be the most important individual that will ensure Michigan's experimental future in space plasma research."

Reviewer F: "Dr. Zurbuchen is among the top two or [scientists of his cohort] in the entire field of solar and space plasma physics, and probably the top solar-heliospheric physicist. But besides being an outstanding scientist, he has become an acknowledged leader in the field, shaping the future lines of research."

Reviewer G: "If the achievements in research, associated funding, stature in the scientific community as well as in teaching are not sufficient to promote him into the rank of full Professor I would not know what achievements would."

Summary of Recommendation: Professor Zurbuchen is a very prominent and very productive space scientist who has made significant contributions to the study of the sun and the heliosphere. He is an excellent teacher and mentor, and he is a leader who contributes enormously to both external and internal service. It is with the support of the College of Engineering Executive Committee that I recommend Thomas H. Zurbuchen for promotion to professor of atmospheric, oceanic and space sciences, with tenure, Department of Atmospheric, Oceanic and Space Sciences, and professor of aerospace engineering, without tenure, Department of Aerospace Engineering, College of Engineering.


David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

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