

PROMOTION RECOMMENDATION

University of Michigan
College of Engineering

Karl Grosh, associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and associate professor of biomedical engineering, without tenure, Department of Biomedical Engineering, College of Engineering, is recommended for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and professor of biomedical engineering, without tenure, Department of Biomedical Engineering, College of Engineering.

Academic Degrees

B.S. 1985 Pennsylvania State University, Engineering Science
M.S. 1988 Pennsylvania State University, Engineering Science
Ph.D. 1994 Stanford University, Mechanical Engineering

Professional Record

2001-present Associate Professor of Biomedical Engineering, University of Michigan
2000-present Associate Professor of Mechanical Engineering, University of Michigan
1994-2000 Assistant Professor of Mechanical Engineering, University of Michigan
1990-1994 Graduate Research Assistant, Stanford University
1987-1990 Research Scientist, Naval Research Laboratory/SFA Inc.

Summary of Evaluation:

Teaching: Professor Grosh is an effective and enthusiastic instructor both inside and outside of the classroom. He is particularly skilled working one-on-one with students, whether in office hours for his courses or in research meetings with his graduate students. Professor Grosh continues to excel as an instructor. His average E&E scores since his promotion (Q1=4.20 and Q2=4.40), exceed the corresponding averages during his rank as an assistant professor (Q1=3.98 and Q2=4.08). This upward trend demonstrates his sustained and continuing improvement in traditional classroom teaching. This conclusion is strengthened by the testimonials of three UG students (letters in casebook) who describe Professor Grosh as an “enthusiastic” and “animated” instructor who employs an “extremely effective teaching method.” Professor Grosh has also shown significant initiative in curriculum development. During a two-year period, he teamed with two colleagues from LSA to create the interdisciplinary course UC 264 titled *Sound, Hearing and Deafness* by combining ideas from engineering, physiology and psychology. As a research advisor, Professor Grosh has mentored nine doctoral students who have graduated and an additional five students currently in the program. It is noteworthy that two of his recent doctoral students have earned competitive faculty positions in the US which reflects positively on him as a research advisor.

Research: Professor Grosh has earned international recognition for his research program and leadership in the field of cochlear mechanics where he has made fundamental contributions to hearing science by conceiving novel micro-machined devices that mimic cochlea function. His micro-machined cochlea analogs are highly visible and have been featured prominently on the web page for the National Science Foundation. The external reviewers, who include the most eminent researchers in the field of hearing science, uniformly praise Professor Grosh’s seminal contributions on the electromotility of the outer hair cells and his novel micro-machined cochlea. They note that Professor Grosh’s prior expertise in computational mechanics coupled with his newly developed expertise in micro-mechanical systems provide him unique capabilities to explore cochlear function. Professor Grosh has largely developed this

line of research since his last promotion, and this is positive testimony to his ability to select and pursue promising new research directions. He also maintains a collaborative research program in soft tissue biomechanics and an established research program in computational structural dynamics/acoustics.

Recent and Significant Publications:

- E. K. Kuhl, K. Garikipati, E. M. Arruda, and K. Grosh. Remodeling of biologic tissue: Mechanically induced reorientation of a transversely isotropic network model. *J. Mechs. and Physics of Solids*, **53**(7), pp 1552-1573 (2005).
- R. D. White and K. Grosh. Microengineered hydrodynamical cochlear model. *Proc. of the National Acad. of Sci.*, **102** (5), pp 1296-1301 (2005).
- N. Deo and K. Grosh. Simplified nonlinear outer hair cell models. *J. Acoust. Soc. Amer.* **117**(4), pp. 2141-2146 (2005).
- A. L. Nuttall, K. Grosh, Zheng, J., de Boer, E., Ren, T., Zhao. Spontaneous basilar membrane oscillation and otoacoustic emission at 15 kHz in a guinea pig. *J. Assoc. Res. Otolaryngology*, **5** (4), pp 337-348, (2004).
- K. Garikipati, E. M. Arruda, K. Grosh, H. Narayanan, S. Calve. A continuum treatment of growth in biological tissue: The coupling of mass transport and growth. *J. Mechs. Phys. of Solids*, **52**(7), pp 1595-1625, (2004).
- N. Deo and K. Grosh. A modified area motor model for outer hair cell mechanics. *Biophys. J.*, **86**(6), 2004.
- K. Grosh, J. Zheng, E. deBoer, A. L. Nuttall. High frequency electromotility of the cochlea. *J. Acoust. Soc. of Amer.*, **115**, 2178-2184, (2004).
- A. A. Parthasarathi, K. Grosh, A. L. Nuttall, and Jiefu Zheng. Influence of direct current stimulation on the *in vivo* basilar membrane velocity response. *J. Acoust. Soc. Amer.*, **113**, pp. 442-452, (2003).
- A. L. Nuttall, T. Ren, E. de Boer, J. Zheng, A. A. Parthasarathi, K. Grosh, M. Guo, and D. F. Dolan. *In vivo* micromechanical measurements of the organ of Corti in the basal cochlear turn. *Audiology and Neuro-otology* **7** (1) pp. 21-26, (2002)

Service: Professor Grosh's level of service is commensurate with his promotion to Professor. Professor Grosh is recognized for co-organizing the major conference in his field of cochlear mechanics (Auditory Mechanics: Processes and Models held in 2005 in Portland, Oregon), as co-organizer of the 2003 meeting of the Society of Engineering Science, as an Associate Editor for the *ASME Journal of Vibration and Acoustics*, for his many years of service to the ASME Technical Committee on Vibration and Sound and to the Technical Committee on Structural Acoustics for the Acoustical Society of America. Within the University of Michigan, Prof. Grosh also provides unselfish service to our Department and College.

External Reviewers:

Reviewer (A): "upon reviewing Karl's documentation, my impressions of him are even more positive. His publication rate is high.... his funding record is consistent and solid.... and his service to the profession has been and continues to be exemplary."

Reviewer (B): "The quality, quantity, and impact of his work over the past five years have been outstanding."

Reviewer (C): "My overall assessment is that Dr. Grosh has a strong record of achievement that is matched by few others at comparable career stage."

Reviewer (D): "Karl is right at the top of what I would call "our" group of 100 select ear people."

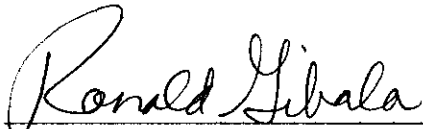
Reviewer (E): “The quality of the publications concerning the ear are superb and have established Karl as an [sic] well-recognized scientist in the auditory neuroscience area.”

Reviewer (F): “He has established himself as a recognized leader in this very challenging area [cochlear mechanics].”

Reviewer (G): “I believe that he has a unique background in mechanical properties that allows him to contribute to cochlear mechanics in ways that few others can.”

Reviewer (H): “This [in reference to his *JASA* 2004 publication] is really an outstanding work.” “In fact, we at [my institution] have also been working on such a model [regarding his *PNAS* 2005 publication], and Karl has scooped us with the publication.”

Summary of Recommendation: Professor Grosh is a highly regarded researcher and educator with important research contributions in the fields of acoustics and bio-mechanics at the University of Michigan. His teaching is appreciated by students and colleagues beyond Engineering. He professionally and willingly serves the department, the college, and the profession. It is with the support of the College of Engineering Executive Committee that I recommend him for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and professor of biomedical engineering, without tenure, Department of Biomedical Engineering, College of Engineering.



Ronald Gibala
Interim Dean, College of Engineering

May 2006