

PROMOTION RECOMMENDATION
UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF RADIOLOGY
COLLEGE OF ENGINEERING
DEPARTMENT OF BIOMEDICAL ENGINEERING

Xueding Wang, Ph.D., assistant professor of radiology, Department of Radiology, Medical School, and assistant professor of biomedical engineering, College of Engineering, is recommended for promotion to associate professor of radiology, with tenure, Department of Radiology, Medical School, and associate professor of biomedical engineering, without tenure, Department of Biomedical Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2004	Texas A&M University
M.S.	2000	National Key Lab of Modern Acoustics, Nanjing University, China
B.S.	1997	Nanjing University, China

Professional Record:

2009-present	Assistant Professor of Biomedical Engineering, University of Michigan
2008-present	Assistant Professor of Radiology, University of Michigan
2007-2008	Research Assistant Professor, Department of Radiology University of Michigan
2005-2007	Research Investigator, Department of Radiology, University of Michigan

Summary of Evaluation:

Teaching: Dr. Wang provides both formal classroom teaching as well as informal teaching in a small group setting or on an individual basis. He has shown innovation and leadership in his teaching and teaches on both a local and national level. At the University of Michigan, Dr. Wang teaches optical imaging in the College of Engineering in its Medical Imaging Laboratory course (BME510). This has been ongoing since 2005. Dr. Wang teaches graduate students and post-doctoral research fellows in a small group setting or on an individual basis. He also teaches graduate students in the Basic Radiological Sciences Division and mentors graduate students by serving on advisory committees in the College of Engineering. On a national level, Dr. Wang organized and chaired two sessions for the Joint American Association of Physicists in Medicine (AAPM) and the Canadian Organization of Medical Physicists (COMP) meeting, including "Ultrasound Imaging Symposium-Photoacoustic Imaging" and "Ultrasound Scientific Session-Photoacoustic and Other Novel Imaging." Dr. Wang has exhibited innovation and

leadership by organizing a radiology research conference which has been held monthly for the last two years.

Research: Medical imaging includes conventional x-ray, computed tomography, nuclear medicine, magnetic resonance and ultrasound. Each of these modalities has strengths and weaknesses. Optical imaging is the next frontier and offers several advantages, including the lack of ionizing radiation, the ability to interrogate at the cellular level and relatively inexpensive equipment. Dr. Wang has taken the lead in developing optical imaging at the University of Michigan. Dr. Wang is applying optical imaging to the investigation of several areas of disease pathophysiology. He is using Spectroscopic Photoacoustic Tomography (SPAT) to quantify blood oxygenation levels in subsurface tissues. This is a novel method to measure the spectroscopic tissue optical absorption by using emerging SPAT technology aided by extrinsic optical contrast agents. Arthritis is one of the most common chronic diseases affecting our patients, and there is a need for a noninvasive technique for the early diagnosis and monitoring of therapeutic interventions. Dr. Wang is developing a photoacoustic imaging technique for inflammatory arthritis. His work is sufficiently promising that he was asked to write a review article on the use of optical imaging techniques for the diagnosis and treatment monitoring of patients with arthritis. Dr. Wang and co-workers have developed a new Pure Optical Photoacoustic Microscopy system (POPAM) using a superbroad bandwidth optical micro-ring resonator. This system provides resolution in the five to eight micrometer range, which is comparable to optical microscopy. Working in animal models, he has demonstrated that the 3D structure of microvasculature, including capillary networks and even individual red blood cells, can be discerned.

The quality of Dr. Wang's research is outstanding. This is demonstrated not only by his peer-reviewed publications in high quality journals, but also by his external funding. Dr. Wang has a strong history of external funding. His first NIH grant, an R21, was used to develop a new optoacoustic sensor utilizing a photonic crystal with a totally internal reflection configuration. This sensor can significantly improve the sensitivity and bandwidth of photoacoustic imaging. His current funding includes three NIH grants and one from the Department of Defense. He is the principal investigator of an R01 grant to develop a novel noninvasive nonionizing light based imaging technology for molecular imaging and drug delivery monitoring. This work is ongoing and, as shown by his scientific publications, excellent progress is being made.

International collaboration, especially with physicians and biomedical scientists in China, is an important part of our "Global Outreach" effort. Dr. Wang was recently awarded a Shanghai Jiao Tong University – University of Michigan Collaboration on Biomedical Technologies grant, for which he will serve as the principal investigator. The purpose of this research is to promote and support collaborative research that focuses on the adaptation of emerging photoacoustic techniques to diagnostic imaging.

Dr. Wang is clearly recognized as a leader in optical imaging. He received the Young Investigator award from SPIE Photonics West. He serves as reviewer for multiple journals and is an associate editor for *Medical Physics*. He organized a categorical course for the American Institute of Ultrasound in Medicine (AIUM) and has served as session chair at multiple meetings including the IEEE Ultrasonic Symposium, SPIE Photonics West, BIOS Conference, and this

year's Joint AAPM/COMP meeting. Since 2008, Dr. Wang has received six new grants in which he is the principal investigator on three and the co-PI on the other three.

Recent and Significant Publications:

Shao X, Agarwal A, Rajian JR, Kotov NA, Wang X: Synthesis and bioevaluation of ^{125}I -labeled gold nanorods. *Nanotechnology* 22:135102:1-7, 2011.

Xie Z, Chen SL, Ling T, Guo LJ, Carson PL, Wang X: Pure optical photoacoustic microscopy. *Optic Express* 19:9027-9034, 2011.

Chamberland D, Jiang Y, Wang X: Optical imaging: new tools for arthritis. *Integ Biol* 2:496-509, 2010.

Bouchard, LS, Anwar MS, Liu GL, Hann B, Xie H, Gray JW, Wang X, Pines A, Chen FF: Picomolar sensitivity MRI and photoacoustic imaging of cobalt nanoparticles. *Pro Natl Acad Sci U.S.A.* 106:4085-4089, 2009. Epub 2009 Feb 26.

Rajian JR, Carson PL, Wang X: Quantitative photoacoustic measurement of tissue optical absorption spectrum aided by an optical contrast agent. *Opt Express* 17:4879-4889, 2009.

Service: Dr. Wang provides service at both the local and national levels. At the University of Michigan, Dr. Wang organized and continues to supervise the department's research seminar series. He conceived the idea, identified the venue, created the schedule and moderated many of the sessions. This has been a highly successful series attended by most of our research faculty. He also serves as a member of the Laser Safety Committee. On a national level, Dr. Wang serves as a manuscript reviewer for multiple journals and is the associate editor of *Medical Physics*. He has served his professional societies as a session chair (moderator) and scientific session organizer.

External Reviewers:

Reviewer A: "...I would rank Dr. Wang as one of the leading photoacoustic imaging researchers of his generation."

Reviewer B: "...Xueding has an impressive track record in research with several internationally recognised [sic] research contributions behind him and shows all the signs of having a promising academic career ahead. He has an exceptional track record of publications in prestigious international peer reviewed journals including one in Nature Biotech and another in PNAS. He has been successful in securing grant income from a variety of funding sources including several major grants from NIH allowing him to build his research team."

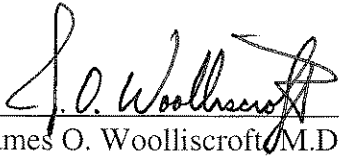
Reviewer C: "...I believe Dr. Wang's future work will be of crucial importance to biomedical photoacoustics and imaging and will establish his laboratory and department as one of the major national and international hubs in this rapidly growing field."

Reviewer D: “Being very active in building collaborations with researchers from biomedical engineering, chemistry, and [the] medical school, he has led multidisciplinary research teams to accomplish several funded projects.”

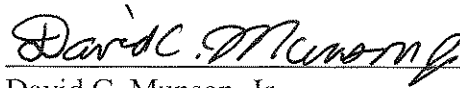
Reviewer E: “His contributions on photoacoustic imaging of arthritic disease and breast cancer detection are unique and important to the biomedical imaging field. In additions, he has developed a new program using photoacoustic spectroscopy technique for cancer detection.”

Summary of Recommendation:

Xueding Wang is an outstanding researcher and an effective teacher who provides significant service both to the University of Michigan and to his professional societies. The field of optical imaging provides several advantages over conventional medical imaging including the lack of ionizing radiation, the ability to interrogate at the cellular level and the use of a relatively inexpensive technology. Dr. Wang has been at the forefront of this research which he has expanded into photoacoustic imaging. He has also combined photoacoustic tomography with magnetic resonance imaging to detect trace amount of nanoparticles in biological tissues. He has applied his research to common clinical situations including the detection and monitoring of disease states in patients with arthritis and in the detection of breast cancer. We are pleased to recommend Xueding Wang, Ph.D. for promotion to associate professor of radiology, with tenure, Department of Radiology, Medical School, and associate professor of biomedical engineering, without tenure, Department of Biomedical Engineering, College of Engineering.



James O. Woolliscroft M.D.
Dean
Lyle C. Roll Professor of Medicine



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

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