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

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

Academic Degrees:
Ph.D.	1999	Florida State University
B.S.	1995	Florida A&M University – Florida State University

Professional Record:
2015 – Present	Associate Professor of Radiology, (with tenure), University of Michigan
2014 – 2015	Associate Professor of Radiology, (without tenure), University of Michigan
2014 – Present	Associate Professor of Biomedical Engineering, University of Michigan
2011 – 2014	Assistant Professor of Biomedical Engineering, University of Michigan
2008 – 2014	Assistant Professor of Radiology, University of Michigan
2007 – 2011	Research Investigator of Biomedical Engineering, University of Michigan
2006 – 2008	Research Investigator of Radiology, University of Michigan

Summary of Evaluation:

Teaching: Dr. Galban provides extensive teaching both within his laboratory, the Center for Molecular Imaging, the Roget Cancer Center, and in formal lectures to students in the Departments of Biological Chemistry, Pharmacology, and Neurology. He provides extensive small group teaching to undergraduate students, graduate students, and post-doctoral fellows who in his laboratory. Dr. Galban instructs these learners in research study design as well as the specifics of the imaging equipment used in the laboratory. He has mentored eight undergraduate students, four graduate students, three fellows and has served on five dissertation committees. He is a didactic lecturer for classes in biological chemistry, biophysics, cancer biology and the University of Michigan – Peking University Joint Institute collaboration.

Research: The goal of Dr. Galban's research is to develop imaging techniques to make earlier and more accurate diagnoses and to better predict tissue behavior. He is doing this in a quantitative manner that will lend itself more easily to clinical translation. One of the most important approaches he uses is parametric response mapping (PRM). This is a voxel-based imaging approach that he has applied to pulmonary CT images for the visualization and quantification of previously invisible components of chronic obstructive pulmonary disease and small airway diseases. Originally published in *Nature Medicine,* PRM has been integrated in the study design of several multi-center clinical trials. Dr. Galban has patented the PRM concept. A commercial PRM product was approved by the Federal Drug Administration (FDA) as a medical imaging

device. The quality of Dr. Galban's research has been outstanding. He has published more than 93 peer-reviewed articles in high quality journals and his work has been consistently funded by external grants, including the National Institutes of Health.

Recent and Significant Publications:
Weinheimer O, Hoff BA, Fortuna AB, Fernández-Baldera A, Konietzke P, Wielpütz MO, Robinson TE, Galbán CJ: Influence of Inspiratory/Expiratory CT Registration on Quantitative Air Trapping. *Academic Radiology* Epub ahead of print, in press, 2018.

Hoff BA, Pompe E, Galbán S, Postma DS, Lammers JJ, Ten Hacken NHT, Koenderman L, Johnson TD, Verleden SE, de Jong PA, Hoesein FAAM, van den Berge M, Ross BD, Galbán CJ: CT- Based Local Distribution Metric Improves Characterization of COPD. *Sci Rep* 7(1): 2999, 2017.

Belloli EA, Degtiar I, Wang X, Yanik GA, Stuckey LJ, Verleden SE, Kazerooni EA, Ross BD, Murray S, Galbán CJ, Lama VN: Parametric Response Mapping as an Imaging Biomarker in Lung Transplant Recipients. *Am J Respir Crit Care Med* 195(7): 942-952, 2017.

Pompe E, Galbán CJ, Ross BD, Koenderman L, Ten Hacken NH, Postma DS, van den Berge M, de Jong PA, Lammers JJ, Mohamed Hoesein FA: Parametric response mapping on chest computed tomography associates with clinical and functional parameters in chronic obstructive pulmonary disease. *Respir Med* 123: 48-55, 2017.

Verleden SE, Vos R, Vandermeulen E, Ruttens D, Bellon H, Heigl T, Van Raemdonck DE, Verleden GM, Lama V, Ross BD, Galbán CJ, Vanaudenaerde BM: Parametric Response Mapping of Bronchiolitis Obliterans Syndrome progression after lung transplantation. *Am J Transplant* 16(11): 3262-3269, 2016.

Service: Dr. Galban provides service both locally and nationally. At the University of Michigan, he serves as the director of the small animal imaging core for the Center for Molecular Imaging and directs the Pre-Clinical Imaging Facility for the Rogel Cancer Center. He has also served as a member of the Research Committee for the Department of Radiology. On a national level, Dr. Galban is a grant reviewer for the Cancer Imaging Archive Head and Neck Cancer Research Group for the National Institutes of Health. He serves as an ad hoc reviewer for multiple journals and is a member of the editorial board of *Tomography: A Journal for Imaging Research*.

External Reviewers:
Reviewer A: "There are only a very few radiologists and imaging scientists at the forefront of quantitative imaging, and even fewer in at the cutting edge of quantitative imaging in the thorax— so I am extremely familiar with how far ahead Dr. Gaban's [SIC] work is of most in the field. Dr. Galban has worked to become one of the very few elite imaging scientists to help bring imaging analytics from concept to validated research tool and then to full clinical availability as a FDA-approved tool. In particular, the Parametric Response Mapping (PRM) of anatomically registered volumetric inspiratory/expiratory imaging has been an astoundingly successful product of his hard work."

Reviewer B: "...Dr. Galban's work in the development of parametric response mapping in airways disease has been pivotal in the development of novel software approaches to imaging. Critically approaches that he has developed have now been widely adopted and commercialised. His work cuts across several disciplines including clinical medicine, computer sciences, and bioengineering and is regarded highly in all of these areas. He has gained an international reputation and I have no doubt that his work will continue to make impact in the future."

Reviewer C: "Dr. Galban has made clearly original and important additions to the medical literature, and his publications provide clear evidence of scholarly productivity advancing a body of knowledge. He has 94 published papers, including many as first author. His current primary research effort has led to a novel voxel-based image analysis approach for the evaluation of otherwise occult features of chronic obstructive pulmonary disease on CT images, and has resulted in SBIR R44 funding...this approach has enormous potential in other disease conditions and represents an exciting contribution to the emerging role of machine learning within radiology."

Reviewer D: "...Dr. Galban's contributions stand out for innovation and discovery in the imaging evaluation of patients with pulmonary disease...His most highly cited first-author publication, which appeared in Nature Medicine in 2014, introduced the technique of voxel-based analysis for parametric response mapping to subtype COPD...Importantly, his CV illustrates an established record of independent funding since his promotion to Associate Professor. He currently serves as PI, co-PI or co-investigator for several NIH-supported programs including one U01 and has several proposals submitted and/or under review. His creative activities have led to 6 patents, 3 since his last promotion."
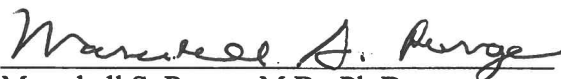
Reviewer E: "...his publications have high visibility and have had broad impact on the field of quantitative medical image analysis; they described and demonstrated methods that can derive quantitative predictors of disease and response to therapy, and have done so in variety of important domains, e.g., gliomas, diffuse lung disease, and osteoporosis. Since then, he and his colleagues have applied his Parametric Response Mapping (PRM) method to new applications and have shown clinical utility."

Reviewer F: "In my opinion, Dr. Galban's most significant recent scientific contribution is the parametric response mapping (PRM) method of assessing change in a matched pair of images (Nature Medicine, 2009). He and his collaborators have successfully applied the PRM to problems ranging from neuroimaging to cancer to emphysema and COPD and have published this work in many different venues. This work has had considerable impact on the lung image analysis field and has been widely adopted as an important biomarker for understanding COPD progress."

Reviewer G: "The focus of Dr. Galban's work is mostly related to radiomics feature analysis in radiology to characterize disease. His papers have been published in quality medical journals, both clinically oriented radiology journals and journals outside of radiology. I believe his most notable contribution is in developing the parametric response mapping approach for characterizing lung disease. This approach could have applicability beyond lung disease as well, and he has extended the methods in other imaging areas."

Summary of Evaluations:

Dr. Galban is an exceptionally productive investigator. His pioneering work with parametric response mapping is widely regarded as a seminal contribution, and his quantitative approach facilitates its translation to clinical applications. I am pleased, therefore, to recommend Craig J. Galban, Ph.D. for promotion to professor of radiology, with tenure, Department of Radiology, Medical School, and professor of biomedical engineering, without tenure, Department of Biomedical Engineering, Medical School and College of Engineering.

Marschall S. Runge, M.D., Ph.D.
Executive Vice President for Medical Affairs
Dean, Medical School

Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
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