Approved by the Regents
May 16, 2019

PROMOTION RECOMMENDATION
THE UNIVERSITY OF MICHIGAN
MEDICAL SCHOOL
DEPARTMENT OF NEUROSURGERY

Daniel A. Orringer, M.D., assistant professor of neurosurgery, Department of Neurosurgery, is recommended for promotion to associate professor of neurosurgery, with tenure, Department of Neurosurgery, Medical School.

Academic Degrees:

M.D.	2004	The Ohio State University
B.A.	2000	Cornell University

Professional Record:

2014 – Present	Assistant Professor of Neurosurgery, University of Michigan
2011 – 2014	Clinical Lecturer of Neurosurgery, University of Michigan

Summary of Evaluation:

Teaching: Dr. Orringer teaches residents in the clinic and theoperating room. He gives regular didactic lectures to third year medical school neurosurgery students, interns, and midlevel providers. He has been a significant research mentor to several residents as well as a variety of medical students and engineering students. Nationally, Dr. Orringer regularly gives lectures as a visiting professor and at our national neurosurgery meetings and neuro-oncology meetings. An important aspect of this teaching is introducing neurosurgeons to a new technology, stimulated Raman histology, that he has helped pioneer.

Research: Dr. Orringer's research focuses on the use of Stimulated Raman Scattering (SRS) microscopy, which enables rapid, high resolution, histologic imaging of tissues based on the distribution of macromolecular components in a fully digital (electronically sharable) platform. SRS provides a means of providing a streamlined alternative to conventional histologic methods for detecting and diagnosing brain tumors during surgery. Combining this with artificial intelligence, the technology can possible mitigate the need for the rare specialized pathologist in the clinical setting. He has been extremely productive with respect to his scholarship. He has published 41 peer-reviewed articles and has presented his research by invitation on 16 occasions nationally and internationally. Dr. Orringer is well-funded through the NIH. He has received numerous awards for his research, including the Andrew Parsa Young Investigator Basic/Translational Research Award in 2016 from the Society for Neuro-Oncolgy, in 2017, he won the Innovator of the Year Award from the Congress of Neurological Surgeons. Institutionally, Dr. Orringer received the 2018 Dean's Award for Innovation and Commercialization. All of these attest to the fact that his research, particularly with respect to stimulated Raman histology, is widely valued and considered extremely innovative and important to clinical outcomes for patients with gliomas. His work has changed neurosurgery in a significant way.

Recent and Significant Publications:

Hollon T, Lewis S, Pandian B, Niknafs Y, Garrard M, Garton H, Maher C, McFadden K, Snuderl M, Lieberman A, Muraszko K, Camelo-Piragua S, Orringer D: Rapid Intraoperative Diagnosis of Pediatric Brain Tumors Using Stimulated Raman Histology. *Cancer Res*, Jan 1:78(1)278-289, 2017.

Orringer D, Pandian B, Niknafs Y, Hollon T, Boyle J, Lewis S, Garrard M, Hervey-Jumper S, Garton H, Maher C, Heth J, Sagher O, Wilkinson D, Snuderl M, Venneti S, Ramkissoon S, McFadden K,

Fisher-Hubbard A, Lieberman A, Johnson T, Xie X, Trautman J, Freudiger C, Camelo-Piragua S: Rapid intraoperative histology of unprocessed surgical specimens via fiber-laser-based stimulated Raman scattering microscopy *Nature Biomedical Engineering* 1: 0027, 2017.

Hoesli R, Orringer D, McHugh J, Spector M: Coherent Raman Scattering Microscopy for Evaluation of Head and Neck Carcinoma. *Otolaryngol Head Neck Surg* Sep 15(3) 448-453, 2017.
Hollon T, Nguyen V, Smith B, Lewis S, Junck L, Orringer D: Supratentorial hemispheric ependymomas: an analysis of 109 adults for survival and prognostic factors. *J Neurosurg* 124: 1-9, 2016.

Ji M, Lewis S, Camelo-Piragua S, Ramkissoon S, Snuderl M, Venneti S, Fisher-Hubbard A, Garrard M, Fu D, Wang A, Heth J, Maher C, Sanai N, Johnson T, Freudiger C, Sagher O, Xie X, Orringer D: Detection of human brain tumor infiltration with quantitative stimulated Raman scattering microscopy. *Science translational medicine* 7(309): 309ra163, 2015.

Service: Dr. Orringer is an important member of the neuro-oncology program at the University of Michigan. He is the lead surgeon in the neuro-oncology program and is an extremely busy clinician. He is a member of numerous major organizations and particularly a member of the Society of Neuro-oncology. He has served as an ad hoc reviewer for the United Kingdom Medical Research Council, the MITACS Elevate Program, the Netherlands Organisation for Scientific Research and the Prostate Cancer program of the United Kingdom. Dr. Orringer is an ad hoc reviewer for multiple journals, and a member of the Neurosurgery Research Education Fund Grant as a reviewer for the tumor section. Institutionally, he is a member of the Coulter Program Oversight Committee and the Surgical Innovation and Entrepreneurship Development Prize Oversight Committee. He has been a member of the Fast Forward Medical Innovation, Office of Research. Nationally, Dr. Orringer is a member of the American Association of Neurological Surgeons/Congress of Neurological Surgeons Self Assessment in Neurosurgery Committee, the Tumor Section Executive Committee, and the Neurosurgeon Editorial Board. He is the scientific program chair for the 2019 AANS/CNS Tumor Section Annual Meeting. He is highly visible in the joint Tumor Section by virtue of his leadership on the Executive Committee but also serves in a leadership role within the Neurosurgical Research Foundation. On an international level, Dr. Orringer serves as a director of the Intraoperative Imaging Society.

External Reviewers:
Reviewer A: "I have found Daniel…is expert at thinking across different disciplines to create novel scientific insights and technologies. His work in using Raman scattering (SRS) microscopy to detect tumor margins has been extremely impressive…The Christopher Davidson Forum for Brain Tumors brings the nation's leaders in brain tumor research to present their cutting edge work. Daniel's presentation was widely received as some of the best and most innovative work performed…Dr. Orringer is extremely thoughtful, insightful, and articulate on how he envisions the future of neurosurgery. He is fluent in numerous different technical domains ranging from neurosurgery, imaging, artificial intelligence, and microscopy. This polymath approach is rare. Even more rare, is that someone of his caliber is such a delightful person to interact with."

Reviewer B: "He has been asked to present his work at numerous national and international forums. His reputation is growing quickly, and the technology that he has promulgated is holding great promise for commercialization and dissemination across the globe…His paper in *Science Translational Medicine* set the stage for his well-recognized and identified expertise in the use of Raman scattering microscopy to detect human brain tumor cells that are infiltrating into normal brain margins."

Reviewer C: "When I first learned of Dr. Orringer's work on Raman spectroscopy for the rapid intraoperative diagnosis of brain tumors, I was struck by the high quality and really quite obvious utility of this exciting project…I think this is a potentially disruptive and ingenious technology that will improve surgery and clinical outcomes for patients with brain tumors…this puts him in the top rank of neurosurgeons of similar academic rank around the country."

Reviewer D: "I am particularly impressed by his contributions on the topic of intra-operative tissue imaging using stimulated RAMAN scattering microscopy. As a true clinician scientist he is one of the very few that achieved genuine translation from the bench to bedside…RAMAN scattering microscopy is – in a nutshell – a method for ultra-rapid intra-operative tissue diagnosis which enables greater accuracy for the removal of neuro-oncological tumors. I am convinced that this method will become one of the few that will be adopted by neurosurgeons for routine use…Daniel's formal academic output is exceptional for a clinically active neurosurgeon at his stage of development."

Reviewer E: "As a consequence of these research efforts, he has many publications and has also been recognized with numerous awards…These awards clearly demonstrate the recognition not just of his effort, but his entrepreneurship, his ability to 'think outside the box,' and his ability to rethink the way we perform surgeries for brain tumors…Dr. Orringer's commitment to academics and instruction is witnessed in his mentorship of numerous graduate students, medical students, and residents…we have recognized his participation in the Intraoperative Imaging Society by nominating him as the Scientific Program Chair for our next meeting in 2019…He has wonderful organizational skills and communication skills, is soft spoken and rarely frazzled despite last minute emails and requests for spur of the moment information."

Summary of Recommendation:
Dr. Orringer is a recognized leader in the area of neuro-oncology. His scholarship record is very strong as is his national reputation. His service to the department has been outstanding, particularly with respect to the development and improvement in the neuro-oncology arena. I am pleased, therefore, to recommend the promotion of Daniel A. Orringer, M.D. for promotion to associate professor of neurosurgery, with tenure, Department of Neurosurgery, Medical School.

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

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