Approved by the Regents
May 19, 2022

PROMOTION RECOMMENDATION
The University of Michigan
School of Dentistry

Alexandre F.M. DaSilva, associate professor of dentistry, with tenure, School of Dentistry, is recommended for promotion to professor of dentistry, with tenure, School of Dentistry.

Academic Degrees:

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| DMedSc | 2002 | Oral Biology, Harvard University |
| DDS | 1991 | Universidade Grande Rio School of Dental Medicine, Brazil |

Professional Record:

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| 2017-present | Associate Professor, with tenure, Biologic and Materials Sciences and Prosthodontics, School of Dentistry, University of Michigan |
| 2017-2020 | Research Associate Professor, Center for Human Growth and Development, University of Michigan |
| 2014-2017 | Research Assistant Professor, Center for Human Growth and Development, University of Michigan |
| 2008-2017 | Assistant Professor, Biologic and Materials Sciences and Prosthodontics, University of Michigan |
| 2006-2008 | Assistant Clinical Investigator, Clinical Research Collaborative, Forsyth Institute |
| 2006-2007 | Research Associate, Psychiatric Department, Pain and Analgesia Imaging and Neuroscience Group (P.A.I.N.), McLean Hospital, Harvard University |

Summary of Evaluation:

Teaching: Professor DaSilva teaches in the area of orofacial pain. He is the course director of one post-doctoral course (The Neuroscience Basis of Orofacial Pain and Dysfunction) and one pre-doctoral course (Patients with Orofacial Pain). He also lectures in numerous additional courses at the School of Dentistry. He incorporates the use of technology to facilitate students' understanding and clinical relevance of difficult neurological concepts. Professor DaSilva mentors students at school, university, regional, national and international levels. In rank, he has been the primary mentor to five graduate orthodontic students, one graduate endodontic student, and one oral and maxillofacial surgery student at the School of Dentistry. He is the co-mentor and thesis committee member on one PhD student project at the Universidade Federal do Rio de Janeiro, Brazil, and two neuroscience graduate students at the University of Michigan. He has mentored five undergraduate students in the Undergraduate Research Opportunity Program at the University of Michigan, one in Molecular and Behavioral Neuroscience Institute at the University of Michigan, one at Eastern Michigan University, and one at the Medical University of Warsaw (Poland), and he has been the primary mentor for three post-doctoral fellows at the University of Michigan. Additionally, Professor DaSilva has been the research advisor to two pre-doctoral dental students at the School of Dentistry. The students that Professor DaSilva mentors are from diverse racial and ethnic backgrounds. In recognition of his research and mentoring efforts, he was nominated and accepted into two of the most competitive national leadership programs in pain and dental academia: the Mayday Pain and Society Fellowship; and the American Dental Education Association Leadership Institute.

Professor DaSilva has worked to create enthusiasm and awareness for pain neuroscience. The recent development of mobile technology, 3D neuronavigation and artificial intelligence (AI), have led to a nomination for the Teaching Innovation Prize and the Transforming Learning for Third Century

Award, both from the University of Michigan Office of the Provost. Professor DaSilva, in conjunction with his laboratory, has created GeoPain, a mobile application for pain tracking and analysis. This application initially piloted successfully in the DENTED 602 graduate course was introduced to the third year dental class of more than 100 students. The students were able to collect pain data from their patients and then categorize the data by pain conditions such as temporomandibular joint disorder, or migraine. The data was analyzed by the students in 3D to determine pain location and intensity according to the disorder. During the pandemic, Professor DaSilva organized interviews with renowned experts in the pain field and the students were responsible for generating questions during these interviews. These efforts show a genuine dedication to teaching and innovation. Professor DaSilva's student reviews are positive with comments stating that Professor DaSilva is an excellent teacher and treats all students with respect, and that his lectures are clinically relevant to patient care.

Research: Professor DaSilva's expertise in the areas of orofacial pain research, headache and pain therapy have led him to found the Headache and Orofacial Pain Effort (H.O.P.E) Laboratory. His research focus is applying neuromodulation tools and neuroimaging to understand the mechanisms of the brain related to chronic pain. He has been able to integrate data from Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) to demonstrate the relationship between neurochemical changes in migraine patients. Currently, optical imaging is used to evaluate brain activity during dental pain in a clinical environment. This research, which is contributing to the understanding of general pain pathophysiology and migraines, can potentially improve the quality of life for patients with chronic pain. Professor DaSilva is collaborating with other University of Michigan researchers to investigate opioid effects on the brain of patients with chronic pain using radiotracers. Mobile technology and AI have led Professor DaSilva to produce invention reports and patent filings with the University of Michigan Office of Information Technology. This work has resulted in the creation of MoxyTech, Incorporated, a start-up in precision medicine using a free mobile pain app with over 10,000 worldwide patient users. This technology is used in multiple clinical trials at the University of Michigan, National Institutes for Health (NIH), foundations, industry and pharmaceutical companies.

Professor DaSilva has 56 peer reviewed publications, 20 while in rank (one first authorship, and twelve senior authorships). His articles are in high impact journals such as *Journal of Pain*, *Journal of Dental Research*, *Journal of Headache and Pain*, and *Journal of Dental Education*. Due to the nature of these publications, Professor DaSilva's media coverage has been profound, including features in *Science News*, *Scientific American*, *Mind*, *Science Daily*, *LA Times*, *USA Today*, and the *Detroit Free Press*. He has eleven book chapters, four while in rank, including contributions to the Surgeon General's Report on Oral Health in 2020. Professor DaSilva's innovative research is showcased by the University of Michigan Office of Research in Washington DC to display the importance of federal investment in research.

Since 2009, the NIH has continuously funded Professor DaSilva's research. Currently, he lists five federal grants and is the principal investigator on three, co-principal investigator on one and co-investigator on one additional grant. These grants total over $14 million. His current grant support and demonstration of funding from national, industry and institution sources indicates a continuous trajectory for future funding. Professor DaSilva demonstrates an ability to collaborate with colleagues from other university units through multiple grants, grant proposals and publications. National and international recognition of his research on pain and the opioid crisis is demonstrated by numerous invitations to speak at meetings. He has presented at 26 national conferences and 10 international research meetings as well as numerous research talks at the University of Michigan.

His scholarly activity related to clinical translational neuroscience and technology is highly recognized worldwide.

Recent and Significant Publications:

Lim M, Jassar H, Kim DJ, Nascimento TD, DaSilva AF. Differential alteration of fMRI signal variability in the ascending trigeminal somatosensory and pain modulatory pathways in migraine. *J Headache Pain.* 2021 Jan 7;22(1):4. doi: 10.1186/s10194-020-01210-6. PMID: 33413090.

Nascimento TD, Yang N, Salman D, Jassar H, Kaciroti N, Bellile E, Danciu T, Koeppe R, Stohler C, Zubieta JK, Ellingrod V, DaSilva AF. μ-Opioid Activity in Chronic TMD Pain Is Associated with COMT Polymorphism. *J Dent Res.* 2019 Nov;98(12):1324-1331. doi: 10.1177/0022034519871938. *Epub* 2019 Sep 6. PMID: 31490699.

Jassar H, Nascimento TD, Kaciroti N, DosSantos MF, Danciu T, Koeppe RA, Smith YR, Bigal ME, Porreca F, Casey KL, Zubieta JK, DaSilva AF. Impact of chronic migraine attacks and their severity on the endogenous μ-opioid neurotransmission in the limbic system. *Neuroimage Clin.* 2019;23:101905. doi: 10.1016/j.nicl.2019.101905. Epub 2019 Jun 18. PMID: 31279240.

Hu XS, Nascimento TD, Bender MC, Hall T, Petty S, O'Malley S, Ellwood RP, Kaciroti N, Maslowski E, DaSilva AF. Feasibility of a Real-Time Clinical Augmented Reality and Artificial Intelligence Framework for Pain Detection and Localization From the Brain. *J Med Internet Res.* 2019 Jun 28;21(6):e13594. doi: 10.2196/13594. PMID: 31254336.

Hu X, Racek AJ, Bellile E, Nascimento TD, Bender MC, Toback RL, Burnett D, Khatib L, McMahan R, Kovelman I, Ellwood RP, DaSilva AF. Brain Functional Changes before, during, and after Clinical Pain. J Dent Res. 2018 May;97(5):523-529. doi: 10.1177/0022034517750136. *Epub* 2018 Jan 11. PMID: 29324076.

Service: Professor DaSilva's service contributions are substantial at all levels. At the School of Dentistry, he has served as a member of the Appointment, Promotion and Tenure Committee, the Executive Committee, and he is the director of the Learning Health Systems Task Force. In 2020, he was appointed as the director of the Learning Health Systems with a goal of developing ways to support decision-making for patient treatment and education. This effort involves the development of structured electronic health systems at the School of Dentistry to monitor, analyze and interpret datasets from patient treatment and training of students and residents using rigorous outcome measurements. With the use of mobile phones and wearables in the clinic and classroom, these methods are integrating knowledge to improve existing academic procedures at the school. At the university level, Professor DaSilva has served as a representative on the Faculty Senate Assembly, is a member of the Learning Health Sciences Collaboratory Steering Committee, and is a scientific review committee member for the MICHR Pilot Grant Program. On a national level, Professor DaSilva has served as an invited panel on innovations and new technologies for the 2021 Distinguished Professor in Dentistry Program (University of Washington). He is a manuscript reviewer for 25 journals including the *Journal of Dental Research*, *Journal of Oral Rehabilitation*, *Journal of Pain*, the *Journal of Clinical Periodontology* and the *Journal of Neuroscience* to name a few. He is currently on the editorial board of the *Journal of Pain Research* and is the section head for *Headache and Orofacial Pain*. He is a grant reviewer for numerous organizations such as the National Institute of Neurological Disorders and Stroke, National Institute of Mental Health, and the Department of Veterans Affairs. Professor DaSilva and his laboratory interact with governmental, academic, patient groups and private businesses to improve the lives of people suffering from chronic pain.

External Reviewers:
Reviewer A: "Professor DaSilva has clearly emerged as a leader in his own right in the fields of pain and brain imaging, as well as in the application of transcranial direct current stimulation of the brain for the treatment of pain. And almost as important as the quality and impact of the data Professor DaSilva has generated, he is able to do his observations more than justice in talks that are informative and highly engaging."

Reviewer B: "The orofacial pain field particularly recognizes his recent neuroscience imaging work and focus on dopaminergic regulation. Most recently, our joint group at Harvard and Tufts involved him as a keynote speaker for the conference entitled Pain Management for Dental Medicine in 2021: Opioids, Coronavirus and Beyond. He has an excellent ability to convey complex concepts to both scientific colleagues and practicing clinicians."

Reviewer C: "Professor DaSilva has demonstrated a distinctive and highly successful career path with strong training and work in trigeminal pain neuroscience. He was a pioneer in functional mapping of peripheral and central pain activation in the trigeminal system following pain. He has worked effectively in developing new clinical pain evaluation tools."

Reviewer D: "In summary, Professor DaSilva is an accomplished clinician scientist who merits promotion to full professor. As a clinician, he is a Diplomate of the American Academy of Orofacial Pain Board. Scientifically, he is a strong neuroscientist pursuing clinically relevant research pertinent to pain conditions."

Reviewer E: "Through ardor and talent Professor DaSilva has generated an exemplary record of scholarly achievement. He is recognized nationally and internationally for his outstanding scientific work in the pain field. He is among the strongest in the field of pain research with respect to grant funding in comparison to other scientists at a similar point in their careers."

Summary of Recommendation:
Professor DaSilva is a valuable asset to the School of Dentistry. He demonstrates a distinctive and highly successful career path with strong training and work in trigeminal pain neuroscience. His service contributions are important, extending to the university, national and international levels. It is with the support of the Executive Committee, that I recommend Alexandre F.M. DaSilva for promotion to professor of dentistry, with tenure, School of Dentistry.

Laurie K. McCauley
Dean, School of Dentistry

May 2022