Approved by the Regents
May 20, 2021

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Chemical Engineering

Sunitha Nagrath, associate professor of chemical engineering, with tenure, Department of Chemical Engineering, College of Engineering, is recommended for promotion to professor of chemical engineering, with tenure, Department of Chemical Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2004	Rensselaer Polytechnic Institute, Mechanical Engineering, Troy, NY
M.S.	2000	Rensselaer Polytechnic Institute, Nuclear Engineering, Troy, NY
B. Tech	1992	Sri Venkateswara University College of Engineering, Chemical Engineering (with honors), Tirupathi, India

Professional Record:

2020 – present	Associate Director for Community, Single Cell of Spatial Analysis Program, Rogel Cancer Center, University of Michigan
2017 – present	Co-Director, Single Cell Analysis Core, Rogel Cancer Center, University of Michigan
2016 – present	Associate Professor (with tenure), Chemical Engineering, University of Michigan
2012 – 2015	Assistant Professor, Biomedical Engineering, University of Michigan
2010 – 2016	Assistant Professor, Chemical Engineering, University of Michigan

Summary of Evaluation:

Teaching: Professor Nagrath is a dedicated educator and mentor. During her time in rank, she substantially revised a required graduate course (ChE 505), and she continued development of a new course in BioMEMS (ChE 696/ME 696), now a required course for trainees in the Microfluidics in Biomedical Sciences Training Program. She routinely receives high marks for her elective course each year, with Q scores between 4 and 5. During her current rank, Professor Nagrath chaired 14 doctoral committees (completing eight) and co-chaired two doctoral committees (completing both), served as a committee member of 17 doctoral committees, and advised four M.S. students. She has mentored three post-doctoral fellows. Professor Nagrath is considered to be a dedicated and effective classroom teacher and a talented, caring and inspirational mentor for both graduate and undergraduate students.

Research: Professor Nagrath's research program is focused on the development of liquid biopsy using microfluidic technologies, particularly isolation and analysis of circulating tumor cells (CTCs) and exosomes secreted by tumor cells. The program spans three major areas: (1) CTC isolation and analysis in vitro; (2) wearable device for CTC analysis in vivo, and (3) exosome isolation and characterization. As of September 2020, these research areas are summarized in 54 peer-reviewed journal articles (appeared or accepted), among which 35 (25 as senior/corresponding author) were published as an associate professor, about seven papers per

year, which reflects Professor Nagrath's strong productivity. Collectively, these publications have garnered 10,600 citations and an h index of 32 (per Google Scholar), and they appear in premier science, engineering, and medical journals. Since coming to UM, Professor Nagrath has been awarded 24 grants or contracts (15 external, eight internal, plus one NIH center grant), totaling approximately $12M (excluding the NIH center grant), with approximately $7.2M directly supporting her lab. These include major awards from NIH, and many foundations such as Susan Komen Foundation, Wallace H. Coulter Foundation, and 3M Foundation. Currently, Professor Nagrath has four active NIH grants (excluding one center grant), one of which is an NIH R01 (with $2.7M as her share) and seven pending proposals. Professor Nagrath was recently elected as a fellow of the American Institute for Medical and Biological Engineering (class of 2021).

Recent and Significant Publications:

Y Kang, T Hadlock, T Lo, E Purcell, A Mutukuri, S Fouladdel, M D Silva, H Fairbairn, V Murlidhar, A Durham, SA. Mclean, S. Nagrath, "Dual-isolation and profiling of circulating tumor cells and cancer exosomes from blood samples with melanoma using immunoaffinity-based microfluidic interfaces," *Advanced Science*, 2020.

Tae Hyun Kim, Yang Wang, Christopher Oliver, Douglas Thamm, Laura Cooling, Costanza Paoletti, Kaylee Smith, Nagrath, S, Hayes, D, "A Temporary Indwelling Intravascular Aphaeretic System for In vivo Enrichment of Circulating Tumor Cells," *Nature Communications*, 04/01/2019; 1;10(1):1478.

Murlidhar V, Reddy RM, Fouladdel S, Zhao L, Ishikawa MK, Grabauskiene S, Zhang Z, Lin J, Chang AC, Carrott PW, Lynch WR, Orringer MB, Kumar-Sinha C, Palanisamy N, Beer DG, Wicha MS, Ramnath N, Azizi E, Nagrath S, "Poor Prognosis Indicated by Venous Circulating Tumor Cell Clusters in Early Stage Lung Cancers," *Cancer Res*, 2017.

Lin E, Rivera L, Fouladdel S, Yoon HJ, Guthrie S, Weiner J, Deol YS, Keller E, Sahai V, Simeone DM, Burness ML, Azizi E, Wicha MS, Nagrath S, "High-Throughput Microfluidic Labyrinth for the Label-Free isolation of Circulating Tumor Cells," *Cell Systems*, 2017.

Hyeun Joong Yoon, Tae Hyun Kim, Zhuo Zhang, Ebrahim Azizi, Trinh M. Pham, Costanza Paoletti, Jules Lin, Nithya Ramnath, Max S. Wicha, Daniel F. Hayes, Diane M. Simeone, and Sunitha Nagrath, "Sensitive capture of circulating tumour cells by functionalized graphene oxide nanosheets," *Nature Nanotechnology*, Vol 8 October 2013.

Service: Professor Nagrath has made significant contributions in the areas of service and leadership at the department, college, university and external levels. Professor Nagrath directly influences the governance and future of the department by her service. She serves on the Chemical Engineering Executive Committee, which works closely with the chair to guide decisions on teaching, recognition, and promotion, etc. This is an elected position and shows the confidence and respect of her colleagues. She served on the Faculty Search Committee (2017-2020), identifying and recruiting multiple excellent candidates to the department. In addition, Professor Nagrath served on the college's Internal Review Committee (2017-2018), setting the stage for conversations about the department's future directions both within the context of the following year's external review but also more broadly. Professor Nagrath is committed to ChE's efforts in DEI. Her lab is engaged in outreach activities aimed at creating awareness of women and scientists of color. She is active in the department's student-run DEI committees.

She has hosted pre-Medical Scientist Training Program students and mentors young female and under-represented minority students.

External Reviewers:
Reviewer A: "Based on the body of work described in this dossier, her strong level of extramural funding, and other activities related to service and education, I believe that she would earn promotion to full professor at my institution."

Reviewer B: "She is already a leader and one of the brightest stars at the engineering-medicine interface with numerous seminal publications in the area of liquid biopsy."

Reviewer C: "Compared to others in similar fields and the same stage of their career, I would say that Professor Nagrath does particularly well in connecting and collaborating with potential end users (e.g. clinicians) and thus coming up with relevant solutions to clinically important problems."

Reviewer D: "Her group not only developed next generation of technologies for the isolation and characterization of CTCs but immensely contributed to the translational potential of CTCs through their clinical studies. ... Hers is the first group, who incorporated nanomaterials into microfluidic devices and designed a GO [graphene oxide] chip in 2013 and published a milestone paper …"

Reviewer E: "I view her funding record as well above average for an associate professor being considered for promotion to full professor."

Summary of Recommendation: Professor Nagrath is a treasured colleague, highly respected scientist and dedicated educator. It is with the support of the College of Engineering Executive Committee that I recommend Sunitha Nagrath for promotion to professor of chemical engineering, with tenure, Department of Chemical Engineering, College of Engineering.

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

May 2021