

# Seminar by, Dr. Manish Kumar, Ph.D.

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## *Biomimetic Ideas for Sustainable Separations*

**Abstract:** Membranes are rapidly becoming the fastest growing platform for water purification, wastewater reuse, and desalination. They are also emerging in importance for carbon capture, hydrocarbon separations, and are being considered for applications involving catalysis and sensing. All synthetic membranes have selectivity-permeability tradeoffs, i.e., if a membrane has high permeability, it will have a lower selectivity between two solutes or between a dissolved solute and a solvent. This is due to the mechanism of solution-diffusion through a wide distribution of free volume elements in non-porous membranes such as reverse osmosis membranes used for desalination and reuse, and a wide pore size distribution in porous membranes. A simple solution, in concept, to such a challenge is to do what nature does – design precise angstrom to micron scale pores with no polydispersity. However, so far, such an ideal has not been realized in synthetic membranes and in particular for angstrom scale separations. We will discuss bioinspired ideas, and its realization in our lab, that could lead to an achievement of such an ideal membrane based on biological protein channels and artificial channels that mimic their structure.

**Biosketch:** Dr. Kumar, Ph.D., is an Associate Professor in the departments of Civil, Architectural and Environmental Engineering, and Chemical Engineering at University of Texas, Austin. He earned his Ph.D. in Environmental Engineering from University of Illinois at Urbana-Champaign in 2010. He and his research group are interested in mimicking biological processes and materials at the molecular scale to develop materials and processes that bring the exquisite specificity and functionality of biological molecules and processes to engineering scales.

**Date:** Friday February 25<sup>th</sup>, 2022

**Time:** 4:00 – 4:50 PM

**Zoom Meeting ID:** 953-6839-8159



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