**Texas Tech Chemical Engineering**
**Department of Chemical Engineering**
**Seminar Schedule**

## What can we learn from nature about designing membranes?

Manish Kumar
University of Texas at Austin

**Bio**

Manish Kumar is an Associate Professor of Environmental Engineering at UT Austin, where he recently moved to from the Chemical Engineering Department at Penn State. He received his bachelors from the National Institute of Technology in Trichy, India in Chemical Engineering. He completed masters in environmental engineering at the University of Illinois and then worked for approximately seven years in the environmental consulting industry on applied research projects primarily centered around membranes for water. He returned to Illinois to complete a PhD in the area of biomimetic membranes and then conducted postdoctoral research at the Harvard Medical School on the structure of water channel proteins, aquaporins. He works in the areas of biophysical transport characterization of membrane proteins, membrane protein enhanced synthetic membranes and devices and on developing artificial membrane proteins. His group also works on improving reverse osmosis membrane processes to prevent biofouling and colloidal fouling.

**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-permeablility 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 polydispersivity. 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.

**Friday Oct, 4**
**Livermore 101**
**3:00 pm**