Oklahoma Chemist of the Year - Thursday, November 12, 2026

Chemistry of Life in Action: Proteins from Health to Sensing



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Proteins are the molecular machines of life, and chemistry provides the tools to understand how they function in action. This talk presents three stories from my laboratory that illustrate how protein structure, dynamics, and molecular interactions govern biological processes, from human disease to cancer biology and molecular sensing.

The first story focuses on human health. The membrane-embedded oligosaccharyl transferase (OST) complex catalyzes N-linked glycosylation, and defects in this process cause congenital disorders of glycosylation. We determined the architecture of the Stt3p–Ost4p–Ost3p subcomplex, assigned the NMR resonances of Stt3, a 31 kDa helical membrane protein, mapped its catalytic site, and combined molecular dynamics simulations with solid-state NMR to reveal how the lethal Ost4p V23D mutation disrupts the complex.

The second story connects protein interactions to cancer biology. The human PDZ domain protein GIP serves as a scaffold for interactions with partners involved in cancer-associated pathways. We determined GIP–peptide complex structures, mapped its interaction network, and demonstrated that peptide modulators alter metabolic activity in human glioma cells.

The final story explores molecular sensing. Insect pheromone-binding proteins (PBPs) transport hydrophobic ligands through the antennal lymph, binding them at neutral pH and releasing them under acidic conditions through gate-controlled conformational changes. Comparative studies of silk moth and corn borer moth PBPs reveal how subtle sequence differences reshape this mechanism, distinguishing a classical two-state transition from a pathway involving a molten-globule-like state for ligand release. These findings provide mechanistic insights that may inform the development of environmentally benign pest control strategies.

Together, these studies demonstrate how protein structure, dynamics, and molecular interactions govern biological function across diverse systems, from human health to chemical sensing.

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6:00-7:30 pm Social Hour/Dinner
First floor atrium (north side)
7:30-8:30 pm Presentation
Astellas Conference Room (3410/3430)
Catering by Qdoba (Mexican)
Chicken, steak, or sauteed veggie bowls
Black beans, pinto beans
Cilantro lime rice, brown rice, queso, various toppings

RSVP is NOT required to attend the presentation.

The University of Oklahoma
Stephenson Life Sciences Research Center
101 Stephenson Parkway, Norman, OK
map: https://goo.gl/maps/Y7qPQS1Fh6R2 OU map

Cost
$20 members
$5 students

Dinner RSVP Deadline Tuesday, Nov 10th, noon
Contact: AJ Sona
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Smita Mohanty received a PhD degree in Chemistry in 1988 from the University of Delhi, India. She did postdoctoral studies in Structural Biology especially protein NMR at the University of Washington, Seattle, and Albert Einstein College of Medicine in New York. She joined the faculty of the State University of New York at Stony Brook, New York from 1999-2005 and at Auburn University from 2006-2014. She is currently a professor in the Department of Chemistry and an Adjunct Professor in the Department of Biochemistry and Molecular Biology at Oklahoma State University (https://cas.okstate.edu/chemistry/smita_mohanty). Dr. Mohanty takes a multidisciplinary approach to characterize the structure, and function of both globular and membrane-associated proteins involved in various critical biological functions with an overall objective of understanding the molecular basis of function for exploiting these as new targets for the designing of inhibitors.

