SOCIETY FOR GLYCOBIOLOGY AWARDS—2019

Karl Meyer Lectureship Award

The Karl Meyer Lectureship Award was established in 1990 to honor the distinguished career of Karl Meyer and his outstanding contributions to the field of Glycobiology. This international award is given to well-established scientists with currently active research programs who have made widely recognized major contributions to the field of Glycobiology.

The 2019 Karl Meyer Award will be presented to Dr. Robert J. Linhardt, who is Professor at Rensselaer Polytechnic Institute in the Departments of Chemistry and Chemical Biology, Chemical and Biological Engineering, and Biomedical Engineering. Professor Linhardt, aka “Bob”, earned his Ph.D. degree in Chemistry in 1979 at The Johns Hopkins University. His Ph.D. research in Physical Organic Chemistry gave him a strong background in chemical analysis, synthesis and mechanistic chemistry. Bob moved to MIT in 1979 to undertake postdoctoral studies with Professor Robert Langer in drug delivery and removal systems. There, he was a codiscoverer of poly (anhydrides) for drug delivery resulting in the Gliadel® wafer to treat brain cancer and first purified heparinase for use in a heparin removal system (Science 1982), eventually leading to the invention of a new low molecular weight (LMW) heparin drug, tinzaparin. On leaving MIT in 1982, Bob joined the faculty at the University of Iowa where he spent the next 21 years rising through the ranks to become a Chaired Professor in the Departments of Medicinal and Natural Products Chemistry, Chemical Engineering and Chemistry. While at Iowa, Bob developed his reputation as one of the world’s foremost experts on GAGs, particularly the drug heparin. He shepherded the introduction of LMW heparins into the market by being the first to use multidimensional NMR, MS and gel and capillary electrophoresis (Science 2002) for its analysis. He also elucidated new biological and pharmacological roles for heparin in inflammation (J Clin Inv 1998), angiogenesis (Science 1983), cell growth (Science 1996; Molec Cell 2000) and as an anti-infective (Nat Med 1997). During this period, Bob had the opportunity to work with many exceptional glycobiologists, including work undertaken during his 1992 sabbatical at UCSD and the La Jolla Cancer Res Fdn (now SBP).

In 2003, Bob moved to Rensselaer with a focus on understanding heparin–protein interactions as they related to heparin’s structure–activity relationships (Angew Chem 2002). In 2007–2008, when a heparin contamination crisis resulted in hundreds of deaths, Bob joined the team of scientists who discovered the OSCS adulterant (Nat Biotechnol 2008, 2010; PNAS 2009). He then worked with the USP to help write a new monograph protecting this critical drug (Nat Biotechnol 2016). It was at this point that Bob changed his focus to the chemoenzymatic synthesis of LMW heparins and heparin, relying on recombinant Golgi enzymes, first developed in the Rosenberg lab by his former students, Jian Liu and B. Kuberan. Working with Jian Liu, Bob has chemoenzymatically synthesized many LMW heparins (Science 2011; Nat Chem Biol 2014; Sci Transl Med 2017; PNAS, 2019). He also has successfully prepared bioengineered heparin, which is in preclinical evaluation (J Am Chem Soc. 2008; Angew Chem 2019).

Bob’s new research directions include the application of metabolic engineering to GAG synthesis with targets including the large-scale production of heparin and chondroitin sulfates. He is applying CRISPR to control GAG biosynthesis (Nat Meth 2018) and better understand GAG glycobiology. Sequencing of GAG chains is underway (Nat Chem Biol 2011) and novel approaches for undertaking glycosaminoglycanomics are being investigated.

Over the past four decades Bob has mentored and advised over 200 graduate students, postdoctoral fellows and visiting scientists and over 60 of these have become Professors, themselves. He has published over 900 research papers and holds nearly 100 patents. Bob is a Fellow of the NAI and AAAS and has received numerous awards including the ACS Isbell, Hudson and Wolfrom awards for his work on carbohydrates and the Volwiler, Gisvold and USP awards for his pharmaceutical research.

In summary, the 2019 Karl Meyer Lectureship Award recognizes Professor Linhardt’s seminal contributions to glycobiology, which include many outstanding contributions to our understanding of heparins and GAGs.

Rosalind Kornfeld Award for Lifetime Achievement in Glycobiology

The Rosalind Kornfeld Award for Lifetime Achievement in Glycobiology was established in 2008 to honor the distinguished scientific career and service to the Society by Dr. Rosalind Kornfeld. The award is given by the Society to scientists who have made significant contributions with an important impact on the field of Glycobiology over their professional lifetimes.

The 2019 Rosalind Kornfeld Award will be presented to Dr. Nancy Dahms, Professor in the Department of Biochemistry at the Medical College of Wisconsin. Dr. Dahms, a native of Wisconsin, received her B.S. degree from Marquette University in Milwaukee. She then entered graduate school at Johns Hopkins University where she earned her Ph.D. in Biochemistry working in the lab of Gerald Hart and was introduced to glycobiology studying the nature of glycans on several plasma membrane glycoproteins. Nancy then
undertook her postdoctoral training in Stuart Kornfeld’s lab at Washington University in St. Louis where, along with Peter Lobel, another postdoc, she succeeded in cloning the cDNAs for the two mannose 6-phosphate receptors, the cation-independent (CI-) and cation-dependent (CD-) MPRs. These receptors play a central role in the transport of newly synthesized acid hydrolases from the Golgi to the lysosome. Most of the FDA-approved treatments for lysosomal storage diseases (LSDs) involve enzyme replacement therapy that target the CI-MPR for the uptake of recombinant acid hydrolases.

In 1989, Dr. Dahms began her independent career as Assistant Professor of Biochemistry at the Medical College of Wisconsin. Recognizing the importance of understanding how the MPRs bind Man-6-P-containing glycans, she had the courage to undertake the arduous task of determining the structure of the Man-6-P binding domains of these receptors. In a seminal Cell paper in 1998, in collaboration with Dr. Jung-Ja Kim, Dr. Dahms published the threedimensional structure of the Man-6-P binding domain of the CI-MPR, providing the first insight into the mechanism of Man-6-P binding to the receptor. This was followed by structural studies of the CI-MPR, which has 15 repetitive domains in its extracellular region, as compared to only one for the CD-MPR. She discovered 4 of the 15 repeats bind Man-6-P. Two bind Man-6-P monoesters, one binds a Man-6-P-GlcNAc diester and one binds both. Nancy identified the key residues within the binding pocket that interact with the mannose ring and phosphate and clarified the molecular basis for the difference in the ability to bind phosphodiester.

Another of Dr. Dahms’ major contributions has been her studies of the Man-6-P receptor homology (MRH) domain of the beta subunit of the ER enzyme, glucosidase II (GIIb). The MRH domain of GIIb shows homology to domains found in a family of ER proteins that function as mannose-binding lectins as well as to the Man-6-P binding domains of the Man-6-P receptors. In collaborative studies with Dr. Cecilia D’Alessio in the Parodi lab, Dr. Dahms elucidated the complete structure of the GIIb MRH domain in both mannose bound and unbound states. This provided insight into how this MRH domain recognizes and binds carbohydrate ligands.

Dr. Dahms has generated the first nonmussel model of the LSD, Fabry disease. Fabry disease is caused by a deficiency of the acid hydrolase, α-galactosidase A, which leads to glycosphingolipid accumulation in many cell types. Unlike Fabry mouse models, this α-galactosidase A-deficient rat recapitulates ocular, hearing, heart and pain phenotypes experienced by Fabry patients. Fabry rats are being used to study disease mechanisms and test new therapies.

Together, these studies have greatly advanced our understanding of how the MPRs function in acid hydrolase transport and also how the MRH-containing lectins facilitate glycoprotein folding in the ER. Dr. Dahms has written the definitive reviews of this topic for major scientific journals. Her publications are models of careful and well-executed research that is clearly presented.

Dr. Dahms’ service to the Medical College of Wisconsin has been exceptional, especially in terms of teaching and mentoring. She has been recognized as the Outstanding Medical Student Teacher eight times and has received the Outstanding Faculty Service Award three times. She also has received the Outstanding Graduate Student Teacher Award. She has served on the Ph.D. thesis committee of 50 graduate students and advised numerous postdoctoral students and junior faculty. Dr. Dahms has been active in the Society for Glycobiology for many years. Dr. Dahms served on the Board of Directors from 2003–2006 and again from 2017–2020. She was a member of the Nominations Committee from 2011–2012. She also has served on the Editorial Boards of Glycobiology and the Journal of Biological Chemistry. Based on the high impact of her research, her service to the field and her high standards of scholarship, Dr. Dahms is a highly deserving recipient of the Rosalind Kornfeld Award for Lifetime Achievement in Glycobiology.

Glycobiology Significant Achievement Award

The Glycobiology Significant Achievement Award is given annually by Oxford University Press (publisher of Glycobiology) to honor new or midcareer scientists who have made key discoveries during their early careers with the potential to have a substantial impact on the glycoscience community.

This year, Oxford is delighted to present the Glycobiology Significant Achievement Award to Dr. Jochen Zimmer, who was recently appointed as a Full Professor in the Department of Molecular Physiology and Biological Physics at the University of Virginia School of Medicine. The award will be given to Dr. Zimmer at the Society for Glycobiology Annual meeting this November in Phoenix, Arizona.

Dr. Zimmer has made several significant discoveries during his time at UVA. His work has focused on complex carbohydrates and systems that make up the cell walls of both bacterial and eukaryotic cells. Due to the widespread importance and utility of these systems, Dr. Zimmer’s pursuit has led him to bridge the gap between all forms of life through their glycobiology. Employing techniques including X-ray crystallography and electron microscopy, he has studied the translocation and surface expression of polysaccharides important for capsule and biofilm formation in bacteria, cell wall biosynthesis in plants, as well as extracellular matrix formation in vertebrates. In particular, there are two structures of great impact—groundbreaking firsts—the cellulose synthase and the O-antigen ABC transporter, which have been significant achievements in Dr. Zimmer’s career. In addition to being widely applicable, the influence of Dr. Zimmer’s work is exemplified through his many high impact publications and awards. In his career, he has published dozens of publications including five in Nature, one in Science, one in Nature Communications and three in PNAS, just to name a few. Dr. Zimmer continues to work on cell surface complex carbohydrates, with the goal to delineate the mechanisms by which they are synthesized, secreted and embedded into an extracellular matrix.

President’s Innovator Award

The purpose of the Society for Glycobiology President’s Innovator Award is to acknowledge the contributions of one scientist each year that has made a significant impact on society.

The 2019 President’s Innovator Award will be presented to Dr. Gerald Hart, Professor and GRA Eminent Scholar in the
Department of Biochemistry and Molecular Biology and Complex Carbohydrate Research Center at the University of Georgia. While Dr. Hart (“Jerry”) is most famous for creating an entirely new field in glycobiology, the dynamic and inducible modification of nuclear and cytosolic proteins via O-GlcNAc, his previous scientific accomplishments in the glycoscience arena were also immense. As a graduate student with Gary W. Conrad at Kansas State University, Jerry made seminal contributions to the role of GAGs in corneal development. As a postdoctoral fellow in Bill Lennarz’s laboratory, Jerry defined the minimal sequence requirement for N-linked protein glycosylation, the so-called “sequon” [N-X (not P)-S/T]. Jerry continued his studies on N-glycosylation as a junior professor at Johns Hopkins School of Medicine, firmly established the concept of site-specific oligosaccharide microheterogeneity and demonstrated this is a non-random process that fine-tunes glycoprotein functions. At the same time, Jerry was working with Paul Englund’s group to elucidate the pathway for GPI-anchor biosynthesis. It was actually Jerry’s labs studies of complex glycosylation on the surface of intact cells in culture that led to the discovery of the O-GlcNAc modification of nuclear and cytoplasmic proteins.

Since his discovery of glycosylation inside the cell, but outside the secretory system, Jerry has continued to lead the ever-growing O-GlcNAc field for the past 30 years. Beyond establishing the existence of the O-GlcNAc modification on literally thousands of proteins, his laboratory has purified, characterized and cloned the cycling enzymes, developed many of the tools in the field and first proposed the yin–yang relationship between O-GlcNAc and phosphorylation, as well as the metabolic sensor hypothesis. Work from Jerry’s lab was also key to establishing O-GlcNAc as part of the histone code and a metabolic regulator of gene expression via multiple mechanisms. More recently, Jerry’s lab has been the leader in exploring crosstalk between phosphorylation and O-GlcNAcylation, as well as examining the role of O-GlcNAc in diabetes and Alzheimer’s. While Jerry would never advocate defining a scientist by any number or set of numbers, he has an h-index of 117 and an i10-index of 313, and his publications have been cited over 46,000 times.

In addition to his direct scientific contributions, Jerry has provided exemplary service to the glycobiology and life science community. He has trained and instilled the importance of excellence in research and service to a large number of graduate students and postdoctoral fellows, including many that have gone on to become Professors, Chairs of Departments and Members of the SFG. He was the founding Editor-in-Chief of Glycobiology, the leading journal in glycoscience, and is a past-president of the Society for Glycobiology and the International Glycoconjugate Organization, as well as a former Chair of the Glycobiology Gordon Conference. He is currently an Associate Editor for two American Society for Biochemistry and Molecular Biology (ASBMB) journals: J Biol Chem and Mol Cell Proteomics. Jerry served as the Department Head of Biological Chemistry at Johns Hopkins School of Medicine for 21 years, won the Karl Meyer award, the highest Award given by the Society for Glycobiology, in 2006, and won the Herbert Tabor Research Award from ASBMB in 2018. He is currently the Georgia Research Alliance William Henry Terry, Sr. Eminent Scholar in Drug Discovery and Professor of Biochemistry and Molecular Biology at the Complex Carbohydrate Research Center, University of Georgia. Finally, Jerry is the current President of the American Society for Biochemistry & Molecular Biology. In short, Dr. Hart is the perfect selection for the 2019 SFG President’s Innovator Award.

Molecular and Cellular Proteomics/American Society for Biochemistry and Molecular Biology Lectureship Award

The Molecular and Cellular Proteomics (MCP)/ASBMB Lectureship Award will be presented to Manfred Wuhrer at the Society for Glycobiology Annual meeting in Phoenix, Arizona. The MCP Journal was created in 2001 to address the growing needs of the proteomics community. Subsequently, the MCP/ASBMB award was established in 2013 to honor scientists that have been at the forefront of the emerging field of glycomics and glycoproteomics.

Dr. Wuhrer is a Professor of Proteomics and Glycomics and Head of the Center for Proteomics and Metabolomics at Leiden University Medical Center (LUMC) in the Netherlands. He is chairman of the Dutch Society for Mass Spectrometry as well as a board member of The Human Glycome Project (https://human-glycome.org/). Dr. Wuhrer earned his Ph.D. in 1999 in Professor Rudolf Geyer’s lab at Giessen University, Germany, where he focused on glycan structural analysis of parasite glycoconjugates. He undertook postdoctoral studies in this same lab, working on analyzing the glycans of NCAM. In 2003, he moved to the LUMC, where he worked on developing glycoanalytical technologies and their application to the study of parasite glycoconjugates. In the past decade, Dr. Wuhrer’s research has focused on analyzing the glycans of human proteins, with particular attention to immunoglobulins. From 2013 to 2015, Manfred served as a Professor in Analytics of Biomolecular Interactions at the VU University in Amsterdam before assuming his current position at the LUMC in Leiden.

Dr. Wuhrer’s work on glycomics and glycoproteomics technology centers around higher throughput mass spectrometry glycomics workflows, which his lab applies to unravel protein glycosylation signatures of various human diseases including autoimmune diseases, infectious diseases, metabolic disorders and cancer. Recently, his lab has worked on the comprehensive characterization of protein modifications, relying on intact protein analysis and functional receptor affinity separations with mass spectrometric detection, in order to structurally and functionally resolve proteoforms in an integrated manner. Another long-term goal of his work is to miniaturize mass spectrometry glycomics and glycoproteomics methods to open up new applications in clinical glycomics.