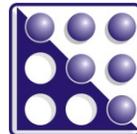




**VIBT**  
Vienna Institute  
of BioTechnology



Invitation to the VIBT/ÖGMBT seminar at the

Department of Nanobiotechnology

Muthgasse 11, 1190 Vienna

Seminarraum 12 (ground floor)

June 21<sup>st</sup>, 2017  
17:00 h

**Prof. Shuguang Zhang**

Center for Bits & Atoms  
Massachusetts Institute of Technology (MIT),  
Cambridge, MA (USA)

## **The QTY Code: a simple tool for engineering membrane proteins**

Host: em. Univ. Prof. Dr. Uwe B. Sleytr



Structure and function studies of membrane proteins, particularly G protein-coupled receptors (GPCRs) and multiple segment transmembrane proteins, require detergents. Without detergents these proteins aggregate and are impossible to analyze. We have devised a useful tool, the QTY Code, for reengineering hydrophobic domains to become water-soluble without significant alteration in protein structure and function. The molecular code QTY (glutamine, threonine and tyrosine) was used to systematically replace the hydrophobic amino acids leucine (L), valine (V), isoleucine (I) and phenylalanine (F) in 4 membrane proteins. Using this QTY Code, we engineered the chemokine receptors CCR5, CXCR4, CCR10 and CXCR7 to become water-soluble and functional in the absence of detergents. We introduced ~22%-29% systematic QTY changes in the re-designed receptors, where ~56% of the transmembrane domains were altered. Our ability to engineer membrane proteins is due to the fact that formation of  $\alpha$ -helices is independent of their side chains (this is like DNA, the double helix formation is independent of the bases). Our results suggest that despite the significant number of QTY changes, these detergent-free variants still maintain their stable structures and ligand-binding activities. Our simple QTY Code is a useful tool and has implications for engineering water-soluble variants of previously water-insoluble and perhaps aggregated amyloid proteins.

Shuguang Zhang is at Center for Bits & Atoms, Massachusetts Institute of Technology. He received his B.S from Sichuan University, China and Ph.D. in Biochemistry & Molecular Biology from University of California at Santa Barbara, USA. He was an American Cancer Society Postdoctoral Fellow and a Whitaker Foundation Investigator at MIT. He was a 2003 Fellow of Japan Society for Promotion of Science (JSPS fellow). His work of designer self-assembling peptide scaffold won 2004 R&D100 award. His and his colleagues' work for direct harvesting biosolar energy was selected one of the 10 finalists of the 2005 Saatchi & Saatchi Award for World Changing Ideas. He won 2006 Wilhelm Exner Medal of Austria. He is a Fellow of American Institute of Medical and Biological Engineering and Fellow of US National Academy of Inventors. He is a Foreign Corresponding Member of Austrian Academy of Sciences. He published >160 scientific papers that have so far been cited ~24,000 times, with h-index 75. He is also a co-founder and board member of Molecular Frontiers Foundation that encourages young people to ask big and good questions in order to win Molecular Frontiers Inquiry Prize. He was a founder of biotech company 3DMatrix.