

## Ph.D. Course in Materials Science and Nanotechnology

University of Milano-Bicocca, Department of Materials Science, via Cozzi 55, 20125 Milano

**June 5, 2019 – 2.00 p.m.**

**Seminar room - Department of Materials Science U5**

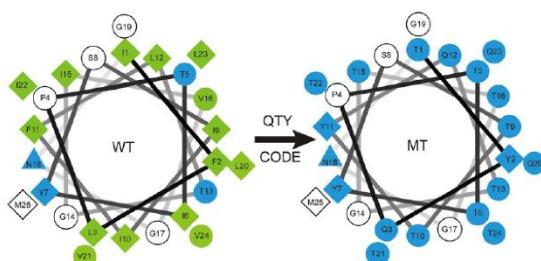
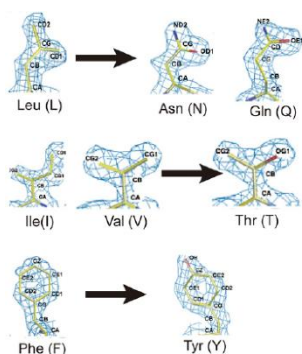
## SHUGUANG ZHANG

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### QTY code, a simple tool for protein design

Shuguang Zhang in 2011 started to design membrane proteins. There are ~30% genes code for membrane proteins in genomes that are crucial for both internal and external cellular communications. He invented a simple and elegant molecular QTY code (glutamine, threonine and tyrosine) to systematically replace the hydrophobic amino acids leucine (L), valine (V), isoleucine (I) and phenylalanine (F) in the 7 transmembrane  $\alpha$ -helices of G-protein coupled receptors (GPCRs). GPCRs function similar like our mobile phones to communicate and interact with external world. Our results suggest that despite 46%-56% transmembrane  $\alpha$ -helices changes, water-soluble QTY variants still maintain stable structures and biological function, namely, ligand-binding activities. Our simple QTY code is a likely useful tool and has big impact for designs of water-soluble variants of previously water-insoluble and perhaps aggregated proteins, including amyloids.

Shuguang Zhang in 1990 made a serendipitous discovery of a repetitious and ionic self-complementary peptide segment in yeast protein Zuotin in 1990. This is discovery of the first self-assembling peptides that eventually led to the development of a new field of peptide nanobiotechnology. Furthermore, his discovery inspired numerous people around the world to design



a variety of self-assembling peptides for wide spread uses including peptide hydrogels in materials science, 3D tissue cell culture and tissue engineering, nanomedicine, sustained molecular releases, clinical and surgical applications. He co-founded a startup company 3DMatrix that brings the self-assembling peptide materials to human clinical and surgical uses.

**SHUGUANG ZHANG, Ph.D.**

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Website: [Laboratory of Molecular Architecture](#)

[John Simon Guggenheim Fellow](#)

[Google Scholar: Shuguang Zhang](#)

Short bio:



Shuguang Zhang is at Media Lab, Massachusetts Institute of Technology. His current research focuses on **designs** of biological molecules, particularly proteins and peptides (fragment of proteins). 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 a 2006

Guggenheim Fellowship and spent academic sabbatical in University of Cambridge, UK. 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 >28,300 times, with h-index 81. He is also a co-founder and board member of Molecular Frontiers Foundation that encourages young people to ask big and good questions that will be awarded for [Molecular Frontiers Inquiry Prize](#).