Center for BioMolecular Modeling Staff Invited to Give Presentations At Prestigious European Bioinformatics Institute in UK

Tim Herman, PhD and Mark Hoelzer, MFA, of 3D Molecular Designs and the Milwaukee School of Engineering (MSOE) Center for BioMolecular Modeling (CBM), are invited to give presentations to educators and secondary students in Cambridge, UK, by the European Bioinformatics Institute (EBI) on the Wellcome Genome Campus. They will lead two workshops and a seminar February 6-9.

Dr. Herman recognized the value of bringing MSOE's 3D printing capabilities to biomolecular education and opened the CBM, an instructional materials laboratory, in 1998. Dr. Herman and his team of two other PhDs in the biosciences, a secondary educator and Hoelzer, who is lead designer and product developer have had continuous funding from the US National Institutes of Health and National Science Foundation.

In addition to 3D printing accurate models of proteins and other molecular structures they have created numerous hands-on manipulative kits that that are used by thousands of secondary and post-secondary students in the US, UK and Australia.

Through its professional development programs, the CBM bridges the gap between research laboratories and the science classrooms with molecular stories of the process of science. They combine accurate 3D printed models of proteins with bioinformatics maps of the DNA sequence that encodes the protein. Students' interest in these stories are further engaged by describing the personal experiences of patients who are being impacted by these diseases. Physical models are a powerful component of these stories in that students can see how a single nucleotide change in a gene can change a single amino acid in the protein, often leading to change in the protein's structure and function.

Since 2001, Dr. Herman's SMART Teams program (Students Modeling A Research Topic) has helped thousands of US students delve into the molecular world, explore science as a potential career and work closely with research mentors to understand the specific proteins the researchers are investigating. In the process, students learn to read scientific articles, write abstracts and design 3D printed models that help convey the significance of the researchers' cutting-edge work to other scientists and lay audiences.

In Cambridge Herman and Hoelzer will hold one workshop for secondary art and science teachers, and another for their students. These workshops are being organized by the PDBe (Protein Data Bank in Europe) in an effort to expand a novel outreach program in which they introduce local art teachers and their students to Protein Data Bank and virtual images of proteins as inspiration for their artwork. Now the PDB-E wants to expand this program by involving science students in program. That's where the CBM comes into play.

"Physical models are the best way to engage people in complicated but fascinating topics," Dr. Herman said. "Just hold hemoglobin, a ribosome, or a CRISPR Cas9 model in your hands and you'll understand the power of modeling."

In a third presentation, Dr. Herman and Hoelzer address the community engagement staff and researchers from the Laboratory of Molecular Biology (LMB) in a seminar entitled ***Communicating Your Science.*** The LMB is considered by many people to be the birthplace of modern molecular biology. It was here that the structure of DNA was first described by Watson and Crick in 1953. Among the long list of other major advances in structural biology that have come from the LMB include the structure of hemoglobin by Max Perutz in1962 , the dideoxy-nucleotide sequencing method of Fred Sanger in 1980 and most recently, the atomic structure of the 70S ribosome by Venki Ramakhrisnan in 2009. Hoelzer and Herman have recently created a physical model of the ribosome – a large multi-subunit complex composed of 50 proteins and 6 RNAs (see attached photo).

"There are countless, amazingly-detailed stories of how the invisible molecular world works," Dr. Herman said. "We'll demonstrate how we use 3D printing technologies and hands-on modeling to engage high school students in the United States. In addition to functioning as a hands-on focus point for exploring proteins, physical models are powerful thinking tools that stimulate meaningful conversations among scientists, students and other audiences."

"We hope to learn as much from the students and teachers in Cambridge as they learn from us," Dr. Herman said, considering how the CBM might be able to incorporate art into its SMART Team program.

Dr. Herman has reserved two spots in the CBM professional development course, "Modeling the Molecular World," for Cambridge science teachers. Participants in the week-long summer workshop on the MSOE campus explore the invisible molecular world using a variety of kits and models and supporting digital resources.

Dr. Herman spun off 3D Molecular Designs (3DMD) from the CBM in 1999, in order to make 3D-printed models commercially available to researchers and educators. The CBM also transfers its best ideas and prototypes to 3DMD for the company to carry out final development and make them commercially available to teachers and schools.

3DMD also engages in its own research and development of biomolecular kits and models. NIH has awarded several Small Business Innovative Research grants to 3DMD to research and develop some of its kits, including its new Dynamic DNA Kit©. 3DMD specializes in small scale manufacturing and produces many of its kits in-house.

After his presentations in Cambridge, Dr. Herman and his wife and partner, Diane, and Heather Ryan, partner and director of operations will visit 3D Molecular Designs' primary European distributor, Timstar Laboratory Suppliers in Shrewsbury, UK.

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