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ENG Fetes Temple Smith with "Frontiers in Biomolecular Engineering" Symposium

By Mark Dwortzan

About 200 colleagues from Greater Boston and across the globe gathered at the Photonics Center on Friday, Sept. 25 for a daylong symposium celebrating the recent appointment of Temple Smith as emeritus professor of Biomedical Engineering. "Frontiers in Biomolecular Engineering" was organized by the Biomedical Engineering Department and featured presentations from 11 scientists and engineers whose work was influenced by Smith.

Michael Waterman and Temple Smith co-developed the Smith-Waterman sequence alignment algorithm, a tool underlying most DNA and protein sequence comparisons.

"During his [19-year] tenure at Boston University, Temple Smith has inspired legions of BU faculty and students, but his influence has been felt well beyond the walls of 36 Cummington Street and the borders of BU," said Boston University Provost David Campbell. "He's a world leader in computational analysis of protein structure, computational genomics and bioinformatics." Campbell noted Smith's many signature achievements, from co-developing the Smith-Waterman sequence alignment algorithm, a tool underlying most DNA and protein sequence comparisons, to analyzing and modeling the evolution of the ribosome.

"This symposium and the individuals who have come to watch it are a testimony to Temple's impact as a scientist and as a scientific colleague," said College of Engineering Dean Kenneth Lutchen. Smith's contributions have been essential to BME's rise to become one of the largest departments of its kind in the country, its consistent top-10 ranking by U.S. News & World Report, its distinction as the only department in the nation to receive both a Whitaker Foundation Leadership Award and a Coulter Foundation Translational Partnership Award, and its nearly $30 million annual research budget, Lutchen added.

He credited Smith with helping to reconcile established faculty members who focused on biology and chemistry, and newer faculty who applied engineering methods to these disciplines.

"Temple Smith was the first faculty member in our department who had the capacity to convince the existing faculty that there was a huge role for engineering to play at the molecular, cellular and genomic scale," Lutchen recalled. "He helped us bridge that chasm and become the integrated department that we are today."

Hailing from academia and industry, the symposium's speakers explored leading-edge research in biomolecular engineering, bioinformatics and systems biology, and its potential impact on medical research, drug discovery and disease treatment.

Lee Hood, president and co-founder of the Institute for Systems Biology (ISB) in Seattle, described how systems biology and advanced digital technologies are moving physicians away from today's reactive approach to medicine and toward a more predictive, personalized, preventive and participatory (P4) form of healthcare delivery.

"The digitalization of biology and medicine and P4 systems medicine will transform medicine," Hood maintained, "and lead to dramatically lower healthcare costs."

Hood predicted that these approaches, coupled with cheaper, more powerful technologies, will result in earlier and more precise detection of disease and more effective treatment. "We are going to be able to reengineer disease-perturbed networks with drugs," he said, "and this will lead to a very efficient new strategy for doing drug targeting and discovery."

Stephen Sligar, I.C. Gunsalus professor of biochemistry at the University of Illinois at Urbana-Champaign, discussed his efforts to engineer self-assembled nanodiscs for the study of how membrane proteins function within the complex signaling and catalytic pathways of the cell.

“The challenge is to understand how these complex systems work and how we can begin to understand their interactions,” he said. Sligar’s nanodiscs, which embed membrane proteins inside self-assembled, soluble lipid bilayers, have already enabled him to investigate membrane proteins associated with hormone-dependent cancers and Alzheimer’s disease.

Xiaolin Zhang, vice president and head of AstraZeneca Innovation Center China in Shanghai, specified ways to optimize drug discovery for the treatment of cancer and other diseases. “The real challenge is to have a clear hypothesis and plan for how to test it,” he stressed. Zhang outlined four considerations he viewed as critical to efficient drug discovery: identifying exactly which disease(s) to target, determining the proper dose and schedule, selecting the right patients for clinical trials and specifying the right biomarkers to track a drug’s effectiveness in patients.

Other presenters included George Church, professor of genetics and director of the Center for Computational Genetics at Harvard Medical School; David Galas, senior vice president for strategic partnerships at the ISB; William M. Gelbart, professor of molecular and cellular biology at Harvard University; Roderic Guigó, coordinator for the bioinformatics and genomics program at the Center for Genomic Regulation in Barcelona; Richard Lathrop, professor of computer science at the University of California, Irvine; Collin M. Stultz, W. M. Keck associate professor of biomedical engineering at the Massachusetts Institute of Technology; Michael Waterman, university professor at the University of Southern California; and Teresa A. Webster, principal biostatistician with Affymetrix, Inc.

Reflecting on the diverse set of scientific and technological advances addressed at the conference, Smith later observed, “What’s most exciting in the long term is that eventually this should lead to real changes in the way we do medicine and train doctors. The new technologies also allow us to ask deeper and deeper questions.”

The sheer number of people who attended the symposium to pursue those questions made a strong impression on Smith. He noted that about half of the speakers were either former students or post-docs, and counted about 32 of his students at the symposium and post-conference dinner.

“There’s something very nice about [seeing] a whole bunch of people whose careers were influenced by my time,” said Smith. “Hopefully, you make a positive difference in people’s lives; that’s what this profession is all about.”