

New Center Looks at How Human Systems Function or Fail

National Resource for Network Biology at UC San Diego will provide better tools for studying biological systems

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A new center called the National Resource for Network Biology (NRNB), based at the University of California, San Diego School of Medicine, will help clinicians analyze an ever-growing wealth of complex biological data and apply that knowledge to real problems and diseases.

In recent years, the study of biological networks has exploded, with scientists shifting much of their focus from single cells to complex systems, producing novel maps of interactive networks of genes and proteins that help define and describe a functioning human being. But the exponential growth in data has created a new challenge: How do you effectively use it?

The NRNB is part of the answer, said Trey Ideker, PhD, associate professor of bioengineering in UC San Diego's Jacobs School of Engineering, chief of the Division of Genetics at the School of Medicine and principal investigator of the new center., which is funded by a five-year, \$6.5 million grant from the National Institute of Health's National Center for Research Resources (NCRR), and the only center of its type to be funded this year.

"Ten years ago, the Human Genome Project was a huge achievement. It listed for the first time all of the 25,000 or so genes in a human being," said Ideker. "But it didn't - and doesn't -- really tell us how those genes work together. For that you need another 'omics data set: the interactome."

An "interactome" describes all of the molecular interactions within cells. For the past decade, a grassroots effort called Cytoscape, developed by Ideker and colleagues, has provided biologists with the beginnings of one: an online, open-source, evolving platform that describes and visualizes complex molecular interactions and biological pathways.

But this gathering of basic data has generally outpaced efforts to practically apply it, said Alexander Pico, PhD, Bioinformatic Group Leader at The Gladstone Institutes at UC San Francisco and executive director of the NRNB.

"The field of network biology is at a very interesting stage," Pico said. "We are sitting on loads of measurement data, with new technologies continuously expanding, and we are just beginning to put these 'parts lists' into comprehensive biological systems."

With support from the NIH, the new center will provide qualified researchers with access to more and better tools for conducting advanced studies of biological systems that result in sophisticated models of how human systems function or fail. All of this will ultimately lead to new and improved treatments and therapies, such as identifying disease biomarkers and molecular targets for potential drugs, defining genetic risk factors and deciphering how individual or group lifestyles (social networks) affect the development and transmission of disease.

"We are unique in having a balanced mix of software developers and bench biologists who know how to communicate with each other and with the greater community," said Pico. "We have been building and using the core toolset of NRNB for many years and we've made a regular practice of training others - establishing collaborations that drive development along the most fruitful and effective routes." Like its subject, the NRNB is the product of extensive interaction, with multiple collaborators. They include James Fowler, a UCSD professor in the School of Medicine and Division of Social Sciences who specializes in social networks; Bruce Conklin of The Gladstone Institute of Cardiovascular Disease; Chris Sander of the Memorial Sloan Kettering Cancer Center in New York; Gary Bader of the University of Toronto and Benno Schwikowski of Institut Pasteur in France. Olga Brazhnik of the NCRR is program officer.

The NRNB joins three other NCRR biomedical technology centers based at UC San Diego: the National Center for Microscopy and Imaging Research (Mark H. Ellisman, Director); the National Biomedical Computation Resource (Peter W. Arzberger, Director); and the Center for Computational Mass Spectrometry (Pavel A. Pevzner, Director).

NCRR biomedical technology centers serve a specific purpose in NIH-funded research. They provide critical and often unique technological and intellectual resources to scientists, emphasizing service and training for outside investigators.

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