New consortium to create 'virtual cell'

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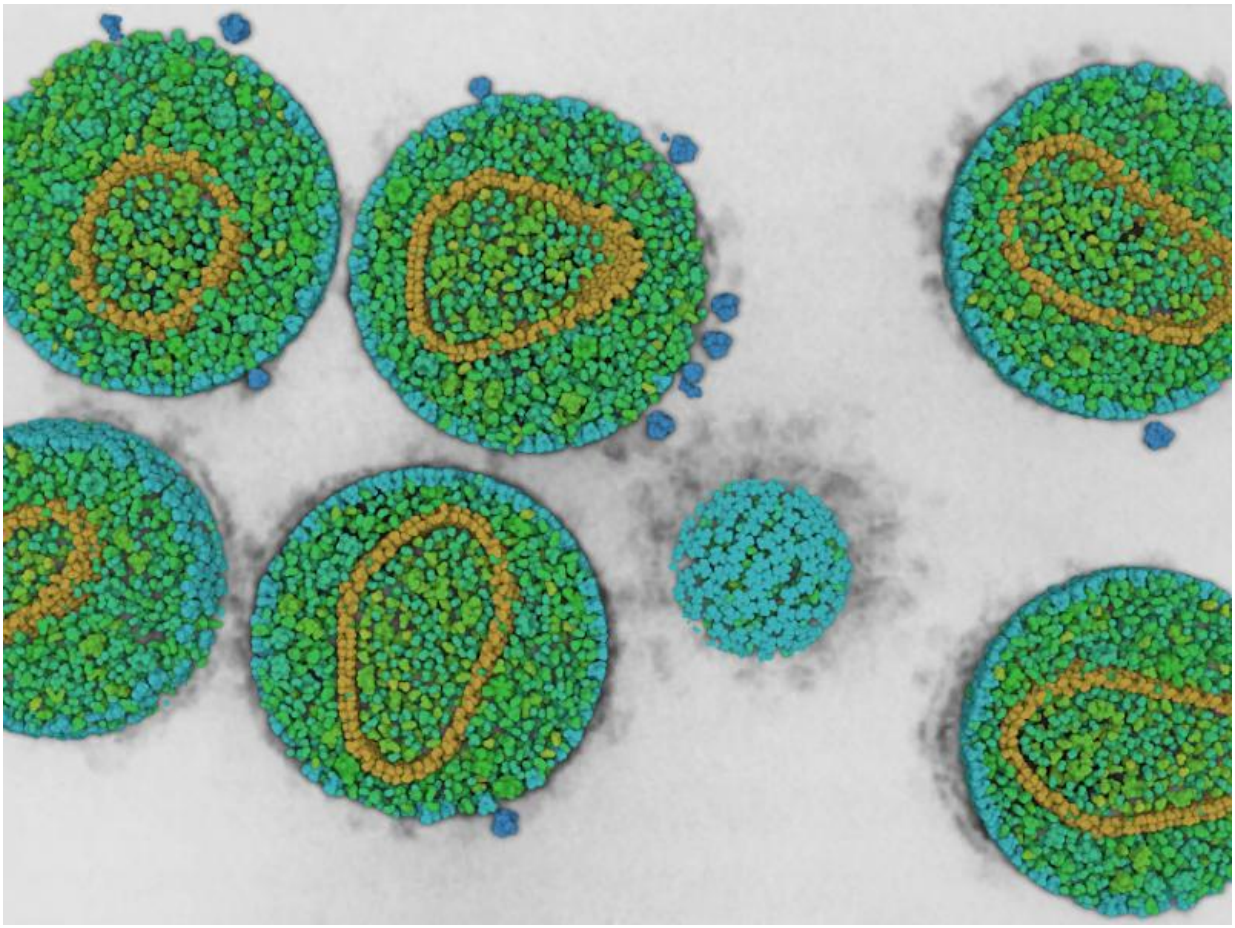

The consortium will stimulate work on collaborative, interdisciplinary projects to assemble and simulate a virtual model of a cell, down to an atomic level of detail. Credit: Olson lab, The Scripps Research Institute

Drawing on complementary strengths of two San Diego institutions, The

Scripps Research Institute (TSRI) and the University of California, San Diego (UC San Diego) have formed a new consortium with a big mission: to map cells in space and time.

"We are entering into this promising collaboration between our campuses with great optimism," said TSRI Acting President and CEO Jim Paulson. "The Visible Molecular Cell Consortium aims to bring together the best minds from different disciplines to understand and articulate how the body's cells work, which will lay important groundwork to understanding health and disease."

"Leveraging existing strengths at UC San Diego and Scripps, the collaboration will advance scientific excellence and research infrastructure at both institutions," said Pradeep K. Khosla, chancellor of UC San Diego. "The goal of building virtual cells poses an important challenge to researchers in fields from experimental biology to computation and information analysis."

The Visible Molecular Cell Consortium (VMCC) will be directed jointly by TSRI Professor Art Olson and UC San Diego Associate Professor of Chemistry and Biochemistry Rommie Amaro.

The consortium will offer fellowship funding for some 10 to 12 graduate students and postdoctoral fellows to work on collaborative projects that build bridges between the campuses and different disciplines to assemble and simulate a virtual model of a cell, down to an atomic level of detail.

"Even the simplest living cells contain 1 to 2 million proteins of 3,000 to 4,000 different types," said Olson. "Figuring out how they work together over time will shed light on the cell as a living, working individual entity. Just like you couldn't build a car from just its wiring diagram, we can't have a complete understanding of a cell unless we know how all of its physical parts work together in 3D."

The researchers hope one day to be able to zoom into cells at the atomic level and zoom out to see "nano neighborhoods," where cells interact. On top of that, they aim to visualize protein interactions in real time to better understand cellular function.

This is a "big data" challenge, Olson points out, applied to the uncharted territory of cellular architecture and ecology. In recent years, better more powerful imaging devices and automated programs in high resolution imaging have provided more detailed pictures of cells and their proteins than ever before, but scientists have not yet translated the huge amounts of data into a single, atomic-level cellular model.

The new consortium will help scientists put the pieces together. TSRI is well-known for its structural biology using both cryo-electron microscopy and X-ray crystallography, and Olson's lab develops and uses graphics programs (similar to those in the gaming industry) to visualize complex cellular machinery. UC San Diego is home to the only publicly available supercomputer in California and the National Biomedical Computation Resource (NBCR), a National Institutes of Health-sponsored national resource that develops multi-scale modeling tools.

"This is a particularly exciting time for such efforts, due to a number of technological and scientific factors," said Amaro. "Advances in various imaging technologies, modeling frameworks and cyber-infrastructure are enabling us to make new strides in the creation of 3D virtual cells. This timely new inter-institutional alliance will provide new insights into the inner workings of cell machinery, some of which may present opportunities for novel therapeutics."

Olson and Amaro plan to host their first "lightning talk" workshop, where any scientist can present his/her work and seek out collaborators, on October 2. They also plan to organize a biannual conference to encourage new collaborations and share results.

The organizers anticipate the consortium will be particularly strong in neurological diseases and infectious diseases, such as influenza, HIV and Ebola virus, although Olson said the insights into cellular behavior will be applicable across many fields.

Provided by The Scripps Research Institute