Welcome to the Quantitative Cell Biology Network

The need for quantitative approaches in Cell Biology

The cell is the basic building block of all life, but while most of the molecular components of the cell have been identified, the emergence of cell structure and behavior from molecular interactions remains a fundamentally mysterious process. Computer simulations, mathematical models, and quantitative measurement approaches inspired by physics are now being brought to bear on the question of how cells are put together and function. But in contrast to many established fields within biology, such as biochemistry or genetics, the idea of quantitative cell biology as a field of its own is still relatively new and not strongly established. The goal of this project is to bring together disparate researchers working on quantitative approaches to cells, to help them join into a community with its own identity and share the methods and ideas that individual researchers have developed in their own groups.

A fundamental unsolved problem in biology is understanding how a living cell emerges from the multitude of molecular components. While cell biology has made great strides in enumerating all the components of the cell, this is only just the beginning, and the challenge remains of understanding the cell as a complex, self-organizing system. While excellent tools exist to measure molecular structures and function with a high degree of precision, and to analyze the shape and overall behavior of cells, the internal workings of the cell itself take place at a mesoscale level of organization that is not accessible to direct observation. To bridge this gap, to understand the cell as an emergent structure resulting from thousands or millions of components working collectively, quantitative and computational approaches are required that do not currently exist. Only by re-thinking cell biology as a fully quantitative science on a par with condensed matter physics will it be possible to go beyond one protein at a time studies and understand how the cell as a whole is able to function. The nascent field of Quantitative Cell Biology aims to do just that, by combining mathematical modeling with new methods in measurement and data analysis. Such approaches are gradually being applied by individual researchers, but their efforts are mostly taking place in isolation from one another. The lack of established data standards and agreed-on algorithms means that every lab is still developing their own approaches, often on an ad-hoc basis, effectively preventing interactions and data exchange. By bringing together researchers sharing a common interest under the banner of Quantitative Cell Biology, using a series of workshops and student exchange activities, this project will accelerate the pace at which this new field is developing.

What we are trying to do

Will include a description of the workshop and personnel exchange series
How you can get involved

Link to sign up to the network list.

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