Unlocking the Cell

The processes that cells perform are as wondrous as their individual mechanisms are mysterious. Molecular biologists and mathematicians are using models to begin to understand operations such as cellular division, movement, and communication (both within the cell and between cells). The analysis of cells requires many diverse branches of mathematics since descriptions of cellular activity involve a combination of continuous models based on differential equations and discrete models using subjects such as graph theory.

It may be surprising, but cell functions are depicted with complex wiring diagrams of circuits with signaling pathways, gates, switches, and feedback loops. Researchers translate the diagrams into equations, which are often solved numerically. Solving the equations is only part of a process in which solutions are analyzed, models are refined, and equations are reformulated and re-solved. This may be repeated many times. The aim of this process is an accurate representation of cell behavior, which may allow drugs and treatments to be designed in the same precise way that electronic circuits are today.

For More Information: *Computational Cell Biology,* Christopher P. Fall, Eric S. Marland, John M. Wagner, and John J. Tyson, Editors.

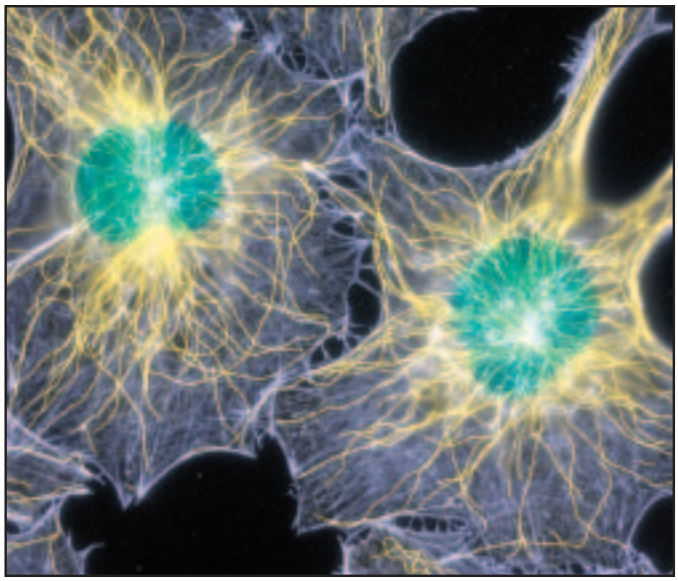

Image: Filamentous actin and microtubules in mouse fibroblasts (Dr. Torsten Wittmann), courtesy of Nikon Small World.

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