From the most basic proteins to the most complex ecosystems, what is life and how does it work? How will understanding life’s systems lead to better health and a more sustainable planet?
“Studying living systems is essential for understanding the fundamental nature of life and for preserving it, extending it, and improving it. Columbia scientists can lead the way in encompassing the full picture of life on Earth, from the molecular components of single cells to the vast intricacies of ecosystems and global climate.”

–Peter de Menocal, Director, Center for Climate and Life.

THE MOMENT
Whether the search is for healthier brains or a more sustainable Earth, a new energy source or a new breakthrough in genomic medicine—issues urgently in need of solutions today have at their heart a better understanding of the complex processes we call life. With recent advances in tools, methods, and understanding, the science of life, once the realm of biology as a separate field, now defines the intersection between every science. The frontiers of chemistry, physics, engineering, mathematics, genomics, biology, and computer science all converge as we see more clearly than ever the web of life in all its forms.

THE PROMISE
FOR HEALTH. Better cures begin with better concepts. All drugs currently in therapeutic use interact with only two percent of the proteins in our cells. Now, scientists are using new information on the structure of cell proteins to gain access to the other 98 percent, creating possibilities for new targeted approaches to disease. More and more, fundamental scientific breakthroughs in understanding how our bodies work on every level lead to new approaches to treatment. Computation and rapid profiling are unlocking the promise of genomics for medicine, and new methods of imaging the cell and the nervous system are transforming research on our minds and bodies.

FOR ENERGY. Working with physicists and engineers, biologists who study mechanical energy in natural systems are developing alternative energy sources. In one such case, Columbia nanoscientists are harnessing the energy of evaporation, nature’s biggest form of energy transfer, through the use of living cells. Their prototype generators are powered by the moisture-driven expansion and contraction of plant spores, which produce a thousand times more mechanical energy than a human muscle of equal size.

FOR THE EARTH. New models allow researchers to understand climate and weather changes. New tools allow their colleagues to track in very precise ways the effect of climate change on diverse populations, human and nonhuman, and to gauge in turn how these populations shape the global climate. Meanwhile, climate scientists are teaming up with engineers to turn natural methods of carbon capture into technological solutions for climate change, and to search for other solutions.

THE INITIATIVE
The Columbia University Life Initiative focuses attention within the University and the larger community on supporting the talent and tools needed to study life in its full complexity. Support for new endowed professorships, postdoctoral and graduate fellowships, and visiting scholars will draw the best talent to Columbia. New facilities, including shared labs and a research greenhouse, will complement fieldwork around the world and open up further opportunities for undergraduates. New technology and infrastructure will enable research to progress at an unprecedented scale and pace in the study of life, so central to progress across the sciences.

To learn more about the Life Initiative and how to get involved, contact Sylvia Humphrey at (212) 851-4377 or sylvia.humphrey@columbia.edu.