Fred Gage, PhD
The Salk Institute

Fred H. Gage, Ph.D., a Professor in the Laboratory of Genetics, joined The Salk Institute in 1995. He received his Ph.D. in 1976 from The Johns Hopkins University. Dr. Gage's work concentrates on the adult central nervous system and unexpected plasticity and adaptability to environmental stimulation that remains throughout the life of all mammals. In addition, his studies focus on the cellular, molecular, as well as environmental influences that regulate neurogenesis in the adult brain and spinal cord.

Prior to joining Salk, Dr. Gage was a Professor of Neuroscience at the University of California, San Diego. He is a Fellow of the American Association for the Advancement of Science, a Member of the National Academy of Sciences and the Institute of Medicine, and a Member of the American Academy of Arts and Sciences.

Dr. Gage has served as President of the Society for Neuroscience in 2002. He has also been on the Board of Directors for the ISSRC, as well as the American Society for Gene Therapy.

Function and Regulation of Neurogenesis in the Adult Mammalian Dentate Gyrus

While most neurons in the adult central nervous system (CNS) are terminally differentiated, evidence now exists that small populations of neurons are generated in the adult olfactory bulb and hippocampus. In the adult hippocampus, newly born neurons originate from putative stem cells that exist in the subgranular zone of the dentate gyrus. Progeny of these putative stem cells differentiate into neurons in the granular layer within a month of the cells' birth, and this late neurogenesis continues throughout the adult life of all mammals. Stem cells can be harvested from a variety of brain and spinal cord regions, genetically modified, and transplanted back to the brain and spinal cord where they can differentiate into mature glia and neurons depending on the local environment. In addition, environmental stimulation can differentially affect the proliferation, migration, and differentiation of these cells in vivo. These environmentally induced changes in the structural organization of the hippocampus, result in changes in electrophysiological responses in the hippocampus, as well as in hippocampal related behaviors. We are studying the cellular, molecular, as well as environmental influences that regulate neurogenesis in the adult brain and spinal cord. We have recently identified several novel mechanisms that regulate proliferation, survival and differentiation of these adult derived stem cells. The functional and practical significance of these findings will be discussed in light of their implications for alternative or expanded views of structural plasticity in the adult brain.

What is the central hypothesis of your presentation?
Newborn neurons are functionally integrated in the adult Dentate Gyrus of the hippocampus.

What is the most important observation you will discuss?
The function of the new neurons changes during their maturation.

What is the translational significance?
Restoration of adult neurogenesis, when reduced by disease, may improve cognitive behavior.