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• COMMENTARY •

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From brain function to therapy

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During the 20th century, biological sciences developed enormously and uncovered many mysteries of life. With one exception, we have now understood very well the various systems of our body, such as the digestive, circulatory and reproductive systems. This one exception is the nervous system, mainly the brain. The scientific study of the nervous system, especially of the brain, has become the hottest field in all the biological sciences in the 21st century. This is evidenced by the launch of two giant 10-year, billion-dollar projects in 2013—the BRAIN (Brain Research through Advancing Innovative Neurotechnologies) Initiative in the United States, and the Human Brain Project funded by the European Union. China has also spent hundreds of millions RMB for brain projects in recent years. If we say that the completion of the Human Genome Project was the landmark of the last decade, the BRAIN Initiative would be the next landmark of biological, or even the natural, sciences.

A unique feature of brain function, which distinguishes the brain from all other organs of our body, is that it governs our mind and emotions. The brain defines who we are. Despite numerous studies in the last decades, little is yet known about how the brain works. Our understanding of brain function faces special challenges beyond elucidating the molecular mechanisms of any other organs and systems in an organism. It is likely that we will need to employ a whole new theory and/or approach that is completely different from the structural and molecular approaches used for dissecting how the other organs/systems of our body work.

Brain disorders, including neurological and psychiatric diseases, pose a huge social, economic and medical burden to modern society. For example, Alzheimer's disease alone affects approximately 35 million individuals worldwide at present. The prevalence rate would triple and the number of patients would quadruple by 2050 if no therapy is found to prevent, slow or cure this disease. Can we wait to develop therapies for treating brain disorders until we fully understand the disease mechanisms? Unfortunately, we cannot afford to wait. Modern research is taking dual approaches simultaneously and in parallel to fight brain disorders: basic research on brain function, and translational/clinical research with limited knowledge of the fundamental mechanism of the disease. Certainly, these approaches face special challenges.

An effective strategy to meet these special challenges is interdisciplinary collaborations among laboratories and institutions with complementary resources and expertise. International collaboration for brain research is a new trend in the 21st century. The Joint Laboratory of Neuroscience and Cognition (JLNC), which was established in 2010 between the Queensland Brain Institute (QBI) at the University of Queensland, Australia, and the Institute of Biophysics (IBP) at the Chinese Academy of Sciences in Beijing, is a promising example of such an international collaboration. The young joint laboratory has made great achievements within a short period of time. This issue of *Science China Life Sciences,* with the theme of "From brain function to therapy," includes some of the exciting research achievements from the JLNC.

This thematic issue of *Science China Life Sciences* con-

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sists of six review articles, four research papers, and two insights, which cover the major topics of the research collaboration at the JLNC, plus one article discussing international collaborations on brain and cognitive research. The collaborations at the JLNC range from very basic research, such as the molecular guidance of axonal sprouting and chemical communication among neurons, to a neurodegeneration-related molecule called tau that appears to mediate neuronal cell death in Alzheimer's disease and other tauopathies.

The achievements of the JLNC reported in this issue of *Science China Life Sciences* signal the success of the international collaboration and the fast progress of brain research. The extraordinary activity of neuroscience research in China is also indicated by the recent publication of a supplement to *Science* reporting exclusively on studies of neurodegeneration and neurodegenerative diseases being conducted in China (Pathways to cures: neurodegenerative diseases in China. S. Sanders, Z. Zhang, B. Tang, Eds. Science/AAAS, Washington, DC, 2013). It is predictable that, with more successful international collaborations like the JLNC and more ambitious efforts by Chinese neuroscientists, neuroscience research in China will likely soon join the ranks of international neuroscience pioneers and contribute to new discoveries leading to effective therapy for brain disorders.