SCIENCE CHINA
Life Sciences

• EDITORIAL •

March 2010 Vol.53 No.3: 301–303
doi: 10.1007/s11427-010-0066-8

Neuroscience in China 2000–2009: Introduction

POO Mu-Ming

Institute of Neuroscience, State Key Laboratory of Neuroscience, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences, Shanghai 200031, China

Received December 30, 2009; accepted January 19, 2010

Citation: Poo M M. Neuroscience in China 2000–2009: Introduction. Sci China Ser Sci, 2010, 53: 301−303, doi: 10.1007/s11427-010-0066-8

The year 2009 marks the tenth anniversary of the founding of Institute of Neuroscience (ION) in the Shanghai campus of Chinese Academy of Sciences. By invitation of the Editor of Science in China, ION investigators undertook the charge of reviewing the contributions made by Chinese scientists in various areas of neuroscience over the past decade. This is a timely task, as Chinese science is now undergoing rapid development with an unprecedented pace. While an exhaustive review of all neuroscience publications "made in China" is not possible, we hope this volume does highlight some of the recent progress made by our Chinese colleagues and illuminate the path they are taking in this new frontier of basic science.

This volume consists of twelve articles on four areas of research: cellular and molecular neuroscience, developmental neuroscience, systems and computational neuroscience, and mechanisms of neural disorders, corresponding to the four divisions of ION. Readers may notice that authors of these chapters have adapted different approaches in their writing – some provide more general review of the research by Chinese colleagues in various institutions, whereas others focus their review on research mostly done in their own laboratories. Brief summary of some recent progress in Chinese neuroscience can also be found in a recent review [1].

Neuroscience as a distinct discipline has a short history in China. Founded in 1995, the Chinese Society for Neuroscience now has 2500 active members, with biennial society meetings attended by up to 1000 researchers. The extraordinary growth of the neuroscience community and research productivity over the past decade may be attributed to three factors. First, the funding and research facilities in most research institutes and universities have been improved with a rapid pace. A rough calculation showed nearly a doubling of government's funding for research in every five years over the past two decades. Second, these improved conditions have attracted a larger number of returning researchers, who had received doctoral and postdoctoral training abroad and had acquired the latest experimental approaches and technologies. Third, the flow of scientific information into Chinese laboratories has been greatly facilitated by the internet access of scientific literature, frequency visits by and collaborations with foreign scientists, and a high frequency of international meetings held in China. These factors have created an environment that allows research activity to flourish. Chinese scientists, particularly those in basic sciences, have never experienced such a splendid springtime.

In 1934, a young Chinese postdoctoral fellow by the name of Feng De-Pei (also known as T. P. Feng) returned to China to set up a neurophysiology laboratory in Peking Union Medical College (PUMC). Founded by Rockefeller Foundation in 1915, PUMC was the first research-oriented medical school in China that offered graduate research training. In PUMC's Physiology Department, an Edinburgh-trained physiologist Lim Kho-Seng ("Robert K. S. Lim") and his colleagues had carried out one of the first "modern" neurophysiology experiments in China [2] and published their results in the *Chinese Journal of Physiology* – the official journal of Chinese Physiological Society (founded by

email: mpoo@berkeley.edu

Lim in 1927). Feng joined Lim's Department after spending five years abroad, for his M.S. training under Ralph Gerald in Chicago, Ph.D training under A.V. Hill in London and E.D. Adrian in Cambridge, and one-year postdoctoral research in Germany and United States. During the period of 1934-1941, before PUMC was closed down due to outbreak of the Pacific War, Feng published a series of papers in the *Chinese Journal of Physiology* on the physiology of neuromuscular transmission. Most notably, he discovered the phenomenon of post-tetanic potentiation – the increased efficiency of synaptic transmission induced by prolonged high-frequency stimulation [3]. This first demonstration of activity-dependent synaptic plasticity, a work done during the difficult wartime China, had firmly engraved Feng's name into the history of Neuroscience. Feng later became the founding director of the Shanghai Institute of Physiology and Biochemistry of CAS, where much of the bioscience research in the new Republic was initiated. Feng himself continued his study on neurotrophic regulation of muscle fiber properties and mechanisms of synaptic transmission and plasticity for four more decades [4], interrupted only by a brief interlude of service as a janitor for the Institute.

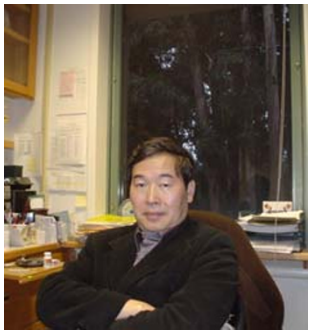
In 1957, a mid-aged Chinese neuroscientist by the name of Zhang Hsiang-Tong (also known as H. T. Chang) returned to Shanghai Institute of Physiology and Biochemistry to set up a CNS physiology laboratory. Zhang had already established an international reputation, having received his Ph.D under John Fulton at Yale in 1946 and pioneered in the development of single unit recording from cortical neurons and in studying the function of dendrites in the integration of neural signal [5]. In Shanghai, Zhang continued his study of CNS physiology [6] and his laboratory became the training ground for a generation of Chinese neurophysiologists across the country. In 1960s, he initiated the research on the mechanism of acupuncture analgesia [7,8], a line of research that sheltered many neurophysiologists in the laboratory during the turbulent years of Cultural Revolution. In 1980, Zhang became the founding director of Shanghai Institute of Brain Research of CAS, the forerunner of ION.

Like Feng and Chang of their times, returning young and established Chinese scientists are now pursuing their career in a new land. They are pioneers in a new land because many of the institutions they join are only beginning to establish a research environment that is conducive to rigorous scientific pursuit. Scientific traditions are shaped by continuous efforts of generations of scientists. Efforts by the Feng/Chang generation in establishing a scientific tradition in China had been seriously impeded by the intermittent wars and political turmoil. It was not until 1980s that stable support for basic scientific research became available, and only in the past decade that quality rather than quantity of publications began to be considered a merit. Thus, new pioneers are facing the dual tasks faced by Feng and Chang – in pursuing their own research interests as well as establishing a tradition in their respective institutions that values the quality, creativity, and innovation in scientific research.

Despite the spectacular progress in molecular and cellular biology over the past few decades, mysteries of the brain remain largely untouched. Elucidation of these mysteries requires integration of experimental approaches from diverse disciplines and new conceptual frameworks that bridge understandings at different levels. The goal and agenda of neuroscience in the coming decades epitomize those of modern science – to understand nature is to understand how a natural phenomenon emerges from the properties of its constituent parts, and any description of a neural phenomenon – whether it is at the cognitive, circuit, cellular, or molecular level – is incomplete and unsatisfactory without addressing its causal links to phenomena at a higher or lower level. No longer are we satisfied with the description that certain brain areas are involved in a particular cognitive function, we need to know the neural circuits underlying the function, the neuron types and synaptic connections shaping these circuits, the neuronal and synaptic properties giving rise to circuit functions, and the genetic and molecular mechanisms responsible for the development, function, and plasticity of individual neurons and synapses. As some of the articles in the present volume suggest, opportunities abound in the frontier of neuroscience for new pioneers to make their contribution. The fact that major mysteries of the brain still await solution also implicates that Chinese neuroscientists are now on equal footing with their peers in the West. We look forward to a sequel of this volume by 2020, when this generation of Chinese neuroscientists will have made their marks on the history of neuroscience no less significant than those made by Feng and Chang.

1 Poo M-m, Guo A. Some recent advances in basic neuroscience research in China. Philos Trans R Soc Lond B Biol Sci, 2007, 362: 1083–1092
2 Lim R K S, Shen T C, Hou C L. Observations on the conduction of the nerve impulse in the cooled phrenic nerve. Chin J Physiol, 1927, 1: 367–389
3 Feng T P. Studies on the neuromuscular junction XXVI: the changes of the end-plate potential during and after prolonged stimulation. Chin J Physiol, 1941, 16: 341–372
4 Feng T P. Looking back, looking forward. Annu Rev Neurosci, 1988, 11: 1–12
5 Chang H T. Cortical neurons with particular reference to the apical dendrites. Cold Spring Harbor Symposium on Quantitative Biology, 1 1952, 7: 189–202
6 Chang H T, Chiang C Y, Wu C P. Electrical response of single neurons in the optic lobe of toad to photic stimulation. Sci Sin, 1959, 8: 1131–1152
7 Lo F S, Yuan C S, Yang S L, *et al*. Inhibition of nociceptive discharges of parafascicular neurons by direct electrical stimulation of nucleus centrum medianum. Sci Sin, 1978, 21: 533–544
8 Chang H T. Neurophysiological interpretation of acupuncture analge sia. Endeavour, 1980, 4: 92–96

Biographical Sketch



POO Mu-Ming

POO Mu-ming was born in Nanjing, China in 1948. He graduated with a B.S. in physics from Tsinghua University, Taiwan, in 1970 and received his Ph.D. in biophysics from Johns Hopkins University in 1974. Since 1976, he had served on the faculty of University of California, Irvine, Yale University, Columbia University, and University of California at San Diego, before joining University of California, Berkeley in 2000, where he served as the Head of Division of Neurobiology in Department of Molecular and Cell Biology at Berkeley and is currently Paul Licht Distinguished Professor in Biology. Since November 1999, he also served as the founding Director of Institute of Neuroscience, Chinese Academy of Sciences in Shanghai. Dr. Poo's research interests focus on development and plasticity of neural circuits. He has received many honors, including Javitz Neuroscience Investigator Award of NIH (1998), Ameritec Prize, Docteur Honoris Causa from Ecole Normale Supérieure, Paris (2003), P. R. China International Science & Technology Cooperation Award. He is a member of Academia Sinica (Taiwan) and National Academy of Sciences (US).