Functional neurology at the dawn of the third millennium: the translation of neuroscience into neurology

Emily Dickinson

The brain is wider than the sky, ...
The brain is deeper than the sea, ...
The brain is just the weight of God, ...

In 2000 Medicine Nobel went to raiders of the brain’s chemical secrets. Arvid Carlsson, of the University of Gothenburg in Sweden, Paul Greengard, of the Rockefeller University in New York, and Erik Kandel, of Columbia University in New York, were honoured for pioneering discoveries concerning one type of signal transduction between nerve cells, referred to as slow synaptic transmission. These discoveries have been crucial for an understanding of the normal function of the brain and how disturbances in this signal transduction can give rise to neurological and psychiatric diseases. These findings have resulted in the development of new drugs.

As stated by Urban Ungerstedt, delivering the Presentation Speech for the 2000 Nobel Prize in Physiology or Medicine at the Stockholm Concert Hall, before the King and Queen of Sweden, “we are all convinced that we will remember this Nobel ceremony for many years. This is because of the dopamine which Arvid Carlsson discovered, enabling the brain to react to what we see and hear; the second messengers that Paul Greengard described, carrying the signals into the nerve cell, and the memory functions that Eric Kandel found to be due to changes in the very form and function of the synapses”.

This event remains as a milestone testifying to the progress of neuroscience and its topical significance in the context of contemporary biomedical research.

Indeed the emergence of neuroscience as a distinct discipline has been one of the most significant developments in biology in the past half century. Previously independent traditional fields such as neurophysiology, neuroanatomy, neuropharmacology, neurochemistry and behaviour have been impacted upon by peculiar factors that in the 60s and in the 70s, led to their convergence in a common discipline. It was early in the 80s that neuroscience became integrated and indissolubly intermingled with other areas of biology, particularly with molecular biology and molecular genetics, a direction that proved to have an immediate and profound influence on neurology and that may soon have an impact on psychiatry as well.

In the mid-80s, in addition, the merging of neuroscience with cognitive psychology led to the formation of cognitive neuroscience, a coherent and systematic brain-based approach to mental function.

By tracing the origins and the roots of contemporary neuroscience we cannot avoid giving a special mention to the seminal work of David McKenzie Roich at the Walter Reed Army Institute of Research, bringing together the scientist working on behavior and the scientist carrying out basic anatomical and physiological studies of the nervous system; to the establishment of the first Neuroscience Research Program at the MIT (Massachusetts Institute of Technology) by Frank O. Schmitt; and to the formation, at Harvard Medical School, of the first Neurobiology Department in the United States under the leadership of Stephen Kuffler.

In 1978 the first volume of the Annual Review of Neuroscience appeared, marking the success of the synthesis proposed and implemented by Stephen Kuffler and colleagues. This publication soon became a citation classic and heralded all the next phases of neuroscience: the emergence of molecular neuroscience, cognitive neuroscience, genetic neuroscience and more recently brain imaging and mapping and computational neuroscience.

More and more talented students and young investigators were progressively attracted by neuroscience. This ever-growing community brought with it new theoretical and technical approaches leading to the blossoming of novel and extraordinary findings and discoveries.

The application and the consequent impact of neuroscience was so strong that today it undoubtedly stands on an equal footing with other fully mature basic disciplines and its importance in medicine has exceeded many expectations.

Striking progresses are now being made in elucidating the bases of such significant disorders as Alzheimer’s disease, Parkinson’s disease, ALS (Amyotrophic Lateral Sclerosis) and some of the ion channel and mitochondrial disorders.

A significant start has also been made by neuroscience in identifying genetic factors in the aetiology of mental disorders including manic depressive illness and schizophrenia.

These developments need now to be fully incorporated into neurology and psychiatry. It is not unthinkable that in the coming decades we will witness the emergence of a new nosology, certainly in neurology and perhaps in psychiatry, not based on symptomatology but on the dysfunction of specific genes, molecules, neural organelles and particular neural systems organised in specific networks.
Contemporary neuroscience is reflected in the birth of new teams, every day, in brand-new neuroscience and brain research institutes devoted to the improvement of our understanding for the sake of both young and older patients.

Projects such as that proposed by Rita Levi Montalcini, a European Brain Research Institute (EBRI) to be founded by all EC countries, are provocative and pave the way for a strong, promising and bright future for young generations and a real solid base for the cultural and social progress of Europe itself. The overcoming of this challenge may prove to be a crucial step for all of us.

New advances in neuroscience research will open the door to new paradigms for practising medicine. The team working for Functional Neurology has been making every effort, during the last years, in order to frame a strategy suitable for an expansion of international cooperation and a fertilization of investigation.

Only but one example is the full proceeding publication, just appeared as a special issue of this journal, of the Symposium “The Decade of the Brain at the C. Mondino Foundation: Ten Years of Research in Experimental Neurobiology (1990-2000)”, held in Pavia, Italy, on June 2001.

We sincerely hope to open some new channels of progress in neuroscience and neurology scientific communication.

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