EDITORIAL

The Case for Neuroscience in Experimental Biology and Medicine

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It is my pleasure to have the opportunity to serve on the editorial board of *Experimental Biology and Medicine* as the Associate Editor for the new Neuroscience section. With this opportunity comes the responsibility to steward this new area in EBM into the leading edge of nervous system research and discovery. With the support of the journal's Editor, staff, and an outstanding group of neuroscience section editors, this is a goal that we should be able to realize in the coming years.

There is hardly a university or medical school that has not targeted neuroscience in its strategic planning process for growth and investment. Even with the current pressures on research funding levels, the growth of neuroscience remains vibrant. One can reasonably ask what is fueling this expansion. Is it irrational exuberance, simply a band-wagon effect, where administrators and deans don't want to be left behind, or is it something more substantive, where university leaders and biomedical scientists see an unprecedented opportunity for major discovery, translation, and application of an array of biological, physical, social, and computational sciences to understand brain function in health and disease and to develop major new diagnostic and therapeutic approaches for brain disorders? I would argue for the latter explanation. Neuroscience is essentially a discipline without borders, integrating information from levels that span molecular to cellular to organismal to group dynamics. It is a field that embraces mathematical and computational approaches at all levels, emphasizing integration across organizational levels and incorporates the leading edge of technologies including behavior, biophysics, chemistry, cell biology, computation, genetics, imaging, and physiology to name a few. The elucidation of the biology of functions from sensation and movement to consciousness and decision-making and the impairment of those processes in disorders such as amyotrophic lateral sclerosis, Alzheimer's disease, addiction, or mental retardation have brought neuroscience to a major new level of understanding and promise. It is this success and opportunity for taking these discoveries to the next level including precise identification of the underlying changes in functional brain signaling and architecture, elucidation of first principles of the biology of information processing in the brain and its role in cognition, and the development of personalized medicine for the neurological and psychiatric disorders that afford great opportunity.

Interdisciplinary and multidisciplinary research are the buzzwords of modern biomedical science. There is no doubt about the value and implementation of these approaches throughout the life sciences community. However, these are well-established core principles in neuroscience with a rich history. The physiological, anatomical, biochemical, genetic, pharmacological, behavioral, computational, and engineering approaches have been at the heart of cutting-edge neuroscience for over a half century—neuroscience investigators usually have been able to find each other and coordinate multidisciplinary research, either within or in spite of the academic organizational framework at their individual institutions. Thus, those of us in the neurosciences who grew up in this type of interdisciplinary scientific culture say to our colleagues across the life sciences—What took you so long? Jump in—the water's fine!

It is often said that understanding behavior is the common underpinning of all neuroscience research. While many of the most important studies in modern neuroscience may address questions at a cell biological, molecular genetic, or biophysical level, they often also incorporate behavioral, computational, or tops-down systems' approaches as well. As a set of guiding principles for our instantiation of the neuroscience component in the EBM portfolio, we will largely ignore the particular disciplinary approach used (all are welcome) and instead focus on attracting and giving a forum to investigators who identify

clearly the big questions of nervous system function in health or disease; who use the best, state-of-the-art methodology for addressing the question posed; who include quantitative, computational, and/or modeling approaches to inform experiments and validate hypotheses when appropriate; and who either integrate the new results presented into the existing framework or upset the cart by putting a stake in the ground for a new framework.

In order to accomplish these goals, we invite you to submit, and to solicit from your colleagues, manuscripts that represent the very best studies in a range of areas that use the tools of modern biological, physical, engineering, behavioral, and computational sciences to address some of the most intellectually challenging, enduring, and potentially paradigm-shifting questions in nervous system research. A few examples are the underpinnings of nervous system aging and declination of function in health and disease; the assembly of the nervous system into coherent organized functional networks; the biological basis of diversity of behavioral phenotypes; the physical substrates and implementation of higher order brain functions; the adaptational capacity for the nervous system to respond to injury and repair itself; the multigenic factors and processes in neuropsychiatric disorders; the interaction between the nervous and vascular systems and the linkage of electro-physiological activity to blood flow and metabolism; the orchestration of regulated gene expression in the brain in response to environmental cues; and the biological substrates and processes that mediate acquisition, retention, recall, and utilization of information. Manuscripts that address these and other important areas are welcomed to *Experimental Biology and Medicine* from individuals and interdisciplinary research teams to represent the best of the breadth of excitement of neuroscience in the 21st century.