Commentary

Neuroscience, Neurocentrism, Neuromania, and Neurophobia: When New Knowledge Challenges Established Ways of Knowing

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Since the 1980s, technologies for investigating the central nervous system have advanced dramatically, transforming both basic and clinical neuroscience. Progress in electrophysiological methods and structural neuroimaging has substantially expanded our understanding of the brain's anatomy and organization. Even greater advances in elucidating brain function followed the introduction of Positron Emission Tomography (PET) in the 1980s and Functional Magnetic Resonance Imaging (fMRI) in the following decade.

Research on the nervous system has yielded fundamental insights into the mechanisms underlying both brain function and mental processes. At the same time, these scientific advances have extended well beyond the academic community, fostering unprecedented public engagement with neuroscience and stimulating widespread philosophical, ethical, and social debate. Three concepts have been introduced to characterize these developments: neurocentrism, neuromania, and neurophobia.

Neuroscience: Definitions and Conceptual Framework

The term neuroscience was coined by the neurophysiologist Otto Schmitt in 1962. Schmitt emphasized the inherently multidisciplinary nature of the field, integrating neuroanatomy and neurophysiology—that is, the relationship between structure and function—to explain neural activity and, ultimately, behavior. He was also instrumental in establishing the Neurosciences Research Program (NRP), which became a landmark initiative in interdisciplinary neuroscience.

In 1992, G. P. Swazey provided a comprehensive overview of the discipline, describing neuroscience as an extensive

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family of biomedical sciences devoted to the study of the nervous system, particularly the brain. Traditionally, this domain encompassed neurology, neurosurgery, psychiatry, and psychology. More recently, however, the field has expanded to include disciplines such as neurogenetics, neurobiology, and neuroimaging, each of which has opened new avenues for scientific investigation. Contemporary neuroscience therefore seeks to explain the development, organization, and function of the nervous system across multiple levels of analysis.

In his 1996 article Three Models in Search of a Future, published in Psychiatry, J. D. Bloom argued that clinical neuroscience represents *"an evolutionary stage in psychiatry, emerging from the revolution that has transformed biological psychiatry over the previous two decades and driven largely by the rapid progress of basic neuroscience during the Decade of the Brain (1990–2000) and the subsequent Decade of the Mind (2000–2010)."*

The psychiatrist Thomas Detre similarly defined clinical neuroscience as follows:

"Clinical neuroscience is not merely one of the principal paradigms for the present and future development of psychiatry; rather, it is the product of the convergence between psychiatry and neurology, giving rise to a genuine clinical science of the brain. Its defining characteristic is its dual orientation, integrating advances in fundamental brain research with psychiatric and neurological clinical practice."

Today, clinical neuroscience draws upon knowledge from a wide range of disciplines, including genetics, neuroanatomy, neurochemistry, neurophysiology, neuropsychology, behavioral science, and environmental sciences. This integration reflects both bottom-up approaches, extending from genetics to neurophysiology, and top-down approaches that examine the influence of environmental, cultural, and biographical factors on brain function and behavior (Carrara, 2024).

Neurocentrism

In The Two Cultures and the Scientific Revolution (1959), the scientist and novelist Charles Percy Snow described the growing divide between the literary-humanistic tradition and the natural sciences. He argued that the inability of these two intellectual cultures to communicate effectively represented a major obstacle to scientific and cultural progress. Responding to the criticism his work generated, Snow published The Two Cultures: A Second Look (1963), in which he introduced the notion of a *"third culture."* He identified this emerging perspective with scholars capable of bridging disciplinary boundaries, while also recognizing the transformative potential of molecular biology and the newly emerging technologies for investigating the nervous system.

Snow concluded by advocating the construction of an intellectual bridge between the sciences and the humanities. Today, disciplines such as bioethics and neuroethics may be understood as fulfilling precisely this mediating role (Carrara & Barboni, 2022).

In 2014, the neurophysiologist Piergiorgio Strata published “La strana coppia. Il rapporto mente-cervello da Cartesio alle neuroscienze” (The Strange Couple: The Mind–Brain Relationship from Descartes to Neuroscience). In this work, he questioned the traditional concept of free will by discussing two landmark neurological cases—Phineas Gage and Elliot, the patient described by Antonio Damasio. According to Strata, *"free will functions merely as a kind of 'notary' or internal 'veto,' intervening only after the actual decision-making processes have already been determined by the brain (or by a specific part of it)"* (Carrara, 2017). From this perspective, free will is not an autonomous causal agent but rather an emergent consequence of the brain's biochemical activity.

Strata's position prompted an immediate response from the philosophers Giovanni Reale and Giacomo Marramao. Writing in La Stampa on 15 October 2014, they argued that:

"Mind and body exist in a relationship of reciprocal interaction within a single, inseparable organism, characterized by an ongoing dynamic of tension and conflict. As St. Paul writes in the Letter to the Romans: 'For I have the desire to do what is good, but I cannot carry it out. For I do not do the good I want, but the evil I do not want is what I keep on doing'" (Serri, 2014).

Over the past several decades, advances in neuroscience have profoundly influenced both medical practice and contemporary conceptions of human nature. The periods 1990–2000 and 2001–2011 have commonly been designated

the Decade of the Brain and the Decade of the Mind, respectively. The broader intellectual movement associated with these developments has been described as neurocentrism.

Neurocentrism has fostered the development of innovative therapeutic strategies for neurological disorders, including pharmacological neuromodulation and electrical neurostimulation. At the same time, it has generated significant ethical questions concerning the extent to which scientific and technological interventions may legitimately alter the brain, cognition, and ultimately the human mind.

Neuromania

In 2009, the cognitive psychologist Paolo Legrenzi and the neuropsychologist Carlo Umiltà published Neuromania. Il cervello non spiega chi siamo (Neuromania: The Brain Does Not Explain Who We Are). The authors argue that much of the popular literature on the brain claims to provide comprehensive explanations of the functioning of the human mind. As Lucetta Scaraffia observed in her review of the book, sensationalized science communication risks misleading non-specialist audiences by presenting mental functioning as if it could be explained exclusively in biological terms or, even more problematically, by fostering the belief that miraculous pharmacological treatments have already been discovered.

According to Legrenzi and Umiltà, this form of scientific popularization may also influence the academic world by affecting the allocation of research funding and the distribution of academic positions. Their book critically examines popular scientific literature that purports to explain the workings of the human mind, as well as the proliferation of newly emerging disciplines that, in their view, often adopt the prefix neuro- inappropriately in order to enhance the credibility of their claims among non-expert readers (Scaraffia, 2009).

The authors further argue that contemporary accounts of human behavior increasingly rely on biological explanations. Although such interpretations often appear persuasive because they offer simple, monocausal explanations, they are ultimately reductionist. As they state:

"This trend nevertheless originates from genuine scientific progress, since we are now beginning to understand more closely the connections between mind and body. Scientists have discovered that specific brain regions are preferentially involved in particular tasks, such as the visual recognition of a familiar face or the mental multiplication of two single-digit numbers. Naturally, these operations also recruit more general brain areas responsible for functions shared across many tasks, including visual, auditory, and motor processing."

Legrenzi and Umiltà also contend that popular science communication frequently highlights one brain region at a time, thereby oversimplifying neuroscientific findings and creating the misleading impression that individual brain areas are solely responsible for specific cognitive functions or psychological phenomena. In their view, excessive emphasis on the observation of brain activity risks obscuring the complexity of mental processes, encouraging reductionist interpretations and legitimizing forms of neurobiological determinism.

The principal concern raised by Legrenzi and Umiltà is that cognitive science may lose its epistemological identity, thereby "dissipating the progress it has accumulated, leading not only to a regression in our understanding of the mind but also to undesirable consequences at the clinical and/or bioethical levels."

Scaraffia concludes her review with the following observation:

"Scientific communication of this kind has the effect of eliminating any possibility of human choice and responsibility and, consequently, any possibility of moral development."

Neurophobia

In 2013, the cognitive neuroscientist Salvatore Maria Aglioti and the physiologist Giovanni Berlucchi published Neurofobia. Chi ha paura del cervello? (Neurophobia: Who Is Afraid of the Brain?). From their perspective, the alarmist attitude of those who advocate the concept of neuromania is unwarranted, as are the broader criticisms of neuroscience that give rise to what they describe as neurophobia.

In a review published in 2015, Marco Viola described Neurophobia as "a genuine paper platypus," resistant to classification within conventional thematic and bibliographical categories. Aglioti and Berlucchi argue that the

primary aim of cognitive neuroscience is to build a bridge between the mind and the brain by identifying regularities and formulating general principles capable of explaining and predicting cognitive and mental functions on the basis of physical states and neural structures. In this sense, Neurophobia constitutes a defense of contemporary neuroscience against accusations of neuromania and, more generally, against the criticisms advanced by *"neurosceptics."*

The authors maintain that accusations of neuromania are unfounded and stem from an unjustified distrust of the explanatory ambitions of cognitive neuroscience, an attitude they characterize as neurophobia.

In the final chapter of their book, Aglioti and Berlucchi argue that contemporary hostility toward neuroscience resembles the skepticism that once surrounded genetics. Just as genetics was accused of promoting a deterministic view of human beings as products of their genes, neuroscience is now criticized for portraying human beings as determined by their neurobiology (Viola, 2015).

However, research on the relationship between genotype and phenotype, as well as studies examining the relationship between the brain and behavior, has consistently demonstrated the profound influence of environmental factors and individual life histories. According to the authors, neuroscience possesses the conceptual and methodological resources to deepen our understanding of human nature without challenging philosophical or religious beliefs (Davi, 2014). Consequently, they argue, neurophobia represents a distorted caricature of neuroscience. Rather than promoting a dehumanized conception of the person, the achievements of contemporary neuroscience offer the possibility of a balanced and nuanced understanding of human nature.

Viola concludes his review with the following observation:

"Neuroscientists need to adopt psychologically plausible models and hope that neuroscientific research does not decide a priori to ignore them, but instead chooses to adopt, reject, or revise them in light of empirical evidence."

Neurocriticism

Additional scholars have further enriched this debate by offering important theoretical contributions and broadening its conceptual scope.

The moral philosopher Patricia Smith Churchland, in her book Braintrust: What Neuroscience Tells Us about Morality (published in Italian as Neurobiologia della morale), argues that moral behavior has a neurobiological foundation and highlights the central role of oxytocin in the development of social attachment, empathy, and moral conduct.

Similarly, in The Mind's New Science, Howard Gardner introduced the concept of the cognitive hexagon as a model for understanding the interdisciplinary nature of cognitive science. Gardner represented this interdisciplinary framework through a geometric figure whose six vertices correspond to the principal disciplines contributing to the scientific study of the mind: philosophy, linguistics, anthropology, neuroscience, artificial intelligence, and psychology. The cognitive hexagon illustrates the intellectual bridge linking neuroscience with the humanities and social sciences, emphasizing that a comprehensive understanding of the mind requires the integration of multiple disciplinary perspectives.

Conclusions

The Society for Neuroscience currently comprises more than 42,000 members worldwide. Each year, approximately 25,000 scientific articles on the brain are published across more than 220 specialized journals. As Carrara (2023) observes, "these developments have contributed to the emergence of a global neurocentric landscape characterized by two opposing poles: neuromania and neurophobia."

In this context, the dissemination of accurate, balanced, and evidence-based scientific knowledge by researchers, scholars, and neuroscientists is both challenging and essential. Equally important is the responsibility of the general public, including individuals without specialized scientific training, to cultivate critical thinking and scientific literacy. Such an approach enables individuals to evaluate neuroscientific findings more thoughtfully and to develop a deeper appreciation of the extraordinary complexity of the human brain, recognizing that its functioning emerges from the dynamic interaction of biological,

psychological, environmental, and biographical factors.

Promoting a balanced understanding of neuroscience not only enhances public awareness but also encourages healthier lifestyles and greater attention to brain health and overall well-being. Finally, it is important to recognize that scientific knowledge is inherently provisional: every theory remains open to revision, refinement, or refutation in light of new empirical evidence. This continuous process of critical inquiry is a defining characteristic of scientific progress and, perhaps, one of the best ways of keeping our own minds intellectually flexible and receptive to new ideas.

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