

Neurophilosophy: an introduction and overview

More than twenty years ago, the term “neurophilosophy” was coined to characterise an emerging field of cross-disciplinary research. The term reflects the potentially revolutionary developments whereby high level theories about the mind interact with neuroscientific results from many levels of brain organisation. The hope was that a synergy of neuroscience, psychology, genetics, evolutionary biology and philosophy would lead to an improved understanding of the human mind (1).

In its simplest formulation, the core idea of neurophilosophy is that if you want to understand the nature of the mind, you need to understand the nature of the brain. Remarkable developments in neuroscientific research in the last two decades have made this seminal idea a reality. Neurophilosophy today is a fundamental part of the research on essentially all philosophical aspects of mental processes (such as consciousness and meaning, decision making and agency, the nature of the self), and it comprises many important subfields such as neuroeconomics, neuroethics, and neuroaesthetics.

The aim of the current issue of *Functional Neurology* is to provide an overview of the neurophilosophical landscape, along with an exploration of some of its especially interesting subfields.

Patricia Churchland opens the issue with a contribution aimed at depicting the birth and the development of neurophilosophy. Early resistance from philosophers to the very idea of the project, on the grounds that neuroscientific assumptions conflict with seemingly obvious intuitions, has slowly eroded as the brain and behavioural sciences have made progress. Whilst the *a priori* methodology typified by philosophers of mind and language in the twentieth century may have run its course, neurophilosophers now are playing an important role in synthesising and integrating data from many subfields. Additionally, because some problems, such as the nature of neural representations and neural computation, remain largely unsolved, theorising within experimental constraints continues to be an essential enterprise.

One of the most prominent features of the neurophilosophical perspective is its rejection of all forms of dualism that try to erect impassable walls between studies of the mind and studies of the brain. Though rare in neuroscience, dualist convictions still hold sway in contemporary philosophy of mind. From the neurophilosophical perspective, however, dualism looks implausible. So far as we can tell, the mind is a natural phenomenon; it is the *brain* “that thinks, feels, decides, sleeps, and dreams”. Mental activity *is* brain activity, at some level of brain organisation.

Even though anti-dualism and naturalism are unquestionably associated with neurophilosophy, the related issue of reductionism deserves more attention. In particular, we may ask whether different high level sciences which contribute to neurophilosophy are ultimately to be reduced to brain science. In other words, even though neurophilosophy is often associated with reductionism and the pursuit of the unity of science, it is not apparent how this unity should be obtained. Michele Di Francesco, Matteo Motterlini and Matteo Colombo, taking advantage of case studies in current neuroeconomics research on neural correlates of decision making, argue for a pluralist model of the intertheoretical relations among the different disciplines (neuroscience, psychology, economics) that characterise neuroeconomics.

Whatever option you find appealing, the indisputable point is that results from neuroscientific research are a powerful constraint on philosophical speculation about the nature of mental phenomena. Sometimes, these results seem to require a revision of our ordinary conception of ourselves as subjects who make our own choices and as rational agents following “canons of reason”, whatever they might be. Giacomo Rizzolatti and Corrado Senigallia describe recent neurophysiological studies on the functional properties of the cortical motor system that challenge the traditional (philosophical) conception of action as based on meta-representational abilities. According to their preferred paradigm “we understand the actions of others by means of our own ‘motor knowledge’” – a mechanism which gives us an *immediate* understanding of the intentional meaning of action.

In a related way, Elisabeth Pacherie’s essay addresses what is known about the neural mechanisms that give rise to our sense of agency and the impact of this understanding on more traditional “agency” conceptions linked, as they typically are, to the phenomenology of agency. In particular, she considers neuropsychological syndromes such as “anarchic hand syndrome” and “utilisation behaviour” to compare two competing approaches: a) the top-down strategy that takes agential self-awareness as fundamentally holistic and as depending on the operations of a central-systems narrator, and b) the bottom-up approach, according to which agential self-awareness is a product of low-level mechanisms grounded “in the very machinery responsible for motor production and control”.

P. Read Montague explores the new developments in the emerging field of neuroeconomics and their relevance to the neuroscience of higher functions. From the perspective of neuroeconomics, the brain is fundamentally a decision-making machine whose choices are guided by interoceptive states, perceptions, and memory regarding past reward. Using standardised quantitative behavioural tests while conducting neuroimaging or neurophysiological experiments, experimentalists can study the evaluative strategies deployed by brains in making choices between options. Computer modelling can provide compact descriptions that link the results to neural structures and functions. According to Montague, in this convergence of subfields we have a clear example of a theoretical advance obtained by “fusing together two separate intellectual traditions”.

Neuroethics is another – and related – subfield where separate endeavours join forces to make scientific progress on traditional philosophical problems. Imaging techniques have been used to illuminate the neural correlates of moral de-

cisions as subjects make these decisions in the scanner. These results, in conjunction with many experiments at psychological level, begin to raise questions about what kind of business reasoning actually is, and what precisely is the role of emotion in rational choice. Massimo Reichlin reviews recent developments of neuroethics and discusses their contribution to what may be considered the “most spectacular” of the naturalisations attempted: the naturalisation of ethics, “the final chapter in the descent of morality from the heavens of religion to the bare ground of our natural condition”.

Neuroaesthetics is the last subfield of neurophilosophy presented in this issue. Here, the research faces special difficulties, mainly due to the elusiveness and vagueness of artistic experience, but also to the variability in aesthetic judgement. Nevertheless, in the last decade, various studies have attempted to give practical grounding to Semir Zeki’s famous claim that “...the artist is in a sense, a neuroscientist, exploring the potentials and capacities of the brain, though with different tools” (2). In this vein, Anna Berti, Stefano Cappa, and Alessia Folegatti compare certain pathological symptoms (such as the drawings of brain-damaged patients) with the work of figurative artists, and show how intriguing the comparison can be. Even if cautiously characterised more in terms of “assonance” between two separate domains than in terms of a genuine merging of distinct fields, the paper suggests that this kind of research may open a new window onto the brain’s organisation.

Patricia Smith Churchland, Michele Di Francesco

References

1. Churchland PS. Neurophilosophy. Cambridge, MA; MIT Press 1986
2. Zeki S. Statement on neuroaesthetics, <http://www.neuroaesthetics.org/index.html>