

Neuroscience and Philosophy – a complicated interdisciplinary relation

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0. Abstract

Recent developments in neuroscience bring scientists closer to fundamental human questions and thus into shared research fields with social sciences and the humanities. Thus, acquiring the necessary skills for interdisciplinary discussions becomes increasingly important to realize collaborative projects, but also for debates at the university or in the public sphere. For this purpose, the exchange with philosophers appears very promising, because of shared interests but complementary expertise.

1. New working conditions for neuroscientists

Neuroscience is among the most successful and publicly appreciated disciplines in contemporary life-sciences and has attracted broad attention due to the fascination of new technologies and novel insights, some of which challenge people's intuitive self-conception. Noteworthy, neuroscience has undergone significant conceptual and methodological changes in the last two decades. FENS-meetings taking place shortly after the beginning of the new millennium were widely populated by scientists studying structural and functional details of individual proteins, the mechanistic details of synaptic transmission, or cell biological processes in explanted neuronal cells. In contrast, recent FENS meetings were dominated by researchers using broad-range approaches to systematically compare gene expression profiles of thousands of individual brain cells or genome-wide association studies to retrace the genetic causes of human diseases. Moreover, complex behavioral analyses of diverse model organisms are combined with multichannel-electrophysiology, optogenetics and extensive statistical analyses in various conditions and paradigms. However, advanced imaging techniques also allow neuroscientists to investigate human brain activities during the performance of specific tasks in real-time.

Together with these methodical developments novel conceptual challenges arose. On the one hand, experimental planning and statistical analyses changed, requiring researchers to deal with a new level of complexity in experiments rendering them less accessible, difficult to understand, and often hard to discuss. On the other hand, some results challenge long-held assumptions and beliefs on the foundation of human behavior. Revising such assumptions bring neuroscientists in closer contact with members of other disciplines such as psychology, sociology, or even the humanities, which themselves have long-standing traditions in interpreting human behavior and experience.

2. Interdisciplinarity as new chance and challenge

In this situation a new diversity of interlocutors from different disciplines and the interested public wish to be informed by neuroscientists about their work, but also want to discuss and critically scrutinize their interpretations. Thus, neuroscientists should be interested in acquiring important

skills to communicate their science in complex social contexts such as multidisciplinary research programs or public debates. Many of these abilities depend on a well-founded understanding of the conceptual framework, in which neuroscience is performed, the awareness of similarities and dissimilarities between natural science and the humanities, and the capability to engage in critical and self-critical, interdisciplinary exchange. Yet, these skills are rarely taught in our educational programs and science curricula, and acquiring them requires solid knowledge, curiosity, and personal experience in such exchange. Currently, diverse funding agencies call for the implementation of interdisciplinary approaches, but most scientists lack any training in working interdisciplinarily in spite of an exceptionally high education in their specific field of expertise.

Philosophers have a special status among the potential discussion partners for neuroscientist, because of their common origin in natural philosophy and their shared interest in the cognitive ability of humans. However, in contrast to psychologists, sociologists, or anthropologist, with whom neuroscientists share an empirical approach, philosophers utilize different methods of investigation, have other study objects, and their research agenda provides different kinds of insight. Accordingly, interdisciplinary discourse with philosophers is expected to be more demanding, but also promises very different perspectives and insights. However, philosophy as scientific endeavor is as differentiated as the life sciences and not all fields appear as promising for interdisciplinary exchange with the neurosciences as the philosophy of mind, philosophy of science, or neuro-ethics. Nonetheless, philosophers share common methods such as the clarification of terms and the analysis of concepts, but also the reconstruction of arguments. The latter includes working out the premises, controlling the validity of conclusion, and distinguishing accepted conclusions from their interpretations.

Neuroscientists can take advantage of interdisciplinary discourse with philosophers on several levels. First, they can get access to a very different thinking tradition in the philosophy of mind, which offers a large spectrum of relevant concepts, and tap into the history and the processes of knowledge generation in the natural sciences. Drawing from meta-scientific frameworks, philosophers set out common fallacies in scientific discoveries based on problematic assumptions and biases, spurious conclusions, and unjustified interpretations. Understanding these challenges that are intricately related to scientific reasoning might prevent neuroscientists from repeating conceptual mistakes, which have been recognized in other fields long ago. Moreover, philosophy of science offers different descriptions of scientific endeavors, which certainly also apply to neuroscience. Within these descriptions the justification of science as a privileged access to reality, the utilization of models in the development of mechanistic concepts, and a comparison of typical types of arguments are widely discussed. These theoretical frameworks may help to better communicate neuroscientific results in public discourse and also better understand the origins of accusations and objections, which sometimes are formulated against neuroscience as discipline. Finally, philosophy of biology as a relatively new subdiscipline in the philosophy of science specifically addresses “living beings” from a conceptual perspective, which tries to interpret novel findings in biology and to put them into a larger picture thereby bridging disparate research fields and thinking traditions.

Neuroscientists are expected to benefit from acquiring and developing skills for interdisciplinary exchange, because such discourse forms frequently occur in multidisciplinary projects, among university faculties, but also in public debates or upon engagements in science outreach activities. Successful interdisciplinary discourses necessitate an awareness of presumptions or argumentation forms, widespread among scientists, but not necessarily shared by all discourse partners and the ability to switch between the primary discussion level and a meta-level to clarify ambiguities, map out incommensurabilities, and overcome conceptual or operational differences.

The need for such skills can be illustrated by various debates, one of the most recent is the debate on cerebral organoids. Such organoids are perceived as miniaturized physical analogues of the human

brain, which mimic sentient human reactions but lack experiential properties. However, most critical discussions center around the ethical and legal status of these organoids, which are critically shaped by information about organoid properties and the mechanisms and processes guiding their development. Thus, a wide audience wants to hear the opinion of neuroscientists, because of their expertise, but also to learn from their discussions with philosophers, lawyers, politicians, or representatives of patient organizations. Without proper expertise and training in interdisciplinary discourse neuroscientists are often ill-equipped for such debates and might prefer to ignore them ceding the field to pundits from other disciplines.

3. History of ANA in hosting interdisciplinary discourse

ANA has a tradition in hosting events to foster interdisciplinary exchange between neuroscience and philosophy, which not only stimulated interesting discussions but also allowed practicing such types of discourse.

In 2013, the ethologist Ludwig Huber from the Messerli Research Institute in Vienna and the philosopher Volker Gadenne from the Johannes Kepler University in Linz expounded the concept of "Free Will" from the perspective of their respective disciplines. The subsequent discussion with the audience unveiled the commonalities and conceptual differences, but also an appreciation of the complementarity of these approaches.

In 2019, two independent mini-symposia were organized to make participation easy and inviting for neuroscientists with different levels of prior knowledge. In the first symposium "Animal Models in Neuroscience to Study Human Diseases," a systematic description of the application of model organisms in the study of complex human behavior was brought together with a conceptual framework of the use of models, which has been developed in the philosophy of science. For this purpose, the neuropharmacologist Simone Sartori and the philosopher Federica Malfatti, both from the University of Innsbruck, gave inspiring introductions to their respective fields. The analysis of the relation between the actual object of interest (e.g., the progression of a human disease) and various models thereof provided a conceptual framework for the justification and power of model organisms, but also for systematic analyses of failures due to unjustified claims of similarity or assumptions of predictability. The second symposium "How to Understand Human Agency? Bridging the Gap between Neuronal Circuits and Human Behavior" was dedicated to reflections on human agency describing the experience of conscious choice between alternatives and of being the author of one's own life. The neuroscientist Johannes Passecker from Columbia University (USA), now at the University of Innsbruck, described empirical investigations on how humans initiate their actions as well as his own investigation of neuronal activities in mice modulating choice behavior under risky conditions. In a direct response, the philosophers Josef Quitterer and Daniel Wehinger from the University of Innsbruck sought to outline criteria for a definition of "to be free." By means of exploring the notion of "freedom to act," they discussed descriptions that are suitable for experimental situations as well as real life conditions and that allow relating choice behavior in mice with that observed in humans. Subsequently, the philosopher Anne Sophie Meincke from the University of Vienna addressed the question, whether successful descriptions of human agency and of choice behavior in animals necessitate a more dynamic understanding of the relation between living beings and their environment. To this end, she introduced a concept, in which processes are the primary level of description, thereby allowing to overcome the traditional split between independently existing living beings and the attracting or repulsing effects of the environment. Many neuroscientists participated in the mini-symposia, were engaged in intense discussions, and grappled with the arguments and foundational concepts proposed by the philosophers.

4. Summary & Outlook

From the authors' perspective, the communication with philosophers provides an interesting opportunity to get acquainted with another perspective, but also to educate oneself and broaden individual skills. Clearly, interdisciplinary exchange is a process of mutual education, terminological clarification and conceptual analyses on a meta-level, which equally prompt the revelation of misunderstandings and the correction of misconceptions about experimental approaches, which may exist in the perception of philosophers. Finally, such events may also contribute to objectify the style of discussions in the public sphere, which is frequently shaped by marked prejudices between representatives of natural science and the humanities.

For the ANA-meeting 2021 in Salzburg another interdisciplinary event has been initiated, which will address the concept of (self-)consciousness, which is at the center of our personal experience, but also a presupposition in the study of complex human experience and behavior. For that purpose, the cognitive scientist Thomas Bugnyar from the University of Vienna will introduce evolutionary precursors of human cognition in animals and Rupert Lanzenberger from the Medical University of Vienna, a neuroscientist and specialist for imaging technologies in human subjects, will discuss cutting-edge techniques and their capacity for studying cognitive dimensions of human experience. Moreover, we are very grateful that the philosophers Georg Gasser from the University of Augsburg (Germany), Daniel Wehinger from the University of Innsbruck, and Stephen Müller from the University of Salzburg accepted our invitation to participate in this interdisciplinary exchange. The aforementioned philosophers will provide an overview of different philosophical perspectives on the phenomenon of consciousness and may critically challenge the foundations of our neuroscientific concepts of cognition, which are based on experiments like the ones described by Thomas Bugnyar and Rupert Lanzenberger. With this symposium we hope to prolong the tradition of sessions at the ANA-meeting devoted to fostering interdisciplinary discourse at a high level and we hope for a large attendance.