

BOOK REVIEW

How Scientific Instruments Speak: Postphenomenology and Technological Mediations in Neuroscientific Practice, Bas de Boer (2021) Lexington Books, Lanham MD, 244pp., £85 (hardback) ISBN 978-1793627841

In a cognitive neuroscience laboratory, scientists make use of non-invasive brain stimulation (NIBS) technology to stimulate the brain at its specific locations. They employ an electroencephalogram (EEG) to read visualized neurophysiological changes to observe behavioral changes in visual attention. In *How Scientific Instruments Speak*, Bas de Boer explains the postphenomenological relationships among the actants involved in this scientific scenario – scientists, technological instruments, scientific objects and scientific knowledge – from theoretical and practical perspectives. In the case of neuroscience, de Boer is interested in unraveling how established frameworks manipulate – ‘appropriate’ is his term – scientific practice involving dynamic relations among scientists, instruments and observed objects, so ‘the (supposed) objectivity of scientific knowledge can be considered constitutive of’ human subjects and their intentionality (p.180). In other words, de Boer is interested in exploring how the scientist community’s assumptions on what should be considered objective can distort the objective principle the community is supposed to follow and exclude those objective findings that do not meet its expectations. De Boer’s book consists of two parts. The first is the theoretical section that teases out how instruments mediate the relations among the scientific actants. In the second, de Boer makes use of theoretical insights to single out the complicated networks in two neuroscientific cases.

In responding to Davis Baird’s *Thing Knowledge* (2004) and Ronald Giere’s *Scientific Perspective* (2006) in chapter 1, de Boer explains his argument about the relations among scientific collectives, instruments and scientific knowledge. De Boer uses the term ‘mediation’ to debunk Baird’s claim that scientific instruments bear ‘thing knowledge’ independent of scientists, yet immediately accessible. Technological mediation means the knowledge of the observed is not immediate to the observers, so the acquisition of the knowledge about the observed should undergo a collaborative process between observers and instruments, as well as the observers’ interpretation. In other words, ‘technologies mediate the relationships between human beings and the world’ (p.22). De Boer also points out that the same instrument offers multiple ways of seeing. Still, the scientific practice within the scientific collectives maintains consistency, so only selected ways of seeing are employed. This is because only collective knowledge, rather than individual knowledge, can be recognized as scientific knowledge, and the scientific collective develops a shared epistemic stance according to the aims of observation. In short, this chapter focuses on discussing the relations between observers and technology.

Based on Heidegger’s notion of technology as non-neutral in chapter 2, de Boer explains the relations between the instrument and the world to be observed from the postphenomenological perspective. According to Heidegger (1977), the world is unconcealed via technology’s ‘enframing’ function. The concept of enframing indicates that when the instrument discovers and explores the world through particular perspectives and approaches, it denies other ways of exploration. However, de Boer points out that Heidegger’s notion of enframing is about a general condition, while postphenomenology pays more attention to the actual workings of technologies, how technologies reveal the world from different perspectives. These themes are detailed later in two case studies in which de Boer explains how the worlds in cognitive neuroscience and neuropsychiatry are unconcealed via different technologies. Having discussed the enframing of

technology, de Boer reflects on the enframing function of science. Modern science ‘presupposes a mathematic way of disclosing the world’, but mathematics science should not be the only way to disclose the world (p.49).

In chapter 4, de Boer considers Gaston Bachelard’s ‘epistemological rupture’ concept and discusses scientific objects and rationality. Bachelard (2002) puts forward the concept of ‘scientific object’ to distinguish it from everyday object, something people can casually encounter in their daily lives and thus take for granted. A scientific object’s specialty lies in being so technologically constituted that its artificial aspect becomes more evident. A scientific object comes into being not independently, but as the consequence of its relations with instruments, theories and aims. Bachelard refers to such a relationship as ‘phenomenotechnique’. De Boer reconceptualizes ‘phenomenotechnique’ into ‘phenomenotechnology’ by emphasizing rationality in scientific objects, and with rationality, scientific objects attain ongoing stability.

The last theoretical section, chapter 5, responds to Bruno Latour’s new materialism and focuses on the features of scientists and the intentionality of scientific practice. Quite different from Bachelard’s notion that rationality is *a priori* for scientific practice, Latour (1988) claims that when a new phenomenon emerges, what is *a priori* is the laboratory condition, a network structure relating to human and non-human actants. De Boer notes that during the construction of the new phenomenon, which scientists recognize as scientific facts, ‘a specific appropriation of the observed is involved’ (p.106). Such an appropriation reveals ‘an intentional relation’ consisting of contributions by both human and non-human actants. Still, diverging from Latour, de Boer points out that the relation does not assign equal footing to both actants (p.112). More capacities are attributed to human actants, and such human capacities include using technology and conducting interpretative activities. Thus, when studying intentional relations, more attention should be directed to the human actant community and human scientific collectives.

In chapters 7 and 8, de Boer employs ethnomethodology and conversation analysis to study two neuroscientific cases as responses to the theoretical explorations. One of the cases is the cognitive neuroscience study mentioned at the beginning of this review. De Boer meticulously explains the experimental setups in two conditions. When the experiment was conducted directly to stimulate certain areas of the brain and observe behavioral changes, the observation can meet the expectations of the cause-effect relations, or the epistemic norm. When repeating the experiment, with an additional condition of integrating EEG to observe brain activities and behavioral changes visually, researchers became less certain about the cause-effect model since the brain scans exceeded desired expectations. This uncertainty did not make researchers suspect the established orientation, but they were oriented to individual reasons to safeguard the normative model. In this regard, de Boer points out that neuroscientific experiments are designed not to discover scientific facts, but to attempt to realize a specific normative framework so that scientific practice can appropriate technological mediations. When the scientific collectives are oriented to *a priori* intentionality, ‘other potential valuable explanations of human behavior are discarded since these would not fit the desired causal model’ (p.158). This practice routine indicates that other possible models that challenge the brain ‘as an autonomous agent that fully determines human behavior’ will be ruled out (p.158). Similarly, in neuropsychiatry, psychiatrists try to appropriate the complexity of the human brain revealed in functional magnetic resonance imaging (fMRI) to cater to their constituted pragmatic aims to ‘confirm earlier established diagnostic’ labels (p.179).

Both from a theoretical perspective and a practical stance, de Boer attempts to challenge established scientific epistemology. *How Scientific Instruments Speak* can be read either as a theoretical exploration of the philosophy of science and technology, or as solid empirical research on the routine practice of current neuroscience. In addition, this book can shed light on the potential of interdisciplinary research between humanities and neuroscience regarding the institutionalized methods and theory within scientific collectives. It can also help examine how critical neuroscience can impact the practices of neuroscientists.

References

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