Workshop: The Mechanistic Approach in Biology and Cognition

It would be preposterous to think that the mechanistic approach to explanation has only been recently articulated. Indeed, since Descartes at least, the mechanistic approach has dominated natural science. Nevertheless, a new mechanistic account has been elaborated in the last decades, presenting itself as an alternative model of explanation to the classical deductive-nomological one based on the primacy of laws (Bechtel and Abrahamsen, 2005; Machamer, Darden and Craver, 2000). According to the new mechanists, explanation starts from the concrete analysis of natural systems and is couched in terms of the spatial, temporal and causal relations between their parts and the global organization of their operations or activities. It is not surprising that the mechanistic approach has experienced a renaissance in the recent philosophy of biology and neuroscience (Bechtel, 2006; Craver, 2007). One reason is that the life sciences were never the primary focus of mainstream, non-mechanistic, 20th century philosophy of science: the idiosyncratic behavior of complex natural systems does not seem to be amenable to an analysis based on nomological subsumption. Hence, if the goal of philosophy of science is to make sense of actual scientific practice, then it must deal with mechanistic explanation.

Organismal biology - roughly what Mayr (1961) called *functional biology* - underwent a conceptual revolution in the last century: a molecular vision of life emerged (Kay, 1993). Molecular biology is a methodologically reductionist endeavor that has driven advances in disciplines like physiology, cell biology, biochemistry, developmental biology, neuroscience etc. (Sarkar, 2005). Significantly, this molecular approach is mechanistic: postulation and discovery of mechanisms is the fundamental research strategy in molecular organismal biology (Craver and Darden, 2001; 2013). At the same time, the molecular approach is often associated with reductionist approaches to causal explanation and with ontological reductionism (Rosenberg, 1997). The traditional theoretical framework of the cognitive sciences arose from advances in the information sciences. However, over the years, views about cognition changed significantly from classical representation-driven frameworks (such as computationalism) to action-orientated, dynamical, embodied and enactive approaches (Di Paolo and Thompson, 2014) and, as some may argue, to a new paradigm, namely predictive coding (Clark, 2015). In this context, key elements of the traditional approach came under scrutiny, in particular the epistemological and metaphysical role of representations (Hutto and Myin, 2013). Arguably, the conceptual transformation of the cognitive sciences has been spurred by the adoption of a mechanistic approach (Miłkowski, 2016). At the same time, the incontrovertible success of the mechanistic approach in organismal biology might not be easily translatable to cognitive science (Piccinini and Craver 2011; Shapiro, 2017).

This workshop aims to discuss recent developments and problems raised by the endorsement of mechanistic approaches in both organismal biology and cognitive sciences. Particularly relevant questions include the following: how are mechanistic approaches in molecular biology and cognitive sciences used? Are the approaches similar? How should we conceive of reductionism and emergence within the mechanistic approach? How should we make sense of hierarchical levels of organization in mechanistic explanations?

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