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Introduction

The Research Workshop on Philosophy of Biology and Cognitive Sciences (PBCS) has been running annually for eight years now. Since its origins in 2011, the PBCS aims at bringing together young researchers from different disciplinary backgrounds: philosophers, cognitive scientists, and biologists working on issues of common interest. As a result, it has become a reference event in Spain for PhD and early postdoc scholars interested in the philosophy of the life and cognitive sciences. The PBCS enhances research through the discussion of each session in a friendly and interdisciplinary atmosphere intended to debate work in progress. In this issue, we offer a selection of the papers presented at the eighth edition of the event, which took place in May 2018 at the Complutense University of Madrid.

The topics in this issue range from general epistemic considerations to metaphysical concerns in the philosophy of biology. The four selected articles are a good instantiation of how classical topics of interest among philosophers of biology connect with new philosophical frameworks, developed in the light of new empirical evidence and the consequent proliferation of biological research fields. The first two papers concern two distinct epistemological issues, namely mechanistic explanations and diagrammatic representations, in the life sciences. From their different perspectives, both of them address the role of epistemic purposes in structuring scientific explanations in the biological practices. The following two papers engage with two classical metaphysical questions in the philosophy of biology, namely the existence and nature of biological natural kinds and the ontological status of biological individuals, in view of recent philosophical theories accounting for new kinds of biological entities such as developmental homologues and holobionts.

The article by Emilio Cáceres, entitled 'Intervals of quasi-decompositionality and mechanistic explanations', deals with recent mechanistic approaches to scientific explanation, which have been especially forceful in the

philosophy of biology literature. Cáceres claims that although it is usual to characterize science as a process of describing mechanisms, there is no consensus among philosophers over what a mechanism is. The purpose of his paper is to analyse certain problems arising from classical approaches, and to develop a novel, pragmatistic account of mechanisms. After distinguishing the main aspects common to most mechanistic views (namely, composition by entities and activities, causal role, and organization), the author encounters a difficulty met by all of them: the definition of a mechanism implies referring to a specific level of organisation whose relation with other levels may be problematic. According to Cáceres, the attempt to classify levels of organisation of nature in an exhaustive way through a hierarchy of mechanisms entails a variety of problematic issues, such as the emergence of higher-level properties or the problem of downward causation. He thus proposes that the particular sciences establish different criteria of *quasi-decompositionality* of systems according to their epistemic goals. This is particularly interesting for biological sciences, where each field defines its objects of study according to the different levels of biological organization. The study of photosynthesis in ecology, plant physiology and molecular biology illustrates this tenet. The result of Cáceres' approach is a view of science as a "nesting of boxes" defined at different levels, where causal interactions only take place at the fundamental one, but non-causal relations between levels can still be established with heuristic purposes.

Javier Anta's article, 'Indispensability and effectiveness of diagrams in molecular biology', concerns a dispute that has recently become a matter of attention among philosophers of biology, namely the epistemic status of diagrammatic representations. In particular, Anta argues that the extended use of diagrams in molecular biology is not merely illustrative in purpose, but plays an important epistemic role. On the one hand, the author defends that diagrams are an indispensable epistemic tool for representing complex properties of molecules. Since they are a well-defined, syntactically-behaved and semantically-driven means of representation, diagrams are able to account for a number of spatial and structural properties that are not always suited for translation into natural languages. Against the thesis that diagrams merely represent in a visual way those properties that would be too hard to account for by linguistic means, Anta argues that some of such properties cannot be computationally processed at all. Therefore, complex structural properties of biomolecules are necessarily coded in diagrammatic schema. On the other hand, Anta also advocates the use of diagrams even in those cases where all the represented properties can be computationally processed. He defends that, in the context of molecular biology, diagrams are more representational and

more inferentially effective than formula-based explanations. He relies on the semantic and epistemic effectiveness of these representations, for they make relevant information more available than by other means. Importantly, the graphical representation of geometric and topological properties makes it possible to encode relevant structural information without inflating syntax exponentially or losing operational rigor. Finally, the article deals with how these epistemic values of diagrams may explain their recurrent and multifacet use in molecular biology: in developing several types of explanations (either functional-structural, mechanistic-dynamic or topological), in testing novel hypothesis, and in predicting new phenomena.

In her paper "How not to resist the natural kind talk in biology", María J. Ferreira Ruiz argues that two major recent criticisms to the conception of biological natural kinds as property clusters are ill formulated, since they depend on underlying, though unnecessary, assumptions on what a philosophical theory of natural kinds should be able to provide. The first objection concerns explanatory limitation. According to this objection, the cluster approach is flawed because it fails to answer the question of why a natural kind is characterized by certain properties rather than others. The second objection addresses the inability of property clusters views to fix kind membership, and their consequent reliance on independent classificatory criteria. Ferreira argues that these two objections rely on the unjustified assumption that a philosophical theory of natural kinds needs to provide a solution to both requirements. In contrast, she contends that the aim of any theory of natural kinds is not to be able to explain why these kinds are as they are, neither to fix membership. Instead, the only primary requirement one can demand from such a theory is to be able to distinguish natural kinds from non-natural ones. While remaining metaphysically agnostic on the true nature of biological natural kinds, Ferreira forcefully shows how our very expectations from philosophical theories have conditioned this classical debate.

The ontological status of the symbiotic associations between hosts and microbiota has become the source of one of the most lively controversies in the philosophy of biology, polarised between those advocating the individuality of "holobionts", and those arguing that these associations have a looser nature, analogous to that of ecological communities. In their paper, "A metaphysical approach to holobiont individuality: Holobionts as emergent individuals", Javier Suárez and Vanessa Triviño align with the former position, but take an original approach that combines new insights from the metaphysical literature on emergence with recent debates in the philosophy of biology on the units of selection. The authors focus on the most controversial hurdle to understand holobionts as units of selection, namely their ability to establish inheritance

relations. They argue that, if inheritance is understood on the basis of trait-recurrence, and given the ability of holobionts to reconstruct their traits intergenerationally by recruiting the members of their microbiota, holobionts can be conceived as emergent individuals. According to the metaphysician Jessica Wilson, higher-level properties of a system are emergent properties in a strong ontological sense if they have new causal powers that are not present in the lower-level properties upon which they depend. The authors apply this criterion to the holobiont case, and conclude that the ability of holobionts to sustain trait recurrence belongs to holobionts as emergent individuals, insofar as some of their traits have a new, downwardly exerted causal power, that determines the relative survival of some of their microbial parts.

The articles of this special issue demonstrate that the proliferation of entities and modes of explanation produced by the life sciences in the last few decades is followed up closely by young philosophers of biology. The heterogeneity of biology is therefore manifested in the philosophical issues here presented, showing that evolutionary theory is no longer the only source of conceptual puzzles in the philosophy of biology, and that new explanatory tools and research objects multiplicate together with different epistemic purposes.