NATURAL KINDS IN PHILOSOPHY AND IN THE LIFE SCIENCES: SCHOLASTIC TWILIGHT OR NEW DAWN?

Program
Natural Kinds in Philosophy and in the Life Sciences: Scholastic Twilight or New Dawn?

Joint workshop of the Konrad Lorenz Institute for Evolution and Cognition Research (Altenberg, Austria) and the Department of Philosophy I, University of Granada (Spain)

Organized by

María José Frápolli
Miles MacLeod
Thomas A.C. Reydon
Aránzazu San Ginés
Ana María Ramírez
Neftalí Villanueva

University of Granada, September, 7 – 9, 2011
**Topic and aims**

This workshop will be devoted to exploring the future of the ‘natural kinds’ concept in the philosophy of the life sciences (broadly conceived) and in scientific practice in this area of science, partly in comparison with the concept in other areas of science. In a recent paper, Ian Hacking claimed that the notion of ‘natural kinds’ has outlived its use, that it stands in the way of progress in both philosophy of science and the sciences themselves, and that it should therefore be disposed of (Hacking, 2007, ‘Natural kinds: rosy dawn, scholastic twilight’). According to Hacking, there is no such thing as a natural kind and, therefore, it doesn’t make much sense for philosophers of science and scientists to frame their work in terms of the concept of ‘natural kinds’.

The aim of this workshop is to explore which responses philosophers and scientists might give to Hacking’s claims.

There are good reasons to think such responses can be given. Hacking is principally concerned with essentialist conceptions of natural kinds and the metaphysical presuppositions of natural kinds philosophy, which are admittedly of limited use in most sciences. However, these are *post hoc* assessments of natural kinds concepts and seem at the very least presumptive of what counts as ‘natural’. In contrast, the concept of ‘natural kind’ seems to be moving away from these issues towards the fashioning of a concept that models important differences in the categories researchers construct in practice, in the process of that construction, and subsequently in the epistemic roles these categories play and how they are productively relied upon to further research (in all these contexts distinct from what may be labeled ‘artificial’ kinds). Natural kinds are less a label philosophically applied to particular products of research, than to important elements of the process of research itself. In light of this the leading questions of the workshop are: Is Hacking really right in his general claim that there is no use for the concept of ‘natural kind’ in either philosophy of science or science itself, or is there rather a significant aspect of the practices of categorization in the context of research to be captured by the notion of a natural category? If the latter, what philosophical work does the concept do? And how do scientists themselves think about their categories?

Since the main questions of this workshop concern research practices, and the productive application of a philosophical concept to them, one of the chief ambitions is to bring active researchers and philosophers into dialogue. We intend to address and discuss the meaningfulness of the natural kind concept both to philosophers of science and to scientists themselves. Participants from both sides of the division are asked to address this issue from the
perspective of their own field of work, building their presentation and paper around the following questions:

- Do you recognise distinctions between types of categories in your field of work (or in the field you study as a philosopher) pertaining to their naturalness?
- What do you consider the natural kind categories of this field or the reasons whether the category makes (or doesn’t make) sense?
- What would you consider the basis and meaning of “your” natural kinds, and how would you distinguish them from non-natural kinds?
- What might be the importance to the field of making such a categorical distinction? In particular, what epistemic work does the notion of ‘natural kind’ do in the field?
- And related, what kind of difference does the label ‘natural kind’ reflect in terms of the use of such a concept in your research practice?

The principal result of this workshop should be a general overview of whether or not scientists from the domains of the life and cognitive sciences, and philosophers looking at these sciences, tend to agree with Hacking’s claim about the concept of ‘natural kind’ – and if they tend not to agree with Hacking, wherein in their view the usefulness of the ‘natural kind’ concept lies. Towards answering this question the workshop plans to bring together scientists and philosophers who work particularly in philosophy of the life sciences and discuss how a concept of natural kinds allows facilitates a comparison of grouping and categorisation practices across science.

Format

The workshop will be held over three days with six or seven presenters per day, allowing ample time for discussion. Except for one case, every presentation plus ensuing discussion has been given a time slot of 1 hour. Presentations should take not more than 30 minutes, leaving at least 25 minutes for discussion.

M.J.F., M.M. & T.R.
## Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Institution and Address</th>
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<tbody>
<tr>
<td>JUAN J. ACERO</td>
<td><a href="mailto:acero@ugr.es">acero@ugr.es</a></td>
<td>Dpto. de Filosofía I, Universidad de Granada, Fac. de Filosofía y Letras, Campus de Cartuja, 18071 Granada, Spain</td>
</tr>
<tr>
<td>ALBA AMILBURU</td>
<td><a href="mailto:alba.amilburu@ehu.es">alba.amilburu@ehu.es</a></td>
<td>Department of Logic and Philosophy of Science, University of the Basque Country (UPV/EHU), Avenida de Tolosa 70, 20080 Donostia/ San Sebastián, Spain</td>
</tr>
<tr>
<td>ALFONSO ARROYO-SANTOS</td>
<td><a href="mailto:agripas@gmail.com">agripas@gmail.com</a></td>
<td>Department of Biological Sciences, Stanford University, Stanford, CA 94305-5020, USA</td>
</tr>
<tr>
<td>STAVROS ASSIMAKOPOULOS</td>
<td><a href="mailto:stavros.assimakopoulos@googlemail.com">stavros.assimakopoulos@googlemail.com</a></td>
<td>Dpto. de Filosofía I, Universidad de Granada, Fac. de Filosofía y Letras, Campus de Cartuja, 18071 Granada, Spain</td>
</tr>
</tbody>
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ANN-SOPHIE BARWICH  ab478@exeter.ac.uk

Egenis – The ESRC Centre for Genomics in Society
University of Exeter
Byrne House, St. German's Road
Exeter EX4 4PF, UK

HELEN BEEBEE  h.beebee@bham.ac.uk

Department of Philosophy
University of Birmingham
ERI Building
Birmingham B15 2TT, UK

JESSICA BOLKER  Jessica.Bolker@unh.edu

Department of Biological Sciences
University of New Hampshire
216 Rudman Hall, 46 College Road
Durham, NH 03824, USA

WERNER CALLEBAUT  werner.callebaut@kli.ac.at

Konrad Lorenz Institute for Evolution and Cognition Research
Adolf Lorenz Gasse 2
3422 Altenberg, Austria
MARÍA CEREZO  
mmcerezo@um.es

Departamento de Filosofía
Universidad de Murcia
Edificio Luis Vives, Campus Espinardo
30100 Murcia, Spain

ANTONIO DIÉGUEZ  
dieguez@uma.es

Departamento de Filosofía
Universidad de Málaga
29071 Málaga, Spain

XAVIER DE DONATO  
xavier.dedonato@usc.es

Area de Lógica y Filosofía de la Ciencia, Dpto. deLógica y Filosofía Moral
Universidad de Santiago de Compostela
Praza de Mazarelos s/n
15782 Santiago de Compostela, Spain

ARANTZA ETXEBERRÍA  
arantza.etxeberria@ehu.es

Department of Logic and Philosophy of Science
University of the Basque Country (UPV/EHU)
Avenida de Tolosa 70
20080 Donostia / San Sebastián, Spain
JOSÉ L. FALGUERA  joseluis.falguera@usc.es

Area de Lógica y Filosofía de la Ciencia, Dpto. deLógica y Filosofía Moral
Universidad de Santiago de Compostela
Praza de Mazarelos s/n
15782 Santiago de Compostela, Spain

MARÍA JOSÉ FRÁPOLLI  frapolli@ugr.es

Dpto. de Filosofía I
Universidad de Granada
Fac. de Filosofía y Letras, Edificio B, Campus de Cartuja
18071 Granada, Spain

LISA GANNETT  lisa.gannett@smu.ca

Department of Philosophy
Saint Mary’s University
923 Robie St.
Halifax, NS B3H 3C3, Canada

MARION GODMAN  marion.godman@kcl.ac.uk

Department of Philosophy
King’s College London
Strand
London WC2R 2LSX, UK
MILES MACLEOD  
miles.macleod@kli.ac.at

Konrad Lorenz Institute for Evolution and Cognition Research
Adolf Lorenz Gasse 2
3422 Altenberg, Austria

ELSA MURO  
emuro@alumni.unav.es

Departamento de Filosofía
Universidad de Navarra
Aptdo. 177
31080 Pamplona, Spain

JOSÉ MANUEL PALMA  
palmamu@correo.ugr.es

Dpto. de Filosofía I
Universidad de Granada
Fac. de Filosofía y Letras, Edificio B, Campus de Cartuja
18071 Granada, Spain

MANUEL DE PINEDO  
pinedo@ugr.es

Dpto. de Filosofía I
Universidad de Granada
Fac. de Filosofía y Letras, Edificio B, Campus de Cartuja
18071 Granada, Spain
THOMAS A.C. REYDON  reydon@ww.uni-hannover.de

Institut für Philosophie & Center for Philosophy and Ethics of Science (ZEWW)
Leibniz Universität Hannover
Im Moore 21, 30167 Hannover, Germany

OLIVIER RIEPEL  orieppel@fieldmuseum.org

Department of Geology
The Field Museum
1400 S. Lake Shore Drive
Chicago, IL 60605-2496, USA

ARÁNZAZU SAN GINÉS  aransangines@gmail.com

Dpto. de Filosofía I
Universidad de Granada
Fac. de Filosofía y Letras, Edificio B, Campus de Cartuja
18071 Granada, Spain

PEDRO J. SÁNCHEZ  pedros@edu.ucm.es

Departamento de Didáctica de las Ciencias Experimentales
Universidad Complutense de Madrid
Rector Royo Villanova s/n, Ciudad Universitaria
28040 Madrid, Spain
KURT SCHWENK  
kurt.schwenk@uconn.edu

Department of Ecology and Evolutionary Biology  
University of Connecticut  
Storrs, CT  06269-3043, USA

MATTHEW H. SLATER  
matthew.slater@bucknell.edu

Department of Philosophy  
Bucknell University  
69 Coleman Hall, Dent Drive  
Lewisburg, PA 17837, USA

NEFTALÍ VILLANUEVA  
nef@ugr.es

Dpto. de Filosofía I  
Universidad de Granada  
Fac. de Filosofía y Letras, Edificio B, Campus de Cartuja  
18071 Granada, Spain
## Natural Kinds in Philosophy and in the Life Sciences: Scholastic Twilight or New Dawn?

### Wed 7 Sep

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<tr>
<td>10.00 am – 11.00 am</td>
<td>Introduction to the workshop</td>
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<td>Frápolli, MacLeod &amp; Reydon</td>
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<td>11.00 am – 11.30 am</td>
<td>Coffee</td>
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<td>11.30 am – 12.30 pm</td>
<td>How to carve nature across the joints without abandoning Kripke-Putnam semantics</td>
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<td>Beebee</td>
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<td>12.30 pm – 01.30 pm</td>
<td>Natural kinds and natural kind terms (CANCELLED)</td>
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<td>01.30 pm – 3:30 pm</td>
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<td>03.30 pm – 04.30 pm</td>
<td>Natural kinds vs. constituted kinds in science and Zalta’s abstract objects</td>
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<td>05.00 pm – 06.00 pm</td>
<td>Natural kind terms as sign functions</td>
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<td>Biology-inspired natural kinds (CANCELLED)</td>
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How to carve nature across the joints without abandoning Kripke-Putnam semantics

It has become virtually a truism in metaphysics circles that the Kripke-Putnam semantics for natural kind terms entails a substantive form of essentialism about natural kinds. I argue that this alleged truism is in fact false. I argue my case by showing how one can accept KP semantics and yet hold either of two anti-essentialist theses that are widely regarded as incompatible with KP semantics: species pluralism and Kuhnian relativism.
In his famous discussion of ‘General Semantics’ Lewis sharply distinguished between “abstract semantic systems whereby symbols are associated with aspects of the world” and the analysis of meaning with resort to “the psychology and sociology of language users: to intentions, sense-experience, and mental ideas, or to social rules, conventions, and regularities” (1970:19). Assuming that the semantics of natural kind terms has primarily, maybe even solely, been approached in the first way within the philosophy of language, the aim of this talk is to revisit it from the competing perspective. Heretical though this may seem at first sight, I will argue that our cognitive limitations as a species are responsible for our inability to provide a definite answer to fundamental questions that underlie our understanding and classification of natural kinds.
Natural kinds vs. constituted kinds in science and Zalta’s abstract objects

This work addresses natural kinds and constituted kinds, and consists of three parts. In the first part, although the natural kinds are not rejected in the metaphysical plane, the principal arguments formulated against the essentialist epistemic realism are indicated, namely: (i) objections to the thesis that so-called natural kind terms really fix natural kinds; (ii) objections that there is a satisfactory justification of the thesis which establishes that, through scientific development, we discover natural kinds and natural laws. I claim, in view of such arguments, that the aim to give reasons in favor of an essentialist epistemic realism has proven unsuccessful until now.

In the second part of this paper, an approach is presented which is found in Kuhn’s latest works on the philosophy of science, in accordance with which scientific terms would designate abstract entities which Kuhn names “kinds” although he does not claim that there are natural kinds. We can say that it is a question of constituted kinds and that they are a type of universals. I will try to show that some of the objections raised to the Kuhnian proposal of constituted kinds are surmountable given the explicit or implicit conditions of this proposal; and we will provide some reasons to consider constituted kinds indispensable, dealing with aspects related to the ontosemantics of the scientific expressions.

Nevertheless, while another type of abstract entities, like the sets, enjoy respectability because behind them there is a theory like set theory and a metatheoretical consideration that provides identity criteria for the sets, constituted kinds enjoy less respectability because they supposedly lack the coverage of an ontological theory and of clear identity criteria. The third part of this paper is an attempt to consider whether the Zalta’s ontological theory can be useful, and to what extent, for such a purpose.
Natural kind terms as sign functions

The topic of this paper is strategies for referring to Natural Kinds. There are two dominant views, the New Theory of Reference and the Descriptivist account. Despite the partial usefulness of both theories for describing the meaning of Kind terms, I will briefly recount their inadequacies. Particularly noteworthy are the difficulties that arise in fixing the extension of, first, theoretical entities, meaning scientific entities that are not directly accessible but are known only through their experimental effects; second, scientific objects that are still part of research and thus not necessarily well-defined; and third, contingent groups in nature like ‘species’ which can be considered as ‘moving targets’ because they adapt and develop over time.

The aim of this paper is then to offer an alternative account of Natural Kind Terms. Based on Umberto Eco’s semiotics I will present Natural Kind Terms as “sign functions”. This semiotic approach states that we can fix the extension of a term by various means. In this sense, the meaning of Natural Kind terms can have different extensions yet the groups referred to, I argue, remain Natural Kinds. The proposed approach of defining Kind terms as sign functions is consistent with the advantages of both contemporary accounts, New Theory and Descriptivist, yet it tries to compensate for their insufficiencies. It offers the possibility of involving new information or discoveries about Kinds without necessarily jettisoning the original referent in virtue of discontinuities regarding a change of extension. In many cases we not only have to face different disciplines but also divergences within disciplines with respect to ways of determining the significant theoretical feature. By defining the ‘meaning’ of a term by various alternative hypotheses we assign heterogeneous ways of defining the extension of a term that can but does not need to result in a change of extension. Meaning in this sense is encyclopaedic; it encompasses the plurality of strategies to fix the extension of a scientifically useful term that ought to address a natural kind. I will introduce this claim by way of an example. My example concerns a present debate, which puzzled both biochemists and biophysicists, concerning two competing theories regarding the properties and theoretically significant feature that determines scent.

This proposed pluralistic concept of meaning aims to support the position of “promiscuous realism” proposed by John Dupré. With the underlying assumption that nature is too complex and interconnected to be divided in a unique comprehensive way, ‘promiscuous realism’ advocates a radically pluralistic account of reality and states that there are numerous and equally applicable
ways to classify the (biological) world. In short, there are real distinctions in nature; but there is no unique set of distinctions but rather overlapping sets that underlie the need for different classifications. These classifications reflect different relations and serve different purposes. Having a variety of classifications, on this account, need not be a flaw in the classification, but may represent the very character of nature. Yet, it remains to be explained what concept of meaning can subserve such a radically pluralistic account. Addressing this question will be the thread that holds together the various strands in this paper.
Biology-inspired natural kinds

Physics has often been the focus of philosophical discussions, and the debate around natural kinds is no exception. Even though the examples used in this debate may come from other sciences, such as chemistry or biology, the gold standard comes from physics. It is thought that, if any science is in the business of discovering natural kinds, it must be physics: physical entities are taken to be more basic and their behaviour seems to be understandable independently of the larger wholes that they create (and, ultimately, independently of each other). This is, amongst other things, a leftover of what some contemporary metaphysicians have called the “Humean distinctness thesis” (see Molnar 2003). The conception of physics that backs this thesis is itself dubious. In any case, it is completely useless as an understanding of biological explanations. Going back as far as Tinbergen (1963), theoretical biology has recognized the need for explanations in terms of evolved functions or adaptive value, besides mechanistic explanations. Those explanations are clearly relational in nature. Also, following Gibson (1979), there has been a growing interest in an ontology of “affordances” that makes more justice to animal behaviour than atomistic ontologies (Chemero 2009 is an excellent example). Using these ideas as an inspiration, this paper will highlight the advantages of placing our conception of natural kinds within the setting of an ontology of powers and dispositions.
Emotion, perception and natural kinds

This talk addresses the question whether emotional experiences (episodes, occurrences) belong to natural kinds. To arrive at an answer, three main steps are taken. First, a theory of what natural kinds are is picked up — in our case, the Homeostatic Property Cluster theory — whereby natural kinds are clusters of properties whose co-occurrence is stabilized or bound by a homeostatic mechanism (Boyd 2010; Griffiths 1997). Emotional experiences being natural kinds, some of their properties should steadily co-occur with further properties. Second, it is argued that the homeostatic mechanism that bound all these properties is the one which serves perception, that is, the one which gives rise to perceptual emotional experiences. Accordingly, the view of emotion that is put forward in the talk holds that emotional episodes are perceptual episodes. Not that in experiencing an emotion we perceive some changes that take place in our own body, as is claimed in well-known varieties of the Perceptual Experience theory of emotion (Damasio 1999; Prinz 2004). On the view defended here, inspired in the ecological approach to perception (Gibson 1986; Gibson & Pick 2000), feeling an emotion is perceiving the way an event or a state of affairs affect us. It follows that emotional learning consists of unfolding the ability of identifying and recognizing those emotional signposts in the agent’s environment that mean something to her and have a hold on her behaviour. Far from being exclusively internal, emotional experiences also involve parts of the environment and parts of the agent’s behaviour. Environmental, psychological and behavioural properties steadily co-occur in virtue of perception links. Third, bounds to this conclusion must be set due to the highly contextual nature of what counts as having been perceived. There are specific domains or settings with respect to which emotional experience group themselves into natural kinds. It is claimed that the visual cliff setting so often resorted to in developmental psychology illustrates this point (Sorce, Emde, Campos & Klinnert 1985; ). In such a setting properties co-occur by the power of a perceptual homeostatic mechanism. However, as far as individual psychological development proceeds, it is to be expected that differences in learning undermine property clustering.
The existence and/or usefulness of natural kinds is challenged from various directions in philosophy and science, even in the traditional “strongholds” of natural kinds: chemistry and biology. It is not surprising that few have dared argue that there are natural kinds in fields like psychology and psychiatry. In this paper I hope to show that according to a recent model of natural kinds, we have good reason to think there are.

I begin by summarizing my preferred model of natural kinds bases on work by Millikan (1999, 2000). First I provide the conditions that groups of individuals must satisfy in order to be natural kinds: A natural kind, $K_1$, is a group of individuals that share an objective grounding, which explains why the individuals jointly enter into multiple non-accidental generalizations. I then suggest that the objective grounding comes in two principal forms: either there is some intrinsic and/or extrinsic properties common to all members of a kind (non-relational grounding) (see e.g. Ellis 2002, Devitt 2008), or there is some historical relation that is uniquely shared by all members of a kind (relational grounding) (Millikan 1999). My criteria is permissive so as to at least prima facie allow for natural kinds in the life sciences – but it is not too permissive; it for instance excludes definitional and functional categories from being natural kinds.

In Ian Hacking’s spirit of doing proper justice to particular cases, my objective is to test my model in psychiatry by applying it to a particular against case study of a putative psychiatric kind. The psychiatric syndrome I will consider is a pathological withdrawal syndrome, colloquially referred as “the children with apathy”, that affected about 450 refugee children in Sweden between 2002-2006. The political and public interest in the phenomenon at the time was considerable because the condition seemed to resemble a specifically Swedish epidemic.

Hacking (2010) has also taken an interest in the case, explaining the withdrawal syndrome by means of an ‘Imitation and Internalization’ model (I&I model). I argue that the I&I model is consistent with the historical/relational grounding I propose for natural kinds, but that it does not do justice to the empirical evidence of the particular case and does not offer an objective grounding with sufficient explanatory power to explain the generalizations associated with the kind. Instead I will propose roughly a trauma model for understanding this kind, which in contrast to Hacking’s model is consistent with a non-relational grounding.
I conclude by addressing the issue of whether there are any general lessons to be drawn about natural kinds in psychology and psychiatry.
Projectability and group concepts in population genetics and genomics

In 'Questions Asked and Unasked' (2010), I argue that although the category 'race' fails as a postulated natural kind, racial, ethnic, and other group designations could nonetheless be considered projectible insofar as they support inductive inferences in biomedicine. In this paper, I investigate more fully what it might mean for group concepts in population genetics and genomics to be considered projectible. I draw on examples from cancer genetics, DNA forensics, and human evolution.
My approach to conceptual delineation in biology is purely pragmatic. It involves answering five related questions: (i) Does a concept (such as ‘natural kinds’) appear to represent something objectively ‘real’ in the sense of an empirically demonstrable phenomenon? (ii) Can we arrive at an internally coherent, biologically defensible definition (i.e., is the concept amenable to definition at all, even if purely theoretical)? (iii) Can the concept be applied empirically to real, biological systems, i.e., can the concept be ‘operationalized’? (iv) In empirical application, does the concept provide utility in the sense of explanatory power, prediction or insight into poorly understood phenomena (i.e., does it lend itself to induction)? (v) As a corollary to question 4, is the concept redundant with pre-existing concepts or nomenclature? Do we already understand the phenomena in question without resort to additional vocabulary? Note that at any point in this process one may return to question 1 and answer negatively. Based on this approach to natural kinds, I disagree with Haskin’s rejection of ‘natural kinds’ on the basis of definitional multiplication and idiosyncratic usage. Haskin believes that because concurrent conceptions of natural kinds are often incompatible, the concept is without utility. He fails, however, to ask if a defensible concept is possible, and if so, useful. As such, he conflates several steps in the process above by equating disagreement with fruitlessness (a pattern mirrored in the ‘constraint’ literature). In contrast, I suggest that a ‘workable’ concept of natural kinds is possible in the tradition of evolutionary morphology, but I doubt that such a concept has utilitarian value to empirical biologists (who tend to reject purely logical or analytical philosophical notions—if they are aware of them in the first place). My conclusions are conventional except in being very restrictive. Natural kinds represent real entities only in the context of evolutionary history. The concept is applicable only to phenotypes (including sub- and supra-organismal aspects of the phenotype) because they are the part of organisms that manifest historical continuity despite often radical changes in underlying hierarchical levels, and because phenotypes are the target of selection. Their key attributes are cohesion, stability on an evolutionary time scale and historical continuity. As such, they can be represented in a phylogeny monophyletically or paraphyletically (because they can be lost in descendant lineages), but never polyphyletically. I see natural kinds in the phenotype as types of “homeostatic property clusters,” but without the necessity of homeostatic mechanisms in the conventional sense; rather, they are historical entities that resist perturbation, but which when sufficiently disrupted, can disintegrate rapidly. Natural kinds are therefore recognized not only on the basis of the attributes noted above, but on the basis of a causal mechanism that is responsible
for these attributes. Suborganismal natural kinds are usually manifested on the basis of ‘internal selection’, which underlies their stability and coherence. Supra-organismal natural kinds are causally related to historical contingency and developmental burden. Although I conclude that natural kinds in evolutionary morphology are objectively real and empirically demonstrable, I believe that the concept fails in the criteria of utility and redundancy. For most, if not all, of the phenomena potentially relatable to natural kinds in the evolution of organisms, there are existing terms and theory that perform well—e.g., concepts of ‘characters’, ‘modules’ and ‘Baupläne’. As a pre-darwinian concept, the question of natural kinds was an important one. In a post-evolutionary view of living systems, however, its value in empirical biology is questionable. With the possible exception of species concepts, modern evolutionary biology has developed in the absence of natural kinds theory and it has found other, more suitable, ways to deal with this philosophical domain.
Pedro J. Sánchez  
Universidad Complutense de Madrid

**Semiotic vs. ontological naturalness**

«Some classifications are more natural than others, but there is no such thing as a natural kind» (Ian Hacking, 2007).

The famous Ian Hacking’s statement has a very simple logical form, namely (p₁ ∧ ¬p₂). An elementary analysis shows that the apparent contradiction implicit in the statement can be avoided if either ‘natural’ is used with different meanings in p₁ and p₂; or if ‘class’ in p₁ is not semantically equivalent to ‘kind’ in p₂. Studying p₂ would take us into the realm of dogmatic ontology, a region which has been explored for centuries by some of the best thinkers ever. Instead, we shall restrict to the humbler limits of p₁. We shall try to shed some light on the way ‘natural’ and ‘class’ are used in this proposition.

Our point is that when we say that a classification is natural, what we are actually meaning is that any individual member of any of the classes that we have defined stands on its own as sign of its whole class. We call **semiotic naturalness** this property of some classifications which is pointed out in p₁. In particular, a classification is said to be semiotically natural when:

a) It induces a partition into *theworld out there*.

b) Any individual which is classified bears the distinctive signs of the class it belongs to.

This semiotic turn in the problem of natural classes is based on the fact that *any classification can be understood as the content of a semiotic system*. Given a classification, a system of signs can be readily constructed by simply linking any class to a distinctive mark. This procedure is always conventional, at least to some extent, but for a classification to be called natural the signs must be, using the terminology of Peirce, *indexes*. A good example of an index is the smell of vinegar. This distinctive odor is a sign of the presence of this substance which cannot be separated from it. Indexes work by contiguity.

In order to delve into the analysis of this type of naturalness, we have adapted the semiotic ideas of Louis Hjelmslev (1899-1965) to the study of the signs of Chemistry. We show that the concepts of denotation and connotation, which are central for Hjelmslev, provide a way to explain the gradation of naturalness which is implied in p₁. We argue that the more *efficient* (i.e., comprehensive, clear and distinct) a classification, the more natural it can be said to be, since it induces a more fundamental partition of the world. In semiotic terms, if a system of natural indexes...
can be connotatively reduced to another, then the latter can be said to be more natural. For example, we hold that the classification of material samples into chemical kinds (i.e., substances) is more natural than any domestic sorting of matter, like, for example, one including classes such as ‘vinegar’, ‘water’, ‘salt’ or ‘sugar’. Our point is that the daily classes always denote a chemical substance (or a mixture of them), while the converse is not always the case. Any quotidian classification can therefore be expressed in terms of chemical classes, but just a fistful of substances can be “explained” by means of ordinary material terms.
Limitations of natural kind talk for understanding scientific practice in the life sciences: homology and other cases

One of the central tasks of this workshop is in the light of Hacking’s (2007) criticisms to evaluate the relevance and informativeness of current natural kind concepts with respect to the task of understanding grouping practices in the life sciences. The measure of natural kind concepts in this respect is the degree to which they help represent and interpret these practices. What I want to do in this paper is detail particular cases where I think current talk about natural kinds, particularly essentialist talk in all its forms, has been counter-productive to this end. It has tended to force kind-thinking into certain preconceived patterns, leaving out or misconstruing the important elements of such reasoning in particular cases. I'll have a few brief things to say in this regard about various cases that have come up in this discussion, such as psychiatric disease concepts and species, but particularly focus on the attempt to apply natural kind talk to homology concepts. What these cases indicate is that if we want 'natural kinds' to be more informative about practice, they need be more closely tied to epistemic rather than ontological considerations. I'll suggest that a better approach is to reconceive natural kinds on a more methodological level as the kind elements of grouping strategies, which group particular elements of the world because these offer tactics of reasoning and inference, experimentation and modelling that are thought productive to goals of explaining, understanding and investigating particular phenomena. This follows on the work of Love (2009) with respect to typological reasoning in biology.
Natural kinds in evolutionary/developmental biology

Evolutionary developmental biologists categorize many different kinds of things, including ontogenetic stages, embryonic anlagen, and modules of gene activity. The process of categorization - the establishment of ‘kinds’ - is an implicit part of describing the natural world in consistent, useful ways, and has an essentially practical rather than philosophical basis. Since the questions scientists ask are concerned with real things (elements of ‘Nature’ as such), abstract classifications that bear no relation whatsoever to Nature are not likely to be helpful. Beyond the minimal requirement that classifications reflect biological reality, what sorts of kinds or classification will be useful in advancing a research program depends on the epistemological context. Thus, the important meaning of ‘natural’ in ‘natural kinds’ is not ‘natural with respect to nature,’ but ‘natural with respect to the question.’ This conclusion arises from the recognition that the proper role of concepts (e.g. natural kind, module, homology, model) is not to answer biological questions, but rather to help frame them: in Brigandt’s terms, philosophy can ‘organize the agenda’ for scientific research. From a scientist’s perspective, arguing about the wording (or existence) of a single definition of ‘natural,’ or ‘kind,’ is beside the point: we get more work done by letting the question at hand determine what kinds of kinds are ‘natural,’ on the basis of their ability to help answer it. We should be content to let ‘natural kinds’ remain vague, multivalent, and - therefore - broadly useful. For a philosopher like Hacking, the diverse, disparate, and ultimately incommensurable uses of the term ‘natural kind’ have diluted its value so far that it loses all meaning. For practicing scientists, however, defining useful kinds in the context of particular questions and systems remains a productive epistemological strategy.
Is life a natural kind?

There is no generally accepted definition of life. In fact, a number of biologists don’t think that providing a definition of life is a useful or even possible task for Biology. At the most, they admit the contextual interest in having a list of characteristics usually –but not always– found in the living beings. Those characteristics aren’t considered, then, necessary and sufficient conditions for life. Apparently, the conclusion to be drawn is that life is not to be characterized by means of necessary and sufficient properties, that is, life is not a natural kind (cf. Cleland & Chyba 2002, Machery 2011). But, then, we have four main alternative possibilities:

1. ‘Life’ is a *folk concept* that designates not a thing, but several disparate things.
2. Life is a *conventional kind*.
3. Life is an *individual*. (Analogy with biological species).
4. Life is a natural kind, but in the sense of a *homeostatic properties cluster*.

All these possibilities will be discussed.
Deep and superficial similarity amongst cellular kinds

Talk of different types of cells is commonplace in the biological sciences. We know a great deal, for example, about human muscle cells by studying the same type of cells in mice. Information about cell type is apparently largely projectible across species boundaries. But what defines cell type? Do cells come pre-packaged into different natural kinds? Philosophical attention to these questions has been extremely limited (see, e.g., Wilson 1999 and Wilson, Barker, and Brigandt 2007). On the face of it, the problems we face in individuating cellular kinds resemble those biologists and philosophers of biology encountered in thinking about species: there are apparently many different (and interconnected) bases on which we might legitimately classify cells. We could, for example, focus on their developmental history (a sort of analogue to a species' evolutionary history); or we might divide on the basis of certain structural features, functional role, location within larger systems, and so on. In this paper, I will sketch an approach to cellular kinds inspired by Boyd’s homeostatic property cluster theory, applying some lessons from this application back to general questions about the nature of natural kinds.
Beyond semantics: stipulation and essentialism regarding natural kinds

In a series of papers, LaPorte (1998, 2004, 2010) criticises the traditional semantic view – i.e., the Kripke-Putnam framework – of natural kind terms. Contrary to this view, he argues that usually, statements about kind’s essences are stipulated to be true and not discovered to be true. He also defends that scientists modify the meaning of kind terms by stipulatively deciding how to use vernacular kind terms when science develops. Responding to LaPorte, Bird (2007, 2010) argues that there is less scope for stipulation and conceptual change concerning the use or application of our vernacular kind terms than LaPorte suggests. The determination of the (proper) use of natural kind terms is only due to a posteriori discoveries of kind essences. In this work, I claim that both positions are not fully incompatible. I defend that most of their disagreements rely in the fact that they consider different notions of natural kind. Considering LaPorte and Bird’s positions I sketch an alternative approach which supports a broader conception of natural kinds. This approach takes the thesis of accommodation as a starting point to establish some epistemic criteria to decide the relevance and interest of particular kinds. This strategy has been championed by authors like Boyd (1999), who’s HPC theory can be seen as a way to get an appropriate formulation of natural kinds for Biology. I explain why this strategy fits better the use of natural kinds in scientific and natural language, and, contrary to influent opinions of some authors, for instance Hacking (2007), it allows us to be optimistic about the usefulness of natural kinds for scientific practice and thinking.
Natural kinds group entities according to relevant similarities, (which are sometimes) explained according to a shared essence, which (sometimes) provides a causal grounding for observed properties. In contrast, artificial kinds fail to provide such grounding, or are found to be heterogeneous, or are artefacts caused by unwanted biases. For many authors, an essentialist approach cannot fully grasp the ontology of biological evolving entities (such as species), which are (logical) individuals and not classes. Thus, one of the problems underlying this debate is the role of descriptions and explanations in science: Although Quine considered natural kinds as adaptations and not scientific ontologies (that required specifying microstructures), and Hacking in a similar vain held that natural kinds were tools for agents and artisans and not for spectators or theorisers, the defence of natural kinds in science is currently linked to their value for scientific explanations or theories.

Boyd’s *homeostatic property cluster kinds* (HPC kinds) are a conceptual device to legitimise scientific categories without having to appeal to essences. Instead, a disjunctive cluster of properties plus a homeostatic mechanism that glues them together defines an exemplar particular (according to empirical observations of causal relations), and in relation to it a kind can be generalised (in a realist manner). As a consequence, HPC kinds intend to be tools that can generically characterise all scientific ontologies (unlike Hacking’s opinion that different kinds of kinds need to be distinguished or Dupré’s arguments in favour of different kinds of ontologies for the different scientific biological disciplines).

The aim of my paper is to explore whether a monism on kinds (based on HPC kinds) can be assumed in biology or whether the need for an ontological pluralism persists. I use the example of biological kinds of individuals such as organisms. While most arguments against natural kinds coming from evolutionary biology fail to take into account the material generative causes underlying the properties of living entities, which can be called internal, the external genealogical and ecological dimensions of living entities are also important for the descriptive or explanatory purposes of some biological fields, and the different demands may not always be compatible. My argument is that the complexity of the notion of organism requires to take into account generative, genealogical and ecological types of causes, and therefore they sometimes cannot be characterised exclusively as HPC kinds, instead at least for some purposes the appeal to spatiotemporally localised external causes is required.
Species, history and identity: Construing kinds without essences

This paper defends the thesis that species are spatiotemporally located individuals (complex wholes) that also instantiate an HPC natural kind. Species may form open or closed genetic systems that are dynamic in nature, that have fuzzy boundaries due to the processual nature of speciation, that may have leaky boundaries as is manifest in lateral gene transfer, that may be of multiple origins through hybridization, and that may split and merge and split again over time. The diverse biology manifest in species of all forms of life, from bacterium to human, requires either a pluralism about species concepts, or a pluralism about metaphysical categories, i.e., a pluralism about natural kinds. The identity conditions of species qua individuals will have to be anchored in their history, rather than in their unique evolutionary origin. Species qua historically conditioned HPC natural kinds requires the kind to be mereologically structured, subject to the part-whole relation rather than the membership relation. This implies that there can be more than one kind of natural kinds. The thesis is that the individuals that constitute the parts of a species-individual also form a mereological aggregate that instantiates an HPC natural kind.
Natural kinds of freaks of nature in biological taxonomy: The case of phylogenetics

To discuss the relevance of natural kinds from a biological point of view, we will ask ourselves what is it that cladograms represent: are they meant to represent natural kinds and if they do, on what sense? Or are they representations of a fruitful theory that has generated a lot of important research but that has nothing to do with anything we might call natural kind. Based on a previous discussion by Laporte, we will say that cladograms do not represent natural kinds. Basically, we will argue that cladograms are constructed on a series of idealizations that include not only the theoretical assumptions of cladism itself but also, those idealizations behind Bayesian networks, to date, the most popular tool for the construction of cladograms. On this basis, phylogenetic relations between species and the taxa they belong to are necessary true only in the sense that they are true exactly on those possible worlds where cladistics and bayesianism hold (this would amount to say that Laporte’s essentialism is practically trivial). Different form Laporte, who defends a sort of moderate essentialism, we admit that maybe there is such thing as essences for living beings but that we do not know whether these are captured by contemporary scientific research. Instead what we have are relevant kinds in the sense of authors such as Hacking or Dupré. This relevant class has bestowed empirical research with numerous epistemic virtues and as such has generated an important scientific corpus but may have no relation to the notion of natural class. Our conclusions show that perhaps the concept of a natural kind (and even that of possible world) is not necessary for scientific practice because for a kind, any sort of kind, to be relevant, it has to include the epistemic, heuristic and epistemic virtues necessary for successful scientific practice independently of its metaphysical status.
Issues on identity and change in biological species

Contemporary philosophers of Biology tend to favour an Evolutionary Concept of Species as the one that is actually required in the evolutionary framework dominant in Biology in a Post-darwinian era. Since the benefits of such concept have to do with the dynamic character of species, philosophers of Biology have considered species as individuals to account for their role as units of evolution (Ghiselin1997, Hull 1989) and have highlighted the bidimensionaltemporal character of species as dyachronic and as synchronic entities (Reydon2008, Richards 2010). This paper aims at exploring the sense in which biological species can be considered to be dynamical entities in the framework of the contemporary metaphysical theories of change and persistence through time. The strategy of the paper is to address some of the standard problems raised by those metaphysical theories and apply them to the case of biological species, taking also into account the similarities and differences between the dynamics of species-individuals and organism-individuals.

References