

# ***THIRD BORDEAUX-BASQUE COUNTRY WORKSHOP ON PHILOSOPHY OF BIOLOGY***

## **Abstracts**

### **Animal body complexity and the evolution of cognition**

**Argyris Arnellos**

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Animals and their relation to a macroscopic environment composed of various media available for locomotion and recognizable objects are central to cognition. I claim that neither animals as freely moving multicellular (MC) organizations nor the macroscopic environment in which they act can be taken as a self-evident starting-point for the evolution of cognition. I argue that acquiring the fundamental sensorimotor features of the animal body may be better explained as a consequence of dealing with internal bodily—rather than environmental complexity. Specifically, I will discuss how an epithelial organization and its properties can be cast as the key enabling factor for the emergence and evolution of the animal sensorimotor interaction, and how a focus on the epithelial organization integrates animal sensing and moving with the physiology and development of its MC body; all essential features of the organizational basis of animal cognition.

### **The Immune Homeostasis Program**

**Lynn Chiu**

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The concept of immune homeostasis is foundational to immunology and neuroimmunology. Gerard Eberl, for instance, stated that one of the three core principle of immunology is the regulation of pro-inflammatory forces with anti-inflammatory forces to maintain homeostasis. Set-point models are at the heart of neuroimmunendocrine-modulated energy balance.

This talk presents the first exploratory step towards a new project in philosophy of neuroimmunology. In this project, we ask the following question: do homeostasis arguments commit an "ad-hockery" problem, much like adaptationist arguments in evolutionary biology (Gould and Lewontin 1979), by assuming that all immune functions are meant to achieve homeostasis at one level or another? Are alternatives to homeostatic hypotheses tested, or are all phenomena measured and explained in ways that fit a homeostatic ideal?

In this talk, I give a brief survey of the way "homeostasis" is used and defined in immunology and neuroimmunology, and try to sketch out a "homeostasis program." Modeling my questions in the style of Gould and Lewontin, I try to identify cases of adhocery argumentative strategies such as: (1) if one homeostasis argument fails, try another, (2) if one fails, assume that another must exist, (3) in the absence of a good homeostasis argument, attribute failure to epistemological gaps, (4) emphasize homeostatic function over other explanations, so on. I will test whether core papers on immune homeostasis reveal empirical, explanatory, and methodological dimensions of a homeostasis program (Godfrey-Smith 2001, Lewens 2009).

### **Can Metabolic Interaction Patterns Evolve? A Comment on Doolittle and Booth's account of Holobiont-level Individuality**

**Antoine C. Doussault**

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In their article “It’s the song, not the singer”, Doolittle and Booth (2017) elaborate an innovative way to meet the challenge of formulating an evolution-based account of the purported individuality holobionts. Their proposal is articulated around the idea that, although holobionts themselves—which they compare to singers, or more adequately to singers bands—are *not* evolutionary individuals, the interaction structures manifested by their interrelated activities—which they compare to (polyphonic) songs—are comparable to *extended replicators* (Sterelny, Smith, and Dickison 1996). Those extended replicators recur through a process of ecological assembly, in which functionally equivalent species or strains come to occupy similar niches in the holobiont ecosystem. With this picture of recurrence through niche refilling, Doolittle and Booth aim to reconcile two seemingly incompatible ideas:

- 1) That holobionts form patterns of metabolic interactions which recur at the level of their functional configuration but not at that of their taxonomic composition; and
- 2) That future occurrences of a holobiont type can nevertheless inherit adaptations from past occurrences of the same holobiont type.

My presentation aims to assess Doolittle and Booth’s proposal and to highlight an important challenge that it faces. I will do so mainly through distinguishing two understandings of the notion of ecological niche and two associated modes of functional classification developed in functional ecology (Leibold 1995; Lavelle and Garnier 2002; Blondel 2003). Those distinction, I will argue, indicate that recurrence through niche refilling is not a kind of biological recurrence on which natural selection is likely to operate.

## References

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- Lavelle, S., and E. Garnier. 2002. “Predicting Changes in Community Composition and Ecosystem Functioning from Plant Traits: Revisiting the Holy Grail.” *Functional Ecology* 16 (5):545–56. <https://doi.org/10.1046/j.1365-2435.2002.00664.x>.
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## Philosophy of/in stem cell biology

**Lucie Laplane**

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## Functional Integration in the Endosymbiotic Origin of Mitochondria

**Guglielmo Militello**

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Functional integration is broadly defined in life sciences as the causal interdependence among the subsystems forming an organism. However, this characterisation is vague and not able to describe the different degrees of functional integration in living beings. From an organizational perspective, functional integration is interpreted as the mutual dependence of the constitutive constraints that collectively maintain the whole organisation. This talk aims to investigate how the endosymbiotic relationship between the proto-mitochondrion and a proto-

eukaryotic cell led to a functional redefinition of both biological organisms which contributed significantly to a more integrated biological organization. The functional redefinition of bioenergetic systems will be examined, because it seems to have played a pivotal role in the emergence of a more functionally integrated organization of the eukaryotic cell. It will be argued that the concept of 'functional integration' is intimately connected with those of 'biological novelty' and 'biological individuality'.

## **Importance of mobility in the immune system: aging as a potential example**

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Although aging seems obvious to any of us, the biological mechanisms underpinning it are yet elusive. More than aiming at an increase in longevity, the question asked merely relies on how to mimic the fate of centenarians in humans, who age but without a series of associated states of diseases such as metabolic diseases, cancer, auto-immunity, brain damaged or cardiovascular diseases (collectively called co-morbidities) where in all these situations the immune system plays a large role.

After having described the features of the aging immune system and exposed the believed causes for it, we propose a new mechanistic hypothesis based on importance of organizing space in biology including mobility. This organizational 3D view of life on our planet also includes the mobility of the cells comprising the so called "immune system" into an organism. Using examples from the medicine or fundamental research, we would like to suggest that through the unicellular/multicellular transition, the extracellular matrix embedding all cells constituting tissues, organs and metazoans, plays a major role in that spatial organisation. His well-documented modifications correlative of aging should therefore be taken into consideration for explaining the aging process and its co-morbidities.

## **Building up alliances between citizen science, arts, philosophy of science, experimental & theoretical biology**

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We will share recent experiences of workshops that try to foster fruitful connections between various research methodologies questioning key conceptual issues in life science. We present ways to extend this network of connections to participatory research with citizens and to art-science interactions. We will present how this can be generative of renewed concepts for basic research. We will open the discussion with participants about future directions for these unusual alliances.