### Francesca Bellazi

### **Biochemical Kinds**

Are biochemical molecules biochemical kinds? Is there something specific about being a biochemical kind or biochemical molecules just instantiate either chemical or biological kinds? In this talk, I will address these questions arguing in favour of the existence of natural biochemical kinds. I will do so by arguing that biochemical kinds respect some requirements for genuine kindhood, as expressed by Khalidi (2013). The structure of the talk will be the following. First, I will present the status of the controversy concerning biochemical kinds. Then, I will introduce the relevant account of a natural kind. Specifically, natural kinds are projectable categories in our best scientific theories and they represent nodes in the causal network of the world (as in Khalidi 2013). I will then consider which accounts of natural kindhood are mostly applied in chemistry and biology and why they do not seem to be suitable on their own for biochemical kinds. As will follow, biochemical kinds present some specific core properties: presenting a chemical structure, having a given biochemical function in a biological context and a form of evolutionary history in being or having been biosynthesised. I will show that these two properties are related and respect the criterion of natural kindhood aforementioned, supporting my argument with vitamin B12. At last, I will consider how this approach can inform debates in taxonomy.

### **Nicholas Emmerson**

It ain't that deep: Metaphysics and the Problem of Progress

I motivate and defend a novel, unifying account of progress across science and metaphysics. On my account, progress is made when scientists and metaphysicians provide explanations of increasing depth. Crucially, I argue that this notion of progress allows us to characterise *correspondence*, the sense in which scientific and metaphysical theories retain the explanatory power of their predecessors.

### **Alexander Franklin**

How the Universe Plays Dice: Emergent Probabilities in Physics

Chances (or physical probabilities) play essential roles in much of modern physics at various different ontological levels. And yet it is still controversial how conflicts between such chances can be avoided. By developing the framework in Hoefer (2019) I propose a novel resolution of this issue. I examine two consequences of this approach: against the use of initial condition probabilities in physical explanations; and in favour of a chancy reading of the many worlds interpretation of quantum mechanics.

# **Toby Friend**

The Determinable World Hypothesis

Abstract: I explore the hypothesis that maximally determinable quantity variables are more fundamental than their corresponding maximally determinate values. I suggest this view has a number of motivations over a more traditional view that determinable properties are either less fundamental or only as fundamental as their corresponding maximal determinates. I then

address the question of how the world could come to have any determinacy if the hypothesis is true. To answer this I pursue at length the idea that laws of nature are of central relevance.

# Joaquim Giannotti

Strong Emergence and Weak Fundamentality

Some views take strongly emergent entities to be fundamental yet dependent. Can grounding improve our understanding of these approaches? I explore this question by discussing the view that strongly emergent facts are weakly fundamental: they are partially grounded but lack full grounds. This original view offers a unified approach to the fundamentality and dependence at play in instances of strong emergence. However, I argue that its tenability is yet to be established. Two unresolved problems concerning the exact relationship between a strongly emergent fact and the facts that ground it imperil this approach.

## **Michael Towsen Hicks**

Agency Considerations in Natural Modality

Do facts about agents enter into explanations involving natural laws, and, if so, how? In this paper I argue that features of agents enter into explanations involving laws, counterfactuals, and causation. But they do not directly explain causal facts, nor do they directly explain which facts are laws or which counterfactuals hold. Rather, they enter into a higher order explanation of these facts: they explain the facts that explain these facts. I argue that this provides one avenue for proponents of pragmatic views about laws to resist the slide into subjectivity. I further argue that considerations of higher-order explanation can shed light on the relationship between difference making accounts of explanation and unification accounts: higher-order difference makers unify.

### Samuel Kimpton-Nye

Modal Anti-Realism: The Really Poisoned Pawn

Thoroughgoing modal anti-realism is unachievable. In fact, anti-realism cannot even curtail real modality because anti-realism about a given necessity implies realism about a corresponding possibility and vice versa (or so I'll argue), and this undermines the original motivation for modal anti-realism. I do, however, think that there are some interesting avenues of response for the modal anti-realist. One option is to put their tools to work in figuring out where to draw the line between real necessity and real contingency and hence to offer modal-anti realism as a modal epistemology. Another option is to embrace the mind-independent necessity of all truths and then supplement this with an anti-realist story about contingency. The motivation for this is that there is some reason to think that contingency, but not necessity, is ontologically committing and epistemically problematic in a way that should offend against modal anti-realist sensibilities.

### Will Morgan

Does Reduction entail Identity?

According to a popular understanding of reduction in the philosophy of science, reduction entails identity. I argue that this understanding of reduction is committed to two controversial

metaphysical theses: a version of Mereological Essentialism, according to which reducible objects have their parts essentially, and Unrestricted Composition, according to which for any things, there is something that they compose. Whilst these theses are controversial inside and outside of science, I argue that they are especially controversial for biology and the philosophy of biology, in particular, for debates about the nature of organisms. The upshot is that to avoid being committed to these controversial theses, reductionists must either take reducible wholes to be distinct from their parts, or they must be eliminativists about reducible wholes.

### **David Papineau**

## What Causal Inference tells us about Causation

Causal inferences techniques allow non-experimental scientists to infer causal influences from pattens of conditional and unconditional correlation. I shall show how this points us to an analysis of causation that happily accounts for counterfactuals, actual causation and the relevance of causes to action.

### **Katie Robertson**

The emergence of statistical mechanical probabilities from entanglement

The standard story says that we introduce probabilities in statistical mechanics because we are ignorant of the microdetails. In this talk, I argue that the source of probabilities is quantum mechanics, rather than ignorance; molecules in a gas are not behaving like billiard balls. Instead, they are entangled, and this will prove to be the source of probabilities.

### Jonathan Schaffer

### **Ground Physicalism**

I articulate a ground-theoretic approach to inter-level metaphysics, and clarify respects in which the approach is physicalist as well as respects in which it may not be.

### Vanessa Seifert

# Molecules as Quantum Objects

Molecules are central to science. Yet when it comes to describing them quantum mechanically, there is no specific structure assigned to them from first principles. Various responses have been offered to this, including that this is evidence of strong emergence and anti-reductionism (Hendry and Needham 2007). A more recent reply by Franklin and Seifert (2020) has focused on the role of the measurement problem to understanding the structure of molecules. In this talk, I explore the implications of their response to our metaphysical understanding of molecules. I show that under certain interpretations of quantum mechanics it would be mistaken to assume that molecules exhibit any of the properties standardly postulated by chemistry. To spell this out, I evaluate two alternative metaphysical views of structure; the dispositional and the relational view. On the dispositional view, isolated molecules maintain their structure but only as dispositions. On the relational view, structure is understood as a property that comes about only in relation to some environment or

interaction. Both views revise radically how chemical properties are understood vis-a-vis their physical basis.

## Tuomas Tahko

Making Reductionism True

When one higher-level phenomenon is ontologically reduced to some lower-level phenomena, what does this entail about the ontological status of the phenomenon being reduced? For instance, if composed entities are reducible to their components, then does this mean that the composed entities do not exist? And if so, how can we continue referring to the reduced higher-level phenomenon in our talk and theories? There are two popular strategies used to regiment reduction: grounding and truthmaking. I will examine these strategies and propose that ontological reductionism is best formulated in terms of minimal truthmakers. I will then put this strategy to use in a case study at the biology-chemistry interface.

## Naomi Thompson

How (and why) to be an Antirealist about Metaphysical Explanation

This paper distinguishes different things we might have in mind when we talk about (metaphysical) explanation, and discusses what it might take to count as an antirealist on each conception.

### Alastair Wilson

Metaphysical Emergence as Higher-level Naturalness

I explore an approach to metaphysical emergence which works by distinguishing between fundamentality and (perfect) naturalness and endorsing the thesis that there are (perfectly) natural properties at non-fundamental levels. I take as my starting point Elizabeth Barnes's proposal to characterize the emergent as fundamental but dependent, criticizing it on the ground that it undermines the theoretical work we need fundamentality to do. However, I think Barnes is on the right track: emergence is linked to a selective metaphysical privileging of higher-level subject-matters. I suggest an alternative account of the metaphysically emergent as non-fundamental but (perfectly) natural, and show how this suggestion can be implemented in a simple subject-matter-based framework.