Symmetry workshop – 1ˢᵗ June 2023, online

Organised by Valeriya Chasova *(CEFISES, UCLouvain / AHP-PReST, UniStra).*
Practical details communicated upon registering by email for those who they have not been promised beforehand.

Time zones with respect to UTC: California PDT(-8+1) / Great Lakes EDT(-5+1) / British Isles WEST(0+1) / Central Europe CEST(+1+1).
In case of time discrepancies (errors) in the programme the time in Austria is decisive.

Programme

05/08/13/14h00 **Jill North** (Rutgers University), ***On the Idea of Perspicuous Representations (and Symmetries)*** *- Respondent:* **Sebastian De Haro** (UvA)

06/09/14/15h00 **Alison Fernandes** (TCD), ***How to Explain the Direction of Time*** *- Respondent:* **Cristian López** (University of Lausanne)

07/10/15/16h00 *Break 15 min.*

07/10/15/16h15 **David Baker** (University of Michigan), ***The Epiphenomena Argument for Symmetry-to-Reality Inference*** *- Respondent:* **David Wallace** (University of Pittsburgh)

08/11/16/17h15 *Break 45 min.*

09/12/17/18h00 **David Wallace** (University of Pittsburgh), ***Observability, Redundancy and Modality for Dynamical Symmetry Transformations*** *- Respondent:* **Valeriya Chasova** (CEFISES, UCLouvain / AHP-PReST, UniStra)

10/13/18/19h00 **Valeriya Chasova** (CEFISES, UCLouvain / AHP-PReST, UniStra), ***Observable Diffeomorphisms (or, How to Limit the Hole Argument and Extend Direct Empirical Status)*** *- Respondent:* **John Dougherty** (MCMP, LMU Munich)

11/14/19/20h00 *Break 15 min.*

11/14/19/20h15 **JB Manchak** (UCI) (*joint work with Thomas Barrett, Hans Halvorson, and Jim Weatherall*), ***A Hierarchy of Spacetime Symmetries: Holes to Heraclitus*** *- Respondent:* **Bryan Roberts** (LSE)

12/15/20/21h15 *End*

Jill North, *On the Idea of Perspicuous Representations (and Symmetries)*

There are in general many different ways of representing something. Some of these ways can be better or more perspicuous than others. I argue that perspicuous representations are such not for pragmatic or subjective reasons, but for objective, intrinsic ones. For example, one way for a representation to be more perspicuous is for it to more directly represent the symmetries of the entity being represented. One consequence I will discuss: there is an interesting sense in which representations or theoretical formulations differing (only) in their level of perspicuity can be regarded as inequivalent.

Alison Fernandes, *How to Explain the Direction of Time*

Reichenbach explains the direction of time and other temporal asymmetries using entropy and 'branch structure'. There is a direction of time because our universe is currently on a long entropic upgrade, and subsystems branch off and become quasi- isolated. This direction is manifest to us in a range of features, including an asymmetry of records. Reichenbach's explanation of the record asymmetry has been criticised for its reliance on entropy. More generally, Reichenbach's approach has been neglected in favour of those that appeal to a particular low entropy initial state (the Past Hypothesis). I argue that this neglect is unwarranted. Reichenbach's approach has important advantages: it correctly identifies the difference-maker that accounts for temporal asymmetries, it considers the conditions required for asymmetries to be manifest, and it identifies a local inferential mechanism that applies towards the past and not towards the future. While Reichenbach's account needs to be supplemented in various ways, it provides a better starting point than alternatives for understanding the necessary conditions for a direction of time and its manifestation.

David Baker, *The Epiphenomena Argument for Symmetry-to-Reality Inference*

A new argument is given for the thesis that only symmetry-invariant physical quantities are real. Non-invariant quantities are dynamically epiphenomenal in that they have no effect on the evolution of invariant quantities, and it is a significant theoretical vice to posit epiphenomenal quantities. This view fits within the more general "redundancy" approach to symmetry and equivalence; I answer objections to that approach raised by Dasgupta.

David Wallace, *Observability, Redundancy and Modality for Dynamical Symmetry Transformations*

I provide a fairly systematic analysis of when quantities that are variant under a dynamical symmetry transformation should be regarded as unobservable, or redundant, or unreal; of when models related by a dynamical symmetry transformation represent the same state of affairs; and of when mathematical structure that is variant under a dynamical symmetry transformation should be regarded as surplus. In most of these cases the answer is 'it depends': depends, that is, on the details of the symmetry in question. A central feature of the analysis is that in order to draw any of these conclusions for a dynamical symmetry it needs to be understood in terms of its possible extensions to other physical systems, in particular to measurement devices. (A connection of this to subsystem-recursivity is also briefly discussed.)

Valeriya Chasova, *Observable Diffeomorphisms (or, How to Limit the Hole Argument and Extend Direct Empirical Status)*

According to the hole argument, theoretical diffeomorphism symmetries are superfluous. According to some studies of direct empirical status (DES), they are not. I reconcile the two by showing that they apply to different kinds of symmetries. I tell which kinds these are more precisely, construct using them the first ever explicit demonstration of DES for theoretical diffeomorphism symmetries, and explain how to go beyond these kinds to further contexts yielding DES. My analysis amounts to a rather radical revision of traditional views on the ontology of theoretical symmetries and on DES.

JB Manchak (joint work with Thomas Barrett, Hans Halvorson, and Jim Weatherall), *A Hierarchy of Spacetime Symmetries: Holes to Heraclitus*

We present a hierarchy of symmetry conditions within the context of general relativity. The weakest condition captures a sense in which spacetime is free of symmetry "holes" of a certain type. All standard models of general relativity satisfy the condition but we show that violations can occur if the Hausdorff assumption is dropped. On the other extreme, the strongest condition of the hierarchy is satisfied whenever a model is completely devoid of symmetries. In these "Heraclitus spacetimes," no pair of distinct points can be mapped (even locally) into one another. We prove that such spacetimes exist and show a sense in which Heraclitus spacetimes are completely determined by their local properties. We close with a brief comment on the extendibility properties of the various symmetry conditions.