Workshop on the Foundations of Gauge Theories
University of California, Irvine
21 – 23 March 2014

List of Abstracts

"Three Positions on Gauge"
Chris Smeenk
Department of Philosophy
University of Western Ontario

This talk aims to provide an overview of recent work on gauge symmetry among philosophers of physics, by discussing the strengths and weaknesses of three different positions: the *fundamentalist*, who identifies gauge symmetry as a fundamental feature of our best quantum field theories, with a status comparable to spacetime symmetries; the *eliminativist*, who holds that gauge symmetry represents mere descriptive redundancy or excess structure, whose elimination clarifies interpretational issues; and the *pragmatist*, who regards gauge symmetry as a useful heuristic or a crucial aid to quantization. One overall theme of the discussion will be the extent to which the evaluation of these positions depends on open issues in mathematical physics.

"Introduction to Symmetry as a Guide to Superfluous Structure"
Jenann Ismael
Department of Philosophy
University of Arizona

One of the most powerful methods for zeroing in on the physical structure underlying a body of data uses symmetries as guides to the identification of excess structure. The guiding idea of the method is that regularity of the right kind is a sign of redundancy in the mathematical representation rather than relations between physically distinct entities, quantities, or situations. This talk will be an introduction laying bare the logical structure of the method and the reasoning behind it. Some of the delicacies of deploying it will be introduced, and we will look at the physical assumptions underlying its application.

"New Thoughts on Yang-Mills Theories"
Richard Healey
Department of Philosophy
University of Arizona

Carlos Rovelli and David Wallace have each recently made interesting proposals on the significance of gauge theories. These prompt a reassessment of the interpretation of classical Yang-Mills theories I offered in my 2007 book *Gauging What's Real*. After sketching their proposals I'll share some initial thoughts on how they bear on that interpretation.

"Symmetry, Infinity, and Redundancy"
Gordon Belot
Department of Philosophy
University of Michigan

A distinction is commonly made between physical symmetries and gauge symmetries: the former can be thought of as relating descriptions of distinct (but closely related) situations, the latter should be thought of as always relating two descriptions of the same situation, and so as corresponding to a redundancy in the apparatus of the corresponding theory. Some theories feature both kinds of symmetry. We will look at some cases of this kind—general relativity and Yang-Mills-style theories involving different sorts of asymptotic boundary conditions—and at some puzzles that they raise.

"Global symmetry in algebraic QFT: DHR theory and ramifications"
Michael Mueger
Institute for Mathematics, Astrophysics, and Particle Physics
Radboud University Nijmegen

We will define global symmetries in AQFT and use them to motivate the superselection theory of Doplicher, Haag, and Roberts. Then the Doplicher-Roberts reconstruction result will be discussed. I will argue that the latter, supplemented with some lesser known results, amounts to a Galois theory for AQFTs and will briefly state my views of its physical relevance. I will close by briefly considering two ramifications of the original D(H)R theory: The lower dimensional situation, where one encounters braided categories, and the theory of Buchholz and Fredenhagen, where weaker localization is considered.