Workshop

Non-Empirical Theory Assessment: how far does it reach and where could it stumble?

Time. June 6th to June 7th
Location: Minerva room in the Gula Villan (yellow house) on the Stockholm University Campus (behind the Södra Huset), Stockholm.

General Description:

It is widely acknowledged that non-empirical theory assessment plays some role in determining the status of scientific theories in physics and beyond. There is much disagreement, however, on the evaluation of this fact. Does the increasing reliance on non-empirical assessment in fundamental physics reflect a productive empowering of theoretical reasoning or does it indicate an act of desperation in the absence of empirically testable hypotheses? This core question is related to a number of more specific conceptual issues. Are there any promising strategies for evaluating the epistemic status of non-empirical theory assessment? Under which conditions does non-empirical theory assessment amount to significant confirmation? How flexible can scientists be when selecting the toolbox of non-empirical assessment? What is its scope? What are the core conceptual problems of the approach? How seriously do those problems constrain the relevance of the approach? To what extent can those problems be solved or held in check? The present workshop takes an in depth look at those issues and aims to provide incentives and directions for further research on the topic.

Participants:

Elena Castellani (Florence)
Cristin Chall (Bonn and South Carolina)
Karen Crowther (Geneva)
Radin Dardashti (Wuppertal)
Richard Dawid (Stockholm)
Stephan Hartmann (Munich)
Casey McCoy (Stockholm)
Tushar Menon (Oxford)
Martin Sahlén (Uppsala)
Karim Thèbault (Bristol)

Contact:

Richard Dawid (richard.dawid@philosophy.su.se)
Casey McCoy (Casey.mccoy@philosophy.su.se)

Schedule:

Day 1: June 6 2019

9.30- 9.45:	opening words	
9.45-10.45:	Casey McCoy	Non-Empirical Theory Assessment of Inflationary Cosmology
11.00-12.00:	Tushar Menon	On the Viability of the No Alternatives Argument
12.15-13.15:	Richard Dawid	The General Role of Meta-Empirical Theory Assessment
13.15-14.45:	lunch	
14.45-15.45	Cristin Chall	String Theory, Lakatos, and Laudan
16.00- 17.00	Radin Dardashti	What is this Thing Called Theory Space?
17.15- 18.45	discussion	
19.30	dinner	

Day 2: June 7 2019

9.30-10.30:	Karen Crowther	What We Cannot learn From Analogue Experiments
10.45-11.45:	Karim Thebault	On the Limits of Theory Confirmation
12.00-13.00:	Elena Castellani	Convergence, Unification, Robustness
13.00-14.30:	lunch	
14.30-15.30	Stephan Hartmann	Anomalies and Non-Empirical Theory Assessment
15.45- 16.45	Martin Sahlén	Assessing the Universe
17.00- 18.30	discussion	

Abstracts:

Elena Castellani (Florence)

Title: Convergence, unification, robustness

Abstract: the talk focuses on the differences/similarities of these notions with respect to their use in theory assessment, in the light of some case studies.

Cristin Chall (SouthCarolina /Bonn)

Title: String Theory, Lakatos, and Laudan

Abstract: The perplexing status of string theory has prompted a philosophical assessment by Johansson and Matsubara, who emphasise a Lakatosian analysis. They determine that string theory is a degenerating research programme, but refrain from offering normative guidance for orienting ourselves towards string theory or its rivals. I propose to adjust Lakatos's research programmes to sharpen the this philosophical analysis and provide some normative guidance for approaching theories which have theoretical virtues, but lack experimental testability. My proposal is to incorporate Laudan's pragmatic problem-solving model into the Lakatosian framework, thereby replacing his notion of progressiveness. Doing so alleviates some of the criticisms levied against Lakatosian assessments. The merger presents the best of both worlds: it provides research programmes with normative force while retaining the useful degree of specificity in which the methodology operates. This new hybrid framework allows us to take initial steps towards a new assessment of string theory and other areas of non-empirical research.

Karen Crowther (Geneva)

Title: What we cannot learn from analogue experiments

Abstract: Analogue experiments have attracted interest for their potential to shed light on inaccessible domains. For instance, `dumb holes' in fluids and Bose-Einstein condensates, as analogues of black holes, have been promoted as means of confirming the existence of Hawking radiation in real black holes. We compare analogue experiments with other cases of experiment and simulation in physics. We argue---contra recent claims in the philosophical literature---that analogue experiments are not capable of confirming the existence of particular phenomena in inaccessible target systems.

Radin Dardashti (Wuppertal)

Title: What is this thing called theory space?

Abstract: The concept of theory space plays a crucial role in both empirical and non-empirical methods of theory assessment. It underlies Dawid's non-empirical methods of theory assessment as well as any discussion about scientific underdetermination more generally. But what is meant with "theory space" and what kind of knowledge can we obtain about it? Is what we may learn about it sufficient for its use in rational reconstructions? It is this divide between our practice-oriented knowledge about theory space and the formal role it purportedly plays in its application in empirical and non-empirical theory assessment that will be the focus of this talk.

Richard Dawid (Stockholm)

Title: The general role of Meta-Empirical Theory Assessment

Abstract: Meta-empirical theory assessment extracts information on theory space based on observations about the research process. While it was first proposed as a means of generating trust in suitable scientific theories that lacked empirical confirmation, it plays a more general role in the context of empirical confirmation. In the latter case, it is essential for assessing the reliability of new predictions extracted from empirically confirmed theories. Acknowledging this fundamental role of meta-empirical theory assessment casts new light on a number of long-standing debates in the philosophy of science. *Novel confirmation* can be viewed in terms of a specific mode of meta-empirical theory assessment that is only available for empirically confirmed theories. In the context of *IBE*, meta-empirical assessment provides the basis for controlling the best of a bad lot threat. Finally, in *Bayesian epistemology*, framing meta-empirical assessment in terms of Bayesian confirmation integrates the discovery of new alternative theories into a scheme of Bayesian updating in a coherent way.

Stephan Hartmann (MCMP/LMU Munich)

Title: Anomalies and Non-Empirical Theory Assessment

Abstract: In his famous work The Structure of Scientific Revolutions, Thomas S. Kuhn made a number of observations about anomalies and scientific revolutions which challenge a rational picture of science. Building on recent work in Bayesian Confirmation Theory and its application to non-empirical theory assessment, I show that most of these observations can be rationally explained.

Casey McCoy (Stockholm)

Title: Non-Empirical Theory Assessment of Inflationary Cosmology

Abstract: In this talk I will make a non-empirical theory assessment of inflationary cosmology. In particular, I will consider the no alternatives argument, the unexpected explanatory coherence argument, and the meta-inductive argument as applied to inflationary theory, with the aim of showing the degree of confirmation that is possible with these arguments in this context. Finally, I will make a comparison with my previous work on inflationary theory's alleged solution of fine-tuning problems of the big bang model.

Tushar Menon (Oxford)

Title: On the viability of the No Alternatives Argument

Abstract: If we cannot directly empirically test the claims of particular scientific theory, then it would be nice to have some other criteria with which to assess its viability. In his 2013 book, String Theory and the Scientific Method, Richard Dawid aims to develop such criteria, with an eye to vindicating research programs in disciplines where direct empirical data is scant or non-existent. In an accompanying paper, Dawid, Hartmann and Sprenger formalise Dawid's so-called 'No Alternatives Argument' (NAA) using a generalised Bayesian framework, as a first step towards formalising Dawid's entire research programme (which itself relies on two further arguments). In this talk, I argue that the formalisation of the NAA cannot play the central role in Dawid's programme as intended. This is based on the observation that not all confirmation is non-negligible confirmation. For Dawid's programme to be useful, it must demonstrate the viability not just of non-empirical theory confirmation, but of non-negligible non-empirical theory confirmation. I argue that Dawid et al.'s appeal to Bayesian confirmation theory to formalise his NAA cannot guarantee non-negligible confirmation. As a result, I conclude that if Dawid's overall project is to succeed, it must do so without the NAA formalised in this way.

Martin Sahlén (Uppsala)

Title: Assessing the Universe

The validity of applications of conventional statistical theory, e.g. Bayesian statistics, to questions concerning global properties of the observable Universe, or properties of the multiverse, is debatable. This could in principle affect conclusions in both parameter estimation and model selection, and makes the difference between empirical and non-empirical theory assessment unclear. At a fundamental level, we must address the fact that our modes of reasoning are instantiated within the Universe, and as such may be contingent upon its physical properties. I will address different approaches to these issues, and the potential implications for theory assessment of the Universe / multiverse as a whole.

Pete Evans (Queensland) & Karim Thébault (Bristol)

Title: On the Limits of Theory Confirmation

Abstract: Dawid (2019) appeals to the distinction between "conclusive confirmation" and "significant confirmation" to demarcate the respective limits of empirical and non-empirical modes of theory confirmation. He defines conclusive confirmation as the circumstances when the "theory has been established to be [empirically] viable in a given regime beyond reasonable doubt" (p. 105) and significant confirmation as the circumstances where there are "substantial probabilities for a theory's [empirical] viability" (p. 108). How should the crucial notion of "reasonable doubt" be characterised? In what circumstances can empirical evidence be strong enough to render any residual doubt unreasonable? Which distinctive features of non-empirical theory confirmation block conclusive confirmation? In this talk we will sketch some tentative answers to these questions drawing upon the Bayesian analysis of: i) conventional experiments; ii) analogue experiments (Dardashti, Hartmann, Thébault & Winsberg 2019); and iii) no-alternatives arguments (Dawid, Hartman & Sprenger 2015).

Dawid, Hartmann, & Sprenger, J. (2015). The no alternatives argument. The British Journal for the Philosophy of Science, 66(1), 213-234.

Dardashti, Hartmann, Thébault, & E. Winsberg (2019). Hawking radiation and analogue experiments: a Bayesian analysis
Studies in the History and Philosophy of Modern Physics
(forthcoming), http://philsci-archive.pitt.edu/15652/

Dawid (2019). The Significance of Non-Empirical Confirmation in Fundamental Physics in `Why Trust a Theory?', Dardashti, Dawid and Thébault (Eds.), CUP, 2019.
Hawking radiation and analogue experiments: a Bayesian analysis