Editors' Introduction

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This special issue is the fruit of a tree planted in the form of a workshop we organised at the Duesseldorf Centre for Logic and Philosophy of Science (University of Duesseldorf) in January 2014. The aim of the workshop was to bring together scholars who work on unification and on coherence in the hope of fostering research at the intersection of these two concepts. The reason for wanting to explore this intersection is our firm belief that unification and coherence are intimately related. At least some of the essays in this special issue make an effort to address the relation between the two concepts while others are content to discuss matters that fall under the purview of only one of them. We hope that the collection as a whole provides fertile ground for research into unification and coherence as well as their relations.

In their contribution, Schippers and Siebel examine a hitherto ignored topic in the debate over coherence measures. Traditionally, such measures have been exclusively concerned with gauging the coherence level of sets of consistent beliefs or propositions. But we all know that most actual sets of propositions or beliefs are inconsistent. And it seems reasonable to suppose that some such sets are more incoherent than others. Schippers and Siebel take up the task of assessing whether existing measures of coherence are able to estimate the level of coherence in sets of inconsistent propositions. Their assessment pits these measures against some test cases and associated intuitions we have about them. The initial comparison involves a list of eleven measures which eventually gets trimmed down to seven, namely the prior-posterior difference, prior-posterior ratio, counterfactual difference, counterfactual ratio, relative distance and factual support measures. Schippers and Siebel demonstrate that these seven do not fare well against the aforesaid test cases and associated intuitions. They trace the reason for this failure to the fact that many of the measures are not defined for sets of pair-wise inconsistent propositions. This suggests a way forward and Schippers and Siebel duly take it by putting forth four distinct proposals on how to modify these measures in order to improve their performance vis-à-vis the test cases and intuitions.

Schupbach's contribution concerns the relationship between measures of coherence and ceteris paribus clauses. The paper starts with a discussion of Bovens and Hartmann's (2003) well-known 'impossibility result'. This result presumably shows that one cannot have a probabilistic measure of coherence that establishes a coherence ordering and at the same time ensures that increasingly more coherent sets are, ceteris paribus, more likely to be true. If correct, the result entails that coherence is not truth-conducive. In an earlier pa-

per, Schupbach has sought to show that Bovens and Hartmann's result is incorrect by arguing that their proof rests on a very narrow conception of the ceteris paribus clause. To be precise, in that paper he proposes three constraints on ceteris paribus conditions, constraints whose satisfaction allows for the truth-conduciveness of coherence measures to be reinstated. In the current paper, Schupbach continues his defence of this viewpoint by, among other things, replying to some objections. One such objection is that the ceteris paribus conditions admissible under his constraints do not provide a plausible account of 'all else being equal'. Schupbach is unimpressed with this objection and argues that it falls apart once it is realised that it rests on the implausible supposition that degrees of coherence must remain fixed on those constraints. Indeed, he motivates the case for the contrary supposition. The essay concludes with a broader discussion of the principles that should guide the selection of ceteris paribus conditions.

Does the debate over how to properly construe coherence have anything to teach us about other important notions in the philosophical literature? In his contribution, Gijsbers considers precisely such an issue and in particular the question whether the debate over the notion of coherence can throw light on the debate over the notion of understanding. One way to motivate the analogy between the two is through some of the informal characterisations associated with each notion. It has been suggested, for example, that understanding is the process by which we see isolated facts as connected. Similarly, it has been suggested that coherence is the way beliefs are connected, or, to use a well-worn metaphor, 'hang together'. Taking this analogy as a departure point, Gijsbers sets about to inspect whether formal and, in particular, probabilistic measures of coherence can help us formulate a probabilistic measure of understanding. Although promising at first, he argues that modelling understanding purely after coherence measures ultimately fails. The problem is that such measures are incapable of capturing an important asymmetry inherent in understanding. That's not to say that no lessons can be drawn from this analogy whatsoever. Indeed, Gijsbers identifies four such lessons. Moreover, he argues that where the notion of coherence is unable to shed light on the notion of understanding, Schurz and Lambert's (1994) account of unification successfully steps in. Gijsbers ends his essay with a conjecture or hope, viz. a hybrid measure of understanding that utilises elements from both coherence and unification accounts holds more promise.

Gijsbers' essay provides a useful thematic bridge to the essay of Schurz. The latter takes a close look at the link between explanation, unification and causation. To be exact, Schurz investigates the apparent tension between two key ideas behind scientific explanation, namely that explanations carry causal information and that explanations unify. The tension disappears, he argues, once we recognise that causal, as opposed to non-causal, explanations yield an increase in unification. The rationale behind this claim is that our general theory of causality unifies statistical regularities that feature as premises in the explanation of causal claims involving single events. This theory, reasons Schurz, is none other than the theory of causal nets (TC). In more detail, it is argued that TC offers the best explanation of the ideas of 'screening off' and 'linking up' by axiomatising directed cause-effect relations. Rival explanations emanating from two other theories, namely occasionalism and the fork-asymmetry approach, are considered and dismissed as inadequate. The essay then turns to the question whether the TC explanation is capable of doing justice to fully deterministic target systems. This question is answered in the affirmative by appeal to the idea that our causal models are typically *pseudo-indeterministic*. The essay concludes with an in-depth discussion of the structure and empirical content of the theory of causal nets.

The final contribution to our special issue is that of Votsis. His essay seeks to establish that unification is not just a pragmatic consideration in matters of theory choice but rather an objective one that can be grounded in facts. With this aim in mind, Votsis puts forth a novel conception of unification and an associated measure. The central idea behind his proposal is that the more the content parts of a hypothesis are confirmationally connected the more that hypothesis is unified. A good deal of the essay is devoted to the articulation of the notion of confirmational connectedness. Very roughly put, two parts are confirmationally connected so long as direct support for the one part spills over to the other. Spill over occurs when at least one of three conditions is satisfied. To give the reader a little taste, one of the conditions requires that two content parts of a hypothesis (expressed as propositions) jointly entail an atomic proposition that neither content part entails on its own. A proper explication of the notion of atomicity needs quite a bit of stage setting so for now it suffices to say that its presence is instrumental in eliminating trivial cases of joint entailment. After laying down his proposed measure, Votsis demonstrates its ability to handle a range of cases where we have clear-cut intuitions about whether or not a given hypothesis is highly unified or highly dis-unified. The essay draws to a close with a brief discussion of the connections between the concepts of coherence and unification.

We would like to thank all the speakers at the workshop, namely Dennis Dieks, Victor Gijsbers, Ilkka Niiniluoto, Jonah Schupbach and Mark Siebel for their contributions to what turned out to be such a successful event. We are also grateful to the German Research Foundation (Deutsche Forschungsgemeinschaft), whose funding for our research project '*A frame-theoretic investigation of unification and reduction in scientific theories*', made the workshop possible. Finally, we would like to thank the editorial team at THEORIA and in particular José Antonio Díez Calzada, Valeriano Iranzo and David Teira for helping make this special issue a reality in such a well-organised and timely manner.

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