

a different system or context does not involve any special “indirect” inference (extrapolation) that requires its own philosophical analysis. Instead he presented an account of evidence appraisal based on hypothetico-deductivism, and argued that this framework accounts for both “direct” and “indirect” evidential reasoning in the same manner; no separate account of the problem of extrapolation would thus be needed.

After lunch, the participants reconvened to hear a talk on metaphysics of mechanisms by Beate Krickel from Bochum. Krickel started by presenting Illari & Williamson’s activity-based definition of mechanisms and highlighting its strengths. She then proceeded to point out some problems related to the central concept of activity, arguing that activities are not up for the job they have been ascribed in the literature on mechanistic explanation, as well as questioning the claim that activities are irreducible to other metaphysical categories such as laws. According to Krickel, an account of causality and mechanistic explanation based on the notion of activity faces a similar problem to the one plaguing Salmon’s process theory of causal explanation; the inability to account for explanatory relevance.

Next in the program was a joint talk by Phyllis Illari and Brendan Clarke of UCL. Illari and Clarke discussed the problems of navigating the complexity and sheer number of detail one faces when appraising mechanistic evidence, arguing for the need of systematic heuristics for dealing with these problems. Illari and Clarke then discussed how Wigmore charts—an informal graphical representation of evidential relations used in law—could be employed to bring structure to reasoning about mechanistic evidence in medicine. After a short break, Jaakko Kuorikoski from Helsinki capped off the workshop by presenting a mechanism-based approach to weighing evidence. Kuorikoski presented a framework in which evidence is evaluated in relation to a given explanandum, such that the importance of a piece of evidence is based on its ability to rule out members from a set of hypothetical mechanistic explanations for that explanandum. He then illustrated how this account works in social scientific explanation.

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Philosophy of Mathematics: Truth, Existence and Explanation, 26–28 May

The second conference of the Italian Network for the Philosophy of Mathematics (FilMat) took place at the University of Chieti-Pescara from the 26th to the 28th of May 2016. The network, established in 2012, gathers together Italian scholars in the philosophy of mathematics and closely related disciplines. This conference came after the first FilMat international conference (held in 2014 at San Raffaele University in Milan) and an initial pilot conference (held in 2012 at the Scuola Normale Superiore in Pisa) and was organized by M. Piazza (Chieti-Pescara), G. Pulcini (Campinas) and P. Graziani (Urbino).

The conference hosted five invited speakers (A. Varzi, CNYU; L. Incurvati, Amsterdam; V. Halbach, Oxford; M. Antonutti Marfori, IHPST and Salzburg; E. Moriconi, Pisa) and fourteen contributed talks by twenty international scholars. The talks focused around the three main themes of the conference, viz. truth, existence, and explanation in mathematics.

As regards truth, contributors mainly focused on truth-theoretic deflationism and its desiderata. Advocates of defla-

tionism often require an adequate theory of truth to be (i) conservative but (ii) not relatively interpretable in the base theory. However, the non-conservativity requirement might be hard to satisfy (C. Cieslinski, M. Lelyk, and B. Wcislo, Warsaw). J. Heylen and L. Horsten (KU Leuven, Bristol) showed, for instance, that a disquotational theory of truth is not conservative even on negative free first-order logic. A. Strollo (SNS, Pisa) then suggested that the philosophical rationale behind conservativity can survive beyond the conservativity requirement itself. On the other hand, an examination of the non-interpretability requirement across base theories would allow us to conclude that it is also ill-motivated (C. Nicolai, Munich).

As regards existence, two talks related to Hilbert’s philosophy, and one to Frege’s. F. T. Doherty (Cambridge) reframed the Hilbert-Frege controversy in terms of conceptual priority of consistency over existence. More technical considerations on Hilbert’s first-order and second-order axiomatizations of geometry were provided by J. Baldwin (Illinois-Chicago). On the other hand, Frege’s views on the ontology of arithmetic heavily depends on the legitimacy of introducing objects by abstraction principles. But abstraction is notoriously risky. For instance, the abstraction principle stating that (a) two well-orderings are represented by the same ordinal iff there is a one-one preserving correspondence between them is inconsistent, since it allows us to reproduce the Burali-Forti paradox. S. Florio and G. Leach-Krouse (Kansas State) provided a new analysis of the paradox in four additional assumptions: (b) second-order comprehension; (c) the conception of ordinals as objects; (d) quantification over absolutely all ordinals; (e) quantification over absolutely all relations. They then explored a “no-class” solution to the paradox, thereby rejecting (c).

As regards explanation, one central topic was Alan Baker’s “Enhanced Indispensability Argument” for platonism (EIA). Almost all the examples in support of EIA are “optimality” explanations, viz., mathematical solutions to optimization problems (R. Knowles, Leeds); D. Molinni (Roma Tre) argued that a newly-introduced distinction between mathematical explanation of particular phenomena and mathematical explanations of whole scientific theories further supports EIA’s premises, thus producing an ‘enhanced Enhanced Indispensability Argument’. Finally, Antonutti defended a form of mathematical naturalism in its connections to EIA. Two other themes related to mathematical explanation were explanatory mathematical proofs (J. Salverada, University College) and the (“unreasonable”) applicability of mathematics to physics, in its relation to the applicability of mathematics to mathematics itself (M. Ginammi, SNS).

Some speakers focused on justification (within or without) mathematical practice, including mathematical depth and mathematical understanding (J. Folina, Macalester College). On this respect, a well-known distinction concerns “intrinsic” (viz., concepts-related) vs. “extrinsic” (viz., consequences-related) justification of an axiom; N. Barton (Birkbeck College), C. Ternullo (Kurt Gödel Research Center) and G. Venturi (CLE Universidade de Campinas) claimed, however, that justification in set theory (intrinsically) involves both intrinsic and extrinsic aspect at once. L. San Mauro (Vienna Univ. of Techn.) engaged instead in a practice-based analysis of the Church-Turing Thesis in computability theory.

The last four invited talks tackled issues in the philosophy of logic. Varzi shed new light on the competition between model-theoretic and proof theoretic approaches describ-

ing some proof-theoretic characterizations of all (and only) the non-tautologies of classical logic. Halbach presented a “substitutional” account of logical validity, according to which a sentence is logically valid iff all of its substitutional instances are true. Incurvati critically assessed the so-called “overgeneration” argument against the logicity of second-order logic. Finally, Moriconi discussed the opposition between provability and the notion of truth in light of incompleteness theorems.

The conference explored a wide variety of topics in the philosophy of mathematics and logic, and proved how lively the debate in this area is at present, and how many novel directions are being investigated. The FilMat Network, which also welcomes expressions of interest for membership from scholars in the philosophy of mathematics, has already announced its third international conference, to be held in Palermo in 2018. Follow the link for information about the FilMat Network.

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Methodologies in Science, 10 June

This year the theme of the spring term workshop of the research group in theoretical philosophy at the University of Copenhagen was methodologies in science. The aim of the workshop, which was organized by Thor Grünbaum and Sune Holm, was to introduce the audience to some current themes concerning our understanding of methodologies in the sciences, in particular the “special sciences.”

The day began with a stimulating presentation by Francesco Guala (University of Milan) on anti-naturalism in the philosophy of social science. In his talk Guala provided an overview of some of the main arguments that have been advanced for an anti-naturalist approach. In particular Guala examined what he identified as “the classic anti-naturalist strategy”, which is to identify a feature of social reality that is overlooked by current social science. Guala provided incisive criticism of exemplifications of this strategy by those who argue that social phenomena are causally or constitutively dependent on representation. An important take-home message was that philosophers of social science should pay much more attention to practicing social scientists. It is, Guala argued, the social scientists who are best positioned to assess the efficacy of specific methods and philosophers who want to improve the methodology of social science must engage with scientific practice at the same level of analysis.

The next three speakers focused mainly on issues arising in the philosophy of biology. Lucy Holt, (University of Copenhagen) provided an engaging discussion of the notion of internal teleology. Her talk outlined attempted definitions of internal teleology and its contrast, external teleology, with a view to assessing the relevance of these notions in evolutionary and synthetic biology. Holt concluded by raising several interesting questions concerning the relationship between internal and external teleology in artificial organisms. Sune Holm outlined how engineering methods are currently being introduced into biological research aiming to enable rational and modular design of living systems. Holm suggested that the methods of synthetic biology indicates the basis of criticism of interventionist accounts of causation in biology. In her talk “Do measurements of specificity tell us about causal importance in living systems?” Gry Oftedal (University of Oslo) discussed the introduction of measurements of the specificity of causal rela-

tions aiming to, e.g., quantify the specificity of genes and other causes in living systems. Oftedal developed detailed criticisms of recent attempts at quantifying causal specificity, and pointed to some of the limits of what specificity measurements can tell us. Finally, the day ended with a more general talk by Samuel Schindler (Aarhus University) on “Prediction and testability.” Schindler argued that testability is an extremely weak condition for scientificity. He then suggested that some of Popper’s central motivations for identifying testability as a necessary condition for scientificity are in fact better described as concerns with the issue of ad hocness. Thus, Schindler suggested that the more central issues concern what it means for a hypothesis to be ad hoc.

The Copenhagen University Research Group in Theoretical Philosophy will host its next workshop in November 2016.

SUNE HOLM

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Calls for Papers

BIG DATA AND BUSINESS ANALYTICS ECOSYSTEMS: special issue of *Information Systems and e-Business Management*, deadline 16 October.

THE BACKGROUND OF CONSTITUTIVE RULES: special issue of *Argumenta*, deadline 10 November.

WHAT’S HOT IN ...

Uncertain Reasoning

Logic and probability are closely related, but they are not the same. One difference which is easy to appreciate is the lack of compositionality of the latter. Suppose θ and ϕ are two sentences in some (propositional) language and v is map from the set of sentences to the binary set $\{0, 1\}$. We say that a connective $*$ is compositional if $v(\theta * \phi)$ is a fixed function of $v(\theta)$ and $v(\phi)$. This condition is satisfied by the semantics of classical logic, which is therefore compositional. For example conjunction satisfies

$$v(\theta \wedge \phi) = v(\theta) \cdot v(\phi)$$

where \cdot is the standard product. Many-valued logics are also compositional, so this is not a property which uniquely characterises classical logic.

Probability, as we anticipated, is not compositional, and indeed it should not be, as pointed out by J. Paris (1994: *The Uncertain Reasoner’s Companion*, Cambridge University Press). To see that it is not always compositional, consider two probability functions P and Q defined on (the atoms of) the propositional language $L = \{p, q\}$ as follows:

- $P(p \wedge q) = P(p \wedge \neg q) = P(\neg p \wedge q) = P(\neg p \wedge \neg q) = 1/4$;
- $Q(p \wedge q) = Q(\neg p \wedge \neg q) = 1/2$; $Q(\neg p \wedge q) = Q(p \wedge \neg q) = 0$.

The additivity of P leads us immediately to see that P and Q agree on p and on q (i.e. $P(p) = Q(p) = P(q) = Q(q) = 1/2$) despite the fact that we just set P and Q to disagree on $p \wedge q$.

To see that this failure of compositionality is indeed desirable, let us reason by contraposition. Suppose P is such that $P(\theta) = P(\neg\theta) = 1/2$. If P were compositional, the following would have to hold by substitution of equal values

$$P(\theta \wedge \theta) = P(\theta \wedge \neg\theta),$$