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## GUEST EDITORIAL

I am delighted to have had this opportunity to interview Julia Staffel and contribute to the great work that Hykel and the main Reasoner editor team do. Staffel is an up-and-coming philosopher doing some very exciting work in formal epistemology. In epistemology we often focus on the perfect, or ideal, reasoner; but Julia is thinking about the important issue of imperfection. She's in the final stages of writing a book on this, *Unsettled Thoughts: A Theory of Degrees of Rationality*, which offers a comprehensive picture of what it is to be more



or less rational and which I'm very much looking forward to reading. We met at the Kent Formal Epistemology conference and she told me a bit about her work and where she's coming from. Julia is currently an assistant professor at Washington University in St. Louis, moving to University of Colorado in Boulder in the fall.

CATRIN CAMPBELL-MOORE  
Bristol University

## FEATURES

- 17 **Interview with Julia Staffel**
- 17 CATRIN CAMPBELL-MOORE: Thanks for doing this interview Julia! Can we start by you telling me a bit about how you got into Philosophy?

JULIA STAFFEL: I went to a high school that had philosophy classes you could take in the last three years. I had read a bit of philosophy on my own, but when I took it at school I really liked it. I didn't initially decide to study philosophy at University because I was worried about getting a job. I instead started to do a degree in Advertising and Communication, but I realised after a few months that I didn't like it so I decided to enrol for Philosophy and German after all. I always kind of wanted to be a professor but I wasn't sure if that would work out so I thought I could always be a high school teacher, which you can do in Germany. But then it did work out in the end!

CCM: And how about Epistemology? You specialise in formal epistemology, right? How did that come about? JS: When I first went to graduate school I thought I was going to study Philosophy of Language. When I was an undergraduate I mostly specialised in logic and I took a lot of linguistics classes as part of my degree in German. I started to think about epistemology by thinking about language. I was thinking of the semantics of the word "rational" and I thought: ah, that's a gradable adject-

tive, so what does it take to be more and less rational? But the theories I found only specified what it is to be ideally rational so I realised there was some work to do, which led me to my PhD dissertation topic.

CCM: This is connected to your book, right?

JS: Yes, I started working on the topic in my dissertation, but the book is giving a much more expanded and comprehensive theory of degrees of rationality based on a Bayesian framework. Basically, my approach is to say that if you have a theory of rationality that gives you norms of rationality that are never full-filable by non-ideal agents like you and me, you have to have some story about how these ideal norms relate to those non-ideal thinkers. Most people want to say that the ideal norms are goals that the imperfect thinkers are supposed to strive towards. But then you have to explain what it means to be closer to or further away from those ideal norms and why there is something good about becoming less irrational. In the book I try to answer these questions.

CCM: So why should one be closer to ideal, or more rational?

JS: Often these ideal conceptions of rationality say you should be rational because doing so gives you optimal access to some kind of value. Some people think the relevant value is that your degrees of confidence are as accurate as they can be given the evidence that you have. Other people think that if you're ideally rational then your degrees of confidence are optimally action-guiding, because they won't lead you to situations where you act in a self-undermining way; in technical terms, this is called being Dutch-bookable. What I show is that we can define conceptions of how to approximate rationality where the closer you get to being ideal the higher a portion of these kinds of benefits you get: So, the more you approach rationality, the more accurate your beliefs get and the less vulnerable you are to engaging in these self-undermining ways of acting.

CCM: Is this meant to apply to actual people like you and me?

JS: Of course, actual people like you and me don't have degrees of confidence in their head in the sense that they have propositions with numbers attached to them in their heads. What we have is something a lot messier. But the Bayesian framework, which uses formal representations of degrees of belief, can model the degrees of belief of people like you and me. And then we can ask: How closely do your degrees of belief approach the degrees of belief you should have if you were ideally rational? We can then use the theory to show: If you revise your beliefs in a certain way, or reason in a certain way, doing so would get you closer to or further away from being ideally rational. You can then compare psychologists' results about how people actually reason to this theory to measure how rational people are.

CCM: So, are psychologists also working on this?

JS: In some sense, yes. The reason why we know that people

like you and me aren't obeying the ideal norms of rationality is because we have all this research from psychology that tries to test whether humans behave like ideal Bayesian reasoners, or in what ways they diverge from that. My worry that these ideal theories don't straightforwardly apply to normal humans is fuelled by the insights we have from the psychology research about how people fail to meet those ideal norms. In that sense, my work is very influenced by what the psychologists have found.

I also think it goes the other way: psychologists are often interested in whether people reason ideally, but that requires a background theory of what is ideally rational that they can compare their results to and that's what philosophers can supply. That is what the philosophers provide. So, the philosophical and psychological components are very useful to each other.

CCM: Are there other projects you're working on now or coming up soon?

JS: The book is still a work in progress. What I'm trying to do is provide a choose-your-own-adventure-type model. I want to show how you can have a theory of degrees of rationality for very different types of Bayesian views, because not everybody who likes formal epistemological approaches ends up with the same sort of theory. So I tried to come up with a model that different people can adapt to their specific views. But then there's a lot to be done to work out the details in the end, and there are definitely certain themes that I'm not going to be able to completely settle in the book.

For example, I'm thinking about the difference between propositional and doxastic rationality; basically, propositional rationality describes what would be rational for you to think given the evidence that you have; doxastic rationality asks whether or not you have the beliefs that you ought to have for the right reasons. That's a really important distinction and I want to think more about how formal epistemologists should incorporate this distinction into their theories. I don't think I'm going to be able to do this at length in the book but it's something I want to look at further in the future.

More generally imperfection in our reasoning hasn't been given the attention it deserves in epistemology, so there's definitely a lot more to do in that general area beyond what I can accomplish in the book.

CCM: Outside of philosophy, any interests? You knit?

JS: Yes, I like knitting. I started about three years ago and it's been a great relaxing hobby ever since. At about the same time, I also started aerial silks which is a circus art where you have fabrics hanging from the ceiling that you climb up and wrap yourself up in and do different figures and moves. That's extremely fun and is a good balance from Philosophy where you don't see very fast results, and you sit in a chair all day. So, it's nice to have another activity that's also challenging but in a very different way, and where you make progress in a very different way.

CCM: You're about to move institutions, can you tell me a bit about that?

JS: Currently I'm an assistant professor at Washington University in St. Louis, but starting in the fall I'm going to be an assistant professor at the University of Colorado in Boulder. I'm looking forward to the new department and new challenges there. I already know many of the faculty in the Boulder department and have talked to them about philosophy a lot, and the graduate and undergraduate students I've met are very enthusiastic and interesting. So, I'm very excited about joining



that community with my husband who's also going to be an assistant professor there.

CCM:Excellent, thank you very much for doing this interview. And keep the great reasoning work going!

JS:Thanks!

## L&P-updating – All Bets Are Off

Philosophy of science is concerned with exploring relations between evidence and scientific hypotheses. One paradigmatic approach in the philosophy of science is Bayesian epistemology which governs an agent's degrees of belief given her evidence. One key component of Bayesian epistemology is the update of an agent's degrees of belief in light of new evidence via Jeffrey updating. Leitgeb & Pettigrew (2010: An Objective Justification of Bayesianism I & II, *Philosophy of Science*, 201-272) explored a different updating rule. Roughly speaking: Jeffrey updating leaves proportions invariant, the L&P-update leaves differences invariant.

Leitgeb & Pettigrew show that epistemic agents maximising the accuracy of their degrees of belief; in a technically precise sense; are Bayesian agents which use their updating rule rather than Jeffrey updating. They do not tell us of how thusly interpreted degrees of belief can be used for rational decision making. Next, I argue that the proposed updating rule is not compatible with the standard interpretation of degrees of belief as rational betting odds.

Consider a Bayesian agent with prior probabilities,  $P$ , on  $\Omega = \{\omega_1, \omega_2, \omega_3\}$  such that  $P(\omega_1) = 0.6$ ,  $P(\omega_2) = 0.4$ ,  $P(\omega_3) = 0$ . Updating in light of the new evidence  $P(\omega_1) = 0.5$  the agent may perform a) a Jeffrey update to obtain posterior probabilities  $P_J(\omega_1) = 0.5$ ,  $P_J(\omega_2) = 0.5$ ,  $P_J(\omega_3) = 0$  or b) an L&P-update to obtain posterior probabilities  $P_{L\&P}(\omega_1) = 0.5$ ,  $P_{L\&P}(\omega_2) = 0.45$ ,  $P_{L\&P}(\omega_3) = 0.05$ . Leitgeb & Pettigrew point out themselves that their updating procedure can raise a zero prior probability to a strictly positive posterior one – and vice versa. It is a feature of the updates that the posterior probabilities agree on the conditioned upon proposition.

According to the standard use of degrees of belief for rational decision making, the agent initially offers odds of 1 : 1,000,000 (and more!) that  $\omega_3$  does not obtain. After the L&P-update, the agent refuses to give greater odds than 1 : 20 – for the exact same eventuality. The new evidence received is nothing to write home about, it is business as usual for Bayesian agents. Such ordinary evidence does not justify such an extreme change in the agent's betting behaviour, I claim. While updates change degrees of belief in a holistic way – and ought to change that way – an agent's betting behaviour ought to change moderately in light of moderately persuasive evidence. Note that no such problem arises via Jeffrey updating, the prior probability and the posterior probability of  $\omega_3$  are zero.

There seem to be only two solutions to this dilemma for a Bayesian agent, either i) give up on using degrees of belief

as odds for rational decision making or ii) do not use L&P-updating. If one gives up the betting interpretation, then it is not clear (yet?) how exactly an agent ought to use her degrees of belief for rational decision making. The Leitgeb & Pettigrew proposal hence needs to be supplemented with a novel account of rational decision making, if it is to guide rational decision making.

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## NEWS

### Responsible Life Science Policy between Private and Public Funding - Workshop Report

Life sciences receive funding from both the public and private sectors. These sectors variably emphasize commercially viable and socially responsible research. Given the COVID-19 pandemic and the fact that most medical research is privately-funded, the question of how to responsibly fund life science becomes even more urgent. For instance, decisions about how the vaccine will be distributed will likely favor richer countries and perhaps even deepen existing global economic inequalities. One argument to justify such inequality is that the countries or corporations who pay for the science should be the ones to reap the rewards. To what extent this is convincing depends on ethical questions about the status of intellectual property rights and a host of national and international laws, as well as more general issues about fairness and justice. In November 2020, researchers gathered to discuss responsible life science funding policies. The speakers came from different backgrounds including social studies of science (Sergio Sismondo), science funding sector (Matthew Wallace), medicine (Ivor Ralph Edwards), pharmacology (Rade Injac), and philosophy of science (Manuela Fernandez Pinto and Jacob Stegenga).

The workshop started with Sergio Sismondo's (Queen's University) talk, which provided an overview of canonical works in science and technology studies that may be useful for thinking about socially responsible funding policy more broadly. These include insights that research should go into technologies whose impacts are relatively easy to undo, research on civic epistemologies that tie questions of funding policy together with a host of national decision-making considerations, and contentions that we should not engage in research where there are no problems. He goes on to claim that all, or maybe most, pharmaceutical research is best understood as a form of marketing. Publication planning, ghost-writing articles, sponsoring conferences or keynotes, and regulatory approval are, according to Sismondo, steps towards mass prescriptions rather than the development of reliable medical knowledge, as contemporary drugs are often either clinically ineffective or are only slightly more effective than previous drugs.

In her talk, Manuela Fernandez Pinto (Universidad de los Andes) focused more specifically on the impact of commercialization of biomedical research. The impacts are, more or less, the same during the COVID-19 pandemic, as Pinto argues that very little has changed. Since the end of the Cold War private funding for R&D, especially in pharmaceuticals, has steadily



increased to the point where roughly 70% of research is performed and funded by the private sector. Most of this funding comes from companies profiting within the global north. Research in the global south is mostly funded through special grants, charity donations, and other mechanisms to transfer both funds and research agendas from the global north. While some journals such as Elsevier are making publications in their journals open access, research on COVID-19 vaccines and therapeutics are still driven by commercial interests. It should come as no surprise, then, that the top 10 candidates for COVID-19 vaccines all involve private firms.

Matthew Wallace (International Development Research Centre) reminded us that science is often improved when it draws on diverse sources of evidence. In the context of a global pandemic, we look for global solutions, which work best when international collaborators are able to participate in their own ways. Wallace highlighted three barriers to autonomous democratic global collaboration in science. First, many actors in the global south face systemic external pressures. Often, they are not in a position to set their own research agendas, as funding agencies from the global north dictate what is to be researched, and how. Also, they do not have the same access to research infrastructures, publishing venues, or even always to the output of their own work. Second, within the global south, national science funding bodies also face homogenizing influences, for example, from the private sector and lobby groups. Third, and perhaps most fundamentally, the notion of “research excellence” itself, which drives most science funding decisions, inherits neo-colonial legacies unfit for the global south. To move forward, more research is needed on how funding agencies in the north and south make funding decisions, and to identify more precisely the power dynamics between all the relevant institutions and organizations that influence these decisions.

Rade Injac (Sandoz International GmbH, and the University of Ljubljana) began his talk by defending the pharmaceutical industry, emphasizing that it has increased the quality of life for millions of people. According to Injac, many people criticize pharmaceutical companies without really knowing what goes on within them. On many occasions, companies receive their funding from private agencies and individuals, e.g., funding from LGBT communities financed important HIV/AIDS treatments. Also, some of the big corporations often work with smaller start-ups, as with Pfizer and BioNTech, which allows for the sharing of knowledge, methods, and resources. Ivor Ralph Edwards (Uppsala Monitoring Center) approached the topic of responsible life science from a medical perspective and emphasized the importance of good evidence in clinical trials. After revealing the worrisome fact that adverse drug reactions are the fifth-highest cause of death in the US, Edwards advocated for transparency in medical evidence and interaction with the patients during the trials. In this way the monitoring agencies can better evaluate the outcomes of the trials. Moreover, responsible science funding, according to Edwards, should include not only short term project goals, but also their long term impacts.

In the concluding talk, Jacob Stegenga (University of Cambridge) discussed optimal ways of funding pandemic science. As the pandemic spreads fast, rapid response from scientists is required. In return, the rapid increase of scientific articles makes it harder to track the research quality. In order to tame quick science, Stegenga pointed out, we need controls such as

randomized trials. He advocated for a proactive approach that would be organized on an international level, as diseases do not “respect” borders. Moreover, in the ideal case, this global scientific response should be independent of industry biases.

The event has been co-hosted by the [Carl Fredrich von Weizsäcker Center](#) of the University of Tübingen, [Centre for Philosophy of Science](#) of the University of Geneva, and the [Forum for Advancing Science and Education through Philosophy – Advise](#). The videos of the talks are available at the following [link](#).

[JAMIE SHAW](#)

University of Toronto

[VLASTA SIKIMIĆ](#)

University of Tübingen

[MICHAEL T. STUART](#)

University of Tübingen & University of Geneva

## Calls for Papers

[PURSUITWORTHINESS IN SCIENTIFIC INQUIRY](#): special issue of *Studies of History and Philosophy of Science, Part A*, deadline 1 May.

[CLASSIC METHODOLOGIES IN THE PHILOSOPHY OF SCIENCE](#): special issue of *Journal for General Philosophy of Science*, deadline 30 April.

## DISSEMINATION CORNER

### What is a program? Historical and Philosophical perspectives

*What is a (computer) program?* The History and Philosophy of Computing is, alongside with its object of investigation, a relatively young field of research, relying on a combined historiographic and conceptual methodology. Its aim is to unveil the depth and breadth of problems associated with the computing discipline: its mathematical foundation, the engineering aspects of implementation, the social, economical and political consequences of computing technologies. In recent years, the Commission for the History and Philosophy of Computing ([www.hapoc.org](http://www.hapoc.org)) has been the major player in promoting a comprehensive research approach to the field, together with other academic and industry-based organisations focusing on specific aspects of the computing spectrum.

The [French National Research Agency](#) has now funded a four-years research project: “What is a program? Historical and Philosophical perspectives”. This core issue in computer science has no simple answer today, neither in academia nor in industry. The possible answers affect very real problems, like responsibility for software failure or formal, conceptual and practical methods to establish what is a software copy. A particular challenge is the diversity of existing approaches: a program can be seen as a piece of symbolic text which requires logico-mathematical analysis; or as a configuration of physical entities, like electrons and magnetic charges, residing in the digital circuits of a computer. The ontology of a program can be related to its algorithm, or taken as a self-standing object, with a “liminal” nature, bridging the formal and the abstract. Associated epistemological problems concern the explanation of such ontology, its meaning as execution (cf. operational semantics)

or as input/output behavior (cf. denotational semantics). Properties of programs include the possibility to verify their correctness and the relation between code and specification. This variety of questions indicates the broad range of positions to be considered.

The aim of this project is to offer a more historical and philosophical angle. The project starts from a basic characterization of “program” along three different modalities:

- 1) Physical (program as stored and executed on a machine)
- 2) Formal (program as (formal) text)
- 3) Socio-technical (program as used and made by people).

Any program is rooted in these three modalities, within a certain ordered relation with respect to one another: the formal modality (mathematical, logical and linguistic time-independent properties) stands in between the physical and sociotechnical one (both temporally characterised). This project wants to develop the first coherent analysis and pluralistic understanding of “program” and its implications to theory and practice. The focus will be on models and the abstractions on which they are based. The only assumption made in this approach is that the model assumes a one or more of the modalities of reference and investigates how the relation with other theoretical or practice based aspects of “program” need to be understood.

The Principal Investigator of this Project is Liesbeth De Mol (CNRS/UMR 8163 STL, Université de Lille 3). The research unit is composed of more than 20 researchers in several different areas related to computing (history, philosophy, computer science, programming, media) from 7 different countries (both European and overseas). The project will hire a Doctoral Student and a Post-Doctoral Researcher to be based at the University of Lille as well as a contracted researcher to assist in the development of a searchable database which will be opened to the general public at the end of this project.

A pre-launch event for this project has taken place in Paris on October 20, 2017. On this occasion, several participants to the project have proposed their current topics of research in the larger frame of the project, with the aim of exploring initial and prospective connections: in an introductory talk, Liesbeth De Mol introduced the project, emphasizing the difference between algorithms and programs; Selmer Bringsjord (Rensselaer Polytechnic Institute) questioned the computation-as-procedure framework as opposed to the logic programming framework; Maarten Bullynck (Université de Paris 8) discussed three viewpoints on programs that developed historically from the 1940s until the 1960s and are still relevant today (program as a plan; programs not program and the significance of the user); Felice Cardone (Università degli Studi di Torino) talked about the (formal) meanings of programs; Edgar Daylight (Siegen University) critically analyzed Strachey’s version of the halting problem for programs; Marie-Jo Durand-Richard (Sphere, Paris) presented Douglas Hartree’s view on programs and the idea of programs as diagrams; Simone Martini (Università di Bologna) introduced a methodological approach whereby programs are interpreted as inscriptions; Elisabetta Mori (Middlesex University London) investigated program correctness in the historical practice of LEO computers; Pierre Mounier-Kuhn (CNRS) illustrated the concept of program in early technical texts and the controversies related to the patentability of programs; Camille Paloque-Berges (CNAM, Paris) talked about Unix and its user groups; Giuseppe Primiero (Middlesex University London) presented two strands (philosophical and formal) in the analysis of identity relations for programs; Franck Varenne (Université de Rouen) proposed an epistemological framework to discuss simulations in biology, including the epistemic impact of programming languages.

This first overview of current research topics has highlighted common aspects for the project to focus on, including simulation; patentability; computational learning; identity, scalability between large and small programs. The official opening of the project is planned with a Workshop in Lille on February 07-08, 2018 at MESHS. The website of the project, currently under construction, can be found at [www.programme.hypotheses.org](http://www.programme.hypotheses.org).

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## The Logic of Conceivability

*Recent work on aboutness and subject matter* I here survey recent developments in the formal study of aboutness and subject matter, highlighting some contributions from the [Logic of Conceivability](#) project.



Descriptive language lets us assert and communicate *truths about interesting topics*, and so propagate true *thoughts about interesting topics*. These platitudes point to three core semantic concepts: truth; aboutness; topic (i.e. subject matter).

Unsurprisingly then, the notions of aboutness and subject matter have exercised the minds of philosophers and cognitive scientists, and have found theoretical application by formal semanticists and philosophical logicians. Accounting for the intentionality of mental contents has vexed philosophers since Brentano’s *Psychology From An Empirical Standpoint*. On the logical side, the notion of aboutness plays a central role in situation theory and its treatment of information flow: situations are here understood to carry information *about* other situations (as when smoke signals fire). See, for instance, Barwise and Seligman’s *Information Flow: The Logic of Distributed Systems*. Further, the notion of subject matter provides a gloss for the relevant logician’s diagnosis of wayward classical inferences: the intuitive fault with an inference from, say, ‘Trump is both US president and not’ to ‘Obama is a space alien’ is that the subject matter of the former does not bear on the subject matter of the latter. See, for instance, Stephen Read’s *Relevant Logic: A Philosophical Examination of Inference*. Finally, linguists have attended to subtle distinctions connected to topicality: notably, theme versus rheme, versus discourse topic. Craig Roberts provides a useful [survey](#).

Nevertheless, until recently, the literature has bestowed neither *sustained* attention nor formal sophistication on theories of aboutness and, especially, subject matter - at least, not to a level comparable to that of truth conditions and the theory of truth. This neglect is explained by an apparently prevalent intuition that truth conditions are *primary* in the study of meaning: consider the opening lines of Heim and Kratzer’s seminal textbook *Semantics in Generative Grammar*: “To know the meaning of a sentence is to know its truth conditions”. Another seemingly

widespread intuition is that aboutness and topic, *qua* discourse phenomena, are irredeemably vague, ambiguous and unsystematic. This perspective is articulated by Ryle and, as John Perry communicates, by Partee.

Such sentiments have receded, however, thanks largely to a line traced to David Lewis and substantially developed in Stephen Yablo's *Aboutness*. Lewis highlights two key intuitions: first, that there is an apparent affinity between questions and subject matters; and, second, that the space of subject matters has a mereological structure. To the first point: notice it is extremely natural (if not obligatory) to fix a discourse topic by way of a question. If our conversation is about the 17th century, we can construe this as addressing the question: how are things with respect to the 17th century? To the second point: one topic can intuitively include another. For example, mathematics includes topology. Topics can also intuitively merely overlap, as when philosophy overlaps with logic.

These insights invite elegant formalisms. Suppose that one identifies the class of subject matters with the class of questions. In this case, a theory of subject matter can draw on a significant body of existing work in logic (e.g. Belnap and Steele on *interrogative logic*), formal semantics (e.g. Groenendijk, Roelofsen, Ciardelli *et al.* on *inquisitive semantics*) and formal pragmatics (e.g. Craige Roberts on *questions under discussion*). Lewis, for his part, models a subject matter as a partition on logical space (i.e. a mutually exclusive and exhaustive division of the space of possible worlds), evoking a classical approach to modeling question meaning. A natural mereological structure follows: a subject matter  $\pi_1$  is said to include another  $\pi_2$  just in case the partition  $\pi_1$  refines the partition  $\pi_2$ . More abstractly, the standard mathematical tool for a theory of part-hood - lattice theory - may be deployed, as in *recent work* by Franz Berto on the logic of imagination and belief.

Complementing these intriguing mathematical developments is a growing awareness of the theoretical uses to which aboutness and topic can be put. For instance, subject matter informs a natural account of partial content and partial truth (as explored in, again, Lewis and Yablo). If one says that Jane is horrendously late, then it is part of what one says that Jane is late. If Jane is indeed late, but not horrendously late, then what one said is only partly true. A natural first proposal is that, in general, content *A* is part of content *B* just in case *B* entails *A*. But reflection casts doubt on this proposal: if I say that Jane is horrendously late, it does not seem that part of what I said is that either Jane is late or Jane is hiding under the desk. Generally,  $A \vee B$  does not seem to part of the content *A*. Why? Intuitively,  $A \vee B$  may involve subject matter that goes beyond that of *A*. Hence, a more promising account of content part-hood: *A* is a part of *B* just in case *B* entails *A*, and the subject matter of *B* includes that of *A*.

Another theoretical use for subject matter is in the theory of hyperintensionality. 'Jill tumbled down the hill' and 'Jill tumbled down the hill and  $2 + 2 = 4$ ' are intensionally equivalent: they are true at exactly the same possible worlds. However, as John Perry observes, 'Jack brought it about that Jill tumbled down the hill' and 'Jack brought it about that Jill tumbled down the hill and  $2 + 2 = 4$ ' are not intensionally equivalent. Thus, it might seem that the operator 'Jack brought it about that' induces a hyperintensional context for its operand, sensitive to aspects of meaning that go beyond truth conditions *per se*. But what aspect of meaning is that? An intuitive thought: 'Jill tumbled down the hill' and 'Jill tumbled down the hill and  $2+2 = 4$ '

differ in subject matter.

Accounting for hyperintensionality in terms of subject matter stands in tension with various developments in the Lewis tradition. Yablo, for instance, develops an account according to which the subject matter of an utterance is determined by its truth conditions: roughly, the subject matter of  $\phi$  is the set of its reductive truth makers and false makers, where the former are the minimal models that render  $\phi$  true, and the latter are the minimal models that render  $\phi$  false. On this account, classically equivalent utterances have the same subject matter. So much, then, for offering a comprehensive account of hyperintensionality. Recognizing this, Yablo offers a variation of his account - based on what he calls *recursive truth/false making*, developed by van Fraassen - that goes further in accommodating hyperintensionality. Arguably, it does not go far enough. In light of this, Peter Hawke's "*Theories of Aboutness*" offers a theory of subject matter with a wide scope for accounting for hyperintensional phenomena, among other advantages.

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## WHAT'S HOT IN . . .

### (Formal) Argumentation Theory

You may recall my review of Sperber and Mercier's evolutionary account of how humans acquired a capacity for system 2 (explicit) reasoning, in my July 2017 column. To recap, reasoning evolved to support communication, enabling addressees to challenge and assess arguments



for the information they receive so as to avoid being misled. Conversely, it is therefore in the interest of the senders of information to focus on finding and communicating arguments for, rather than against, their claims. The theory thus supports a wealth of experimental evidence to the effect that humans are disposed to seek reasons in support of their beliefs or decisions, and ignore arguments to the contrary (e.g. the *confirmation bias*). I then suggested that the filtering algorithms used to selectively filter news and opinion, resulting in the belief bubbles and echo chambers of social media, are digital (and hence significantly amplified) manifestations of our evolutionary dispositions. Elsewhere I have tentatively argued that computational argumentation based technologies should be deployed to counteract the polarising effect of these algorithms, for example by trawling the web to curate and present arguments, opinions and news that challenge the beliefs of bubble dwellers (see also my December 17 column on the topic of argument search engines). I say 'tentatively', because it is unlikely that this is what a 'typical' user would really want, given the evolutionary acquired instincts to seek confirmation and disregard challenges to one's beliefs.

However, current research in cognitive psychology gives me more grounds for optimism. I recently attended a series of seminars by the eminent experimental psychologist Professor Cecilia Hayes, in which she reviewed her theory that rebalances the nature versus nurture scales in favour of the latter. She ar-

gues, with supporting evidence, that many distinctive human cognitive capacities are not, as received wisdom would have it, cognitive instincts that are ‘hard coded’ by evolution, but rather ‘cognitive gadgets’ that are installed in the course of childhood through social interaction. Cognitive gadgets (the title of a forthcoming book by Hayes) are products of cultural evolution, rather than genetic evolution. For example, she draws on experimental evidence to argue that ‘theory of mind’ – the ability to ascribe mental states to others – is acquired through early social interaction in contrast to the standard view that this capacity is encoded in our genes. The implications are potentially significant, since her theory suggests that our biased deployment of system 2 reasoning, while in part having evolved to support communication, may to a significant extent result from social factors operating from early childhood onwards, such as the need to feel a sense of belonging and identity that leads us to adopt and maintain the beliefs of our peer group (of course these social factors may have also played a role in the evolutionary account as well). If these dispositions to seek reasons in support of our beliefs, and disregard challenges to our beliefs, is primarily a cognitive gadget designed by cultural evolution rather than a cognitive instinct, then social interventions, supported by computational technologies, may indeed be effective in counteracting these tendencies. For example, implementations of computational models of argument and dialogue that mediate our interactions with information on the web and in formative education, such as the envisaged argument search engines referred to above, and as I’ve suggested elsewhere, learning technologies that engage and challenge students in dialogues implementing normative models of dialectical reasoning.

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## Medieval Reasoning

[Continuing] As we have seen, the formality of a language does not seem to be a matter of quality but rather of degree. In other words, insofar as any language has a vocabulary, grammatical rules and a syntax, it has some degree of formality – how high of a degree depends on the restrictions and specifications in the vocabulary, grammar, and syntax. To formalise a given language is not simply to make it more formal



(whatever that turns out to be, which is not obvious): rather, it is an operation of translation, typically by abstraction, desemantification and (eventually) symbolisation, while improving, extending or revising the vocabulary and the rules. While the output of a fully-fledged formalisation is the kind of symbolical logical language we are used to, there are intermediate stages in between, i.e. the languages that we usually call ‘regimented’. In a paper on “Formalization in Philosophy” (The Bulletin of Symbolic Logic, Volume 6, Number 2, June 2000, pp. 162-175), along with an analysis of formalization’s virtues and dangers, Sven Hansson offered a picture of formalisation as ideal-

isation in two steps: “first from common language [stage-1] to a regimented philosophical language and then from regimented [stage-2] into mathematical or logical language [stage-3]” (p. 164). Since Medieval Logical Latin (MLL) is not a single language, but many – varying greatly over time in features, uses and in the amount of regimentation involved – let us, for convenience, call MLL the regimented versions of Latin used in the 14th century by John Buridan and some of his followers (e.g. Albert of Saxony and Marsilius of Inghen). How would MLL fit in Hansson’s picture? Not very well. MLL is a regimentation of Medieval Philosophical Latin (MPL), which, in turn, is a regimentation of (a fragment of) Medieval Latin (ML). Therefore, on Hansson’s scale MLL would not be at stage-2 but already at some kind of stage-3, despite not being a fully artificial and formalised language yet. Overall, just like with the scale of formal registers, degrees of regimentation/formalisation (in the specific sense we are interested to) seem to form a continuum, which, as such, is difficult to split up – and, in most cases, the splitting might be somewhat arbitrary. For example, ML itself is not an ordinary language as we commonly intend it: in the Later Middle Ages, ML was a semi-living (or semi-dead) language. MPL is a regimentation of this already partially artificial language – namely, it brings new technical terms into the vocabulary and restricts the use of some terms in the common use. MLL carries out a higher degree of regimentation on MPL and MPL, for example by expansions of the vocabulary (including special notations such placeholders and mention-devices such as ‘ly’) and interventions on the grammatical rules of ML and MPL. The distinction between “grammatically” and “logically speaking” is widespread. The interventions of MLL on ML/MPL’s grammatical rules do not seem to be a full reformation and, generally, a standard of grammatical congruity is kept as a condition of well-formedness. In this sense, MLL constitutes both some sort of extension (it adds rules) and an improvement (it tries to do things more efficiently and in a less ambiguous way) of ML/MPL. However, MLL seems to go for a degree of reformation – on how to interpret the properties of terms and the relations among the same terms in a sentence – that can go against grammatical conventions. For example, “homo est blanca” (“man [m.] is white [f.]”) is not grammatically correct because of the lack of gender agreement between the subject and its predicate term, but it is logically acceptable – and possibly true. At least some branches of Medieval Logic (e.g. *suppositio*, *ampliatio*, *restrictio*) are concerned, among other things, with how to regiment and interpret these properties of the terms beyond their grammatical context. For example, even if “homo est blanca” is an acceptable and well formed sentence of our MLL, so will be “nullus homo est foemina” (“no man is female”) because the “nullus” restricts the supposition of “homo” to males only. Yet, at the same time we will reject the inference: “nullus homo est foemina ergo nulla foemina est homo”, because the “homo” in the consequent is not restricted. Overall, despite MLL being deeply enrooted within ordinary language, these features bring it closer to a formalised language than to the level of philosophical regimentation Hansson talked about and make it an interesting logical language to study and play with.

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## Philosophy and Economics

So much of what we do as academics relates to reasoning: we think, read, discuss, and present. We write and re-write. What we also do, increasingly, is organise events small and large. The increased proliferation of events really is a trend of the past decade. I suppose part of the reasons for why this happened is that it has become cheaper and easier to travel. Grant agencies expecting events as part of ‘dissemination’ is probably another factor. What is more – and here we are on more familiar REASONER-related grounds – reasoning is closely related to intersubjective and social processes. With excuses for getting heavy and serious all of a sudden, the symbols and structures with which we express reasoning, such as formulae, sentences, whole languages and so on, need intersubjective agreement. More practically speaking, conversing, discussing, and reacting to presentations are all helpful social practices of reasoning that events purport to facilitate.



So, how do things look in practice, then? In the philosophy and economics community, some of the largest conferences are the Biannual conferences of the [International Network of Economic Method](#), and the annual conferences of the [French Philosophy-Economics Network](#), and there are philosophy of economics-related panels at many of the big society conferences, such as the American Economic Association (ASSA), Philosophy of Science Associations ([PSA](#) in the US, [EPSA](#) in Europe, [BSPS](#) in the UK), as well as the [European Network for the Philosophy of the Social Sciences](#). There are also long-standing events series such as Philosophy of Science in Practice, Models and Simulations, the Philosophy of Social Science Roundtable, or Formal Ethics, in all of which philosophy of economics plays an important role.

This already quite long list of event series does not even scratch the surface of how much there is going on even in this niche. It seems that the philosophy and economics community is prone to be perpetuating lots of events, as it is an interdisciplinary community in which exchange between different kinds of philosophers and also between researchers in different disciplines needs to be facilitated. In that sense, it is quite similar to what we find in other REASONER-related communities. Indeed, one could say that REASONERS have been helping establishing this trend towards more events, by installing conference and workshop series in which logicians, computer scientists, philosophers, economists, and researchers from many other disciplines mix (think of TARK and LOFT, for instance). Indeed, scientific communities related to REASONER-topics have also been among the most innovative with regards to events. Here’s a story related to me by researchers from ILLC Amsterdam, who quote Peter van Emde Boas that in times of the Cold War, logicians from Communist countries often could not attend events in the West, and so researchers were giving their papers for them at various conferences. This, and similar stories, has inspired ‘paper-swap’ formats in which researchers present work of colleagues, thus giving a more radical twist

to the ‘commentator’ format. Also familiar in REASONER-driven events are ‘masterclasses’ (high-level introductions into a research area) replacing traditional keynotes, and various types of poster sessions.

It is fair to say, though, that the majority of large events that are organised these days – certainly in philosophy and economics – has found its equilibrium in a few keynote talks and 30 Minute slots in parallel sessions. Smaller conferences and workshops often see longer 40-60 Minutes slots. Most of these talks are driven by the speaker presenting a slideshow and some time for discussion at the end, often referred to as the ‘Q&A’. There is, given the large number of events, very little variation in the format. As REASONERS, we may be moved to ask this. What kind of reasoning gets done in these formats? And could other formats be more conducive to reasoning together?

I have come to think of the above equilibrium of received events formats as suboptimal. One aspect of the current default formats is that they require that presenters spend a large amount of time on perfecting talks and slideshows (alternatively, they require large amounts of patience in the audience if presenters did not prepare their talks well enough). Another aspect is, for me, that these slots of 30-45 Minutes feel mostly either too long or too short, but not often ‘about right’. Yet, if we were to replace such sessions with, say, short pitches of five Minutes and lots of time for discussion, many might feel dis-oriented. Or, if we were to install a regime in which full papers are not only mandatory to submit beforehand, but also insist on them being read (for instance, by adopting roundtable or reading group-style formats for parallel sessions), many might not only feel dis-oriented, but also over-burdened. Methinks this kind of dis-orientation or feeling of being asked a lot in relation to events might be conducive to making more out of the time that is spent together in one location than the current standard format. But it remains a hurdle.

Perhaps it is inevitable that, after a period of expanding event proliferation, there is now a settled format that is predictable, and thus incurs low costs of attending a conference, once participants get the hang of it. Moreover, a predictable format has many advantages in terms of facilitating exchanges. All this, however, does not mean that it is impossible to change such standard formats. Some formats like masterclasses, roundtable discussions, and poster sessions are gaining ground, albeit slowly, in some of the bigger events.

Perhaps we should ask more what goals we have in bringing scholars together in a particular event, and what kind of exchanges (and styles and formats of reasoning together) an event should facilitate, and then look for the right format to support these goals. As it has become easier to attend and organise events, that seem to me the right questions to ask.

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## Mathematical Philosophy

This report inaugurates a subsection within the “What’s Hot in Mathematical Philosophy” column, which will be devoted to the “Formal Epistemology of Medicine”. This new strand of research analyses issues arising in medical epistemology by examining the interaction of methodological, social and regulatory dimensions in medicine. The motivation for adopting a

formal approach stems from its higher capability to describe the “rules of the game” and to provide an analytic explanatory account of the investigated phenomena. The idea emerges out of the ERC project “Philosophy of Pharmacology: Safety, Statistical Standards, and Evidence Amalgamation” hosted by the MCMP until June 2017, and now by the Univpm (Ancona, Italy) – with MCMP further remaining involved as additional beneficiary. The project consists in two main research strands: 1) developing a justificatory framework for probabilistic confirmation of causal hypotheses; 2) a game-theoretic approach to epistemic issues around (medical) evidence.

1. Formalisation of scientific inference within the Bayesian epistemology tradition has generally aimed at providing mathematical explanations of various inferential phenomena in the sciences: confirmatory support of coherent evidence, confirmatory role of explanatory power, the role of replication in assessing the reliability of evidence, the no-alternatives and the no-miracles arguments (see e.g. Crupi V. Chater N., & Tentori K. New axioms for probability and likelihood ratio measures. *British Journal for the Philosophy of Science*, 2013, 64(1), 189–204; Dawid R., Hartmann S., & Sprenger J. The No Alternatives Argument. *British Journal for the Philosophy of Science*, 2015, 66, 213–234; Fitelson B. A probabilistic theory of coherence. *Analysis*, 2003, 63(279), 194–199). We drew on this tradition in order to exploit the confirmatory support of heterogeneous sources of evidence, and to expand the justificatory toolset in such domains as drug risk management and policy-making (Landes J. Osimani B. Poellinger R. (2017) *Epistemology of causal inference in pharmacology. Towards a framework for the assessment of harms. European Journal for Philosophy of Science*). This also goes in the direction advocated by Gelman (Gelman A. Working through some issues. *Significance* 12.3 (2015): 33-35.) and Marsman et al. (A Bayesian bird’s eye view of ‘Replications of important results in social psychology’. *R Soc Open Sci.* 2017, 4(1): 160426) invoking a more comprehensive approach to evidence, in the aftermath of the “reproducibility crisis”. In analogy with Bogen and Woodward’s distinction between data and phenomena (Bogen J., Woodward J. *Saving the Phenomena. The Philosophical Review*, 1988, 97 (3): 303-52), our framework breaks down the inferential path from data to hypotheses into two steps: one from data to abstract causal indicators; the other one, from such indicators to the causal hypothesis itself. This also helps depress some crosstalk in the philosophical literature, generated by conflating ontological, epistemological, and methodological issues around causal inference.



2. The scientific ecosystem in which the above epistemic dynamics are embedded is characterised by the joint interaction of several features: 1) medical products are so called “credence products”, that is, products for which the consumer (medical community, patients, and the public health system) cannot evaluate the quality prior to (and often not even after) consumption

2) information asymmetry affects epistemic interchange at various levels (patient vs. doctor, policy makers vs. scientific community, state-of-the-art-knowledge vs. Nature), and may be obviously exploited and lead to various phenomena such as suppliers’ induced demand, or disease mongering; 3) producers of medical knowledge often have vested interests in the research outputs and dissemination, leading them to engage in strategic behavior regarding evidence exhibition (whose features may also evolve in time: see Bennett Holman, *The Fundamental Antagonism: Science and Commerce in Medical Epistemology*. 2015, PhD Dissertation, University of California, Irvine). This strongly impacts on the processes and norms regarding the production, and evaluation of evidence and its use for decisions (see also Teira, D. *On the normative foundations of pharmaceutical regulation*. In: La Caze A., Osimani B. (2018) *Uncertainty in Pharmacology: Epistemology, Methods and Decisions*. Boston Series for the Philosophy and History of Science, Springer).

Various institutional instruments have been developed in order to address these issues: evidential standards (e.g. evidence hierarchies proposed within the EBM paradigm), decision-rules (e.g. the precautionary principle), and deontological norms. We started to investigate the joint interaction of such dimensions by developing a Bayesian model of hypothesis confirmation which takes into account both random and systematic error (Landes J. Osimani B., (2018) *Varieties of Error and Varieties of Evidence in Scientific Inference*, under review). In particular, we examined the interplay of coherence and consistency of evidence, with source(s) reliability. Our results partly confirm Bovens and Hartmann (Bovens, L., & Hartmann, S. (2003), *Bayesian Epistemology*. OUP) and Claveau (Claveau F. *The Independence Condition in the Variety-of-Evidence Thesis. Philosophy of Science*, 2013, 80, pp. 94–118), who investigate similar epistemic dynamics, but we realize that Bovens and Hartmann’s results concerning the failure of the variety of evidence thesis (VET), mainly rely on their randomizing instrument being so in a specific way: when its probability of delivering positive reports (no matter what the truth is) is higher than .5 the instrument tends to be a “yes-man”, whereas it is a “nay-sayer” if this probability drops below .5. In the former case, consistency of positive reports from the same instrument speaks in favour of it being a randomizer (and therefore weakens their confirmatory strength), whereas the opposite holds for the latter case, which explains VET failure there. In our model the VET fails too, but the area of failure is considerably smaller and depends on the ratio of false to true positives of the biased vs. reliable instrument affected by random error; the take-home message is that replication with the same instrument is favoured when the noise of the reliable instrument exceeds the systematic error of the biased one. We plan to further explore these results by modeling different sorts of replications and features of reliability in various scientific settings, and embed them in an extended framework, where more agents/groups are involved in strategic behaviour.

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## EVENTS

[D.WHITING@SOTON.AC.UK](mailto:D.WHITING@SOTON.AC.UK): H-OE, Higher-Order Evidence On-line Workshop, virtual.25 January

## COURSES AND PROGRAMMES

### Courses

### Programmes

**MA IN REASONING, ANALYSIS AND MODELLING**: University of Milan, Italy.

**APHIL**: MA/PhD in Analytic Philosophy, University of Barcelona.

**MASTER PROGRAMME**: MA in Pure and Applied Logic, University of Barcelona.

**DOCTORAL PROGRAMME IN PHILOSOPHY**: Language, Mind and Practice, Department of Philosophy, University of Zurich, Switzerland.

**DOCTORAL PROGRAMME IN PHILOSOPHY**: Department of Philosophy, University of Milan, Italy.

**LOGICS**: Joint doctoral program on Logical Methods in Computer Science, TU Wien, TU Graz, and JKU Linz, Austria.

**HPSM**: MA in the History and Philosophy of Science and Medicine, Durham University.

**MASTER PROGRAMME**: in Statistics, University College Dublin.

**LOPHISC**: Master in Logic, Philosophy of Science and Epistemology, Pantheon-Sorbonne University (Paris 1) and Paris-Sorbonne University (Paris 4).

**MASTER PROGRAMME**: in Artificial Intelligence, Radboud University Nijmegen, the Netherlands.

**MASTER PROGRAMME**: Philosophy and Economics, Institute of Philosophy, University of Bayreuth.

**MA IN COGNITIVE SCIENCE**: School of Politics, International Studies and Philosophy, Queen's University Belfast.

**MA IN LOGIC AND THE PHILOSOPHY OF MATHEMATICS**: Department of Philosophy, University of Bristol.

**MA PROGRAMMES**: in Philosophy of Science, University of Leeds.

**MA IN LOGIC AND PHILOSOPHY OF SCIENCE**: Faculty of Philosophy, Philosophy of Science and Study of Religion, LMU Munich.

**MA IN LOGIC AND THEORY OF SCIENCE**: Department of Logic of the Eotvos Lorand University, Budapest, Hungary.

**MA IN METAPHYSICS, LANGUAGE, AND MIND**: Department of Philosophy, University of Liverpool.

**MA IN MIND, BRAIN AND LEARNING**: Westminster Institute of Education, Oxford Brookes University.

**MA IN PHILOSOPHY**: by research, Tilburg University.

**MA IN PHILOSOPHY, SCIENCE AND SOCIETY**: TiLPS, Tilburg University.

**MA IN PHILOSOPHY OF BIOLOGICAL AND COGNITIVE SCIENCES**: Department of Philosophy, University of Bristol.

**MA IN RHETORIC**: School of Journalism, Media and Communication, University of Central Lancashire.

**MA PROGRAMMES**: in Philosophy of Language and Linguistics, and Philosophy of Mind and Psychology, University of Birmingham.

**MRES IN METHODS AND PRACTICES OF PHILOSOPHICAL RESEARCH**: Northern Institute of Philosophy, University of Aberdeen.

**MSC IN APPLIED STATISTICS**: Department of Economics, Mathematics and Statistics, Birkbeck, University of London.

**MSC IN APPLIED STATISTICS AND DATAMINING**: School of Mathematics and Statistics, University of St Andrews.

**MSC IN ARTIFICIAL INTELLIGENCE**: Faculty of Engineering, University of Leeds.

**MSC IN COGNITIVE & DECISION SCIENCES**: Psychology, University College London.

**MSC IN COGNITIVE SYSTEMS**: Language, Learning, and Reasoning, University of Potsdam.

**MSC IN COGNITIVE SCIENCE**: University of Osnabrück, Germany.

**MSC IN COGNITIVE PSYCHOLOGY/NEUROPSYCHOLOGY**: School of Psychology, University of Kent.

**MSC IN LOGIC**: Institute for Logic, Language and Computation, University of Amsterdam.

**MSC IN MIND, LANGUAGE & EMBODIED COGNITION**: School of Philosophy, Psychology and Language Sciences, University of Edinburgh.

**MSC IN PHILOSOPHY OF SCIENCE, TECHNOLOGY AND SOCIETY**: University of Twente, The Netherlands.

**MRES IN COGNITIVE SCIENCE AND HUMANITIES: LANGUAGE, COMMUNICATION AND ORGANIZATION**: Institute for Logic, Cognition, Language, and Information, University of the Basque Country (Donostia San Sebastián).

**OPEN MIND**: International School of Advanced Studies in Cognitive Sciences, University of Bucharest.

**RESEARCH MASTER IN PHILOSOPHY AND ECONOMICS**: Erasmus University Rotterdam, The Netherlands.

## JOBS AND STUDENTSHIPS

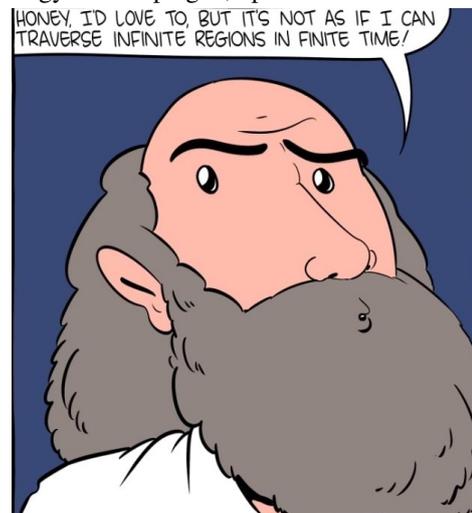
### Studentships

**DOCTORAL PROGRAMME IN PHILOSOPHY**: Language, Mind and Practice, Department of Philosophy, University of Zurich, Switzerland.

**LOGICS**: Joint doctoral program on Logical Methods in Computer Science, TU Wien, TU Graz, and JKU Linz, Austria.

### Jobs

**POST DOC**: in Inferences Under Severe Uncertainties, University of Technology of Compiègne, open until filled.



Fun Fact:  
Zeno never took out the garbage.