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Editorial

Number theory is a fascinating subject, full of apparently approachable problems which turn out to be devilishly difficult to solve. In their quest, number theorists have thrown a bewildering array of tools and techniques at these problems. In the process we see that two similar sounding problems can have very different solutions. For example,

$\{41, 47, 53, 59\}$ is an arithmetic progression of length four within the collection of prime numbers. This prompts the question of whether we find arithmetic progressions of arbitrary length there. Turning things around, I might look at an arithmetic progression, such as 4, 9, 14, 19, 24,..., and wonder how many primes must be contained within it. Then, in general terms I might ask about an arithmetic progression of the form $\{k, k + l, k + 2l, k + 3l, \ldots\}$, where k and l are coprime, whether it must contain infinitely many primes.

In both cases, the answer is 'Yes'. The first is due to Green and Tao in a theorem they published in 2004; the second is due to Dirichlet back in 1837. The latter can be given a Galois-theoretic interpretation and from there related to the elaborate theory-construction side of number theory; the former is related to ideas from random graph theory.

Very recently we see Terence Tao collaborating on a project to lower the bound for which it is known that infinitely many primes differ only by at most the bound. You can track the fortunes of this group as they have reduced the original number from 70 million to, at the time of writing, just over 12000, and quite possibly less than a half of this. Prospects to reduce this much further are viewed as quite dim, but were the bound to reach 2, that would establish the Twin Prime conjecture.

Despite number theory's formidable reputation, Minhyong Kim, Professor of Number Theory at Oxford University, has invited me on a couple of occasions to workshops in his field, with daunting titles such as 'Non-Abelian Fundamental Groups in Arithmetic Geometry'. I have enjoyed enormously our conversations during these visits. Minhyong is author of a range of very interesting expositions, to be found on his webpage, which I consider to be very rich material for philosophers of mathematical practice. I'm delighted that he has agreed to the following interview for *The Reasoner*.

David Corfield
Philosophy, Kent

Features

Interview with Minhyong Kim

David Corfield: Minhyong, thank you for agreeing to talk to *The Reasoner*. As we speak, you're participating in The Asian Mathematics Conference 2013, and will be giving a talk entitled *Diophantine geometry and non-abelian motives*:

> "A substantial portion of mainstream research in number theory over the past several decades has been concerned with the theory of motives, as manifested in the conjectures of Birch and Swinnerton-Dyer, Bloch, Beilinson, and Kato. In this lecture, we will interpret this theory as a linearized,

'virtual' theory of Diophantine equations, and describe recent attempts to refine it using ideas of homotopy theory."

Number theory has a fearsome reputation for the complexity of its background theory, which is wielded sometimes in order to establish surprisingly accessible results, such as Fermat's Last Theorem. Barry Mazur likened number theory's capacity to provoke the deepest reflections within mathematics to the activity of a gadfly. Could you give us any insights into the subject of this talk? Why should number theory take this path?

Minhyong Kim: First of all, I think it's only a certain kind of number theory that has the reputation for being heavy with the conceptual background. This is the kind that grew out of the tradition of viewing an algebraic equation as a geometric object. That is, you can start with a simple equation like Fermat's

$$x^n + y^n = z^n$$

and be interested primarily in the integer solutions. But over the years, people came to apply a geometric perspective that grew progressively abstract. For example, to get at the rational or integral solutions, you learn soon to use the geometry of the real and complex solutions, or the slightly more abstract analysis associated with the non-Archimedean complete number systems. This kind of thing was familiar to people like Fermat, Hasse, and probably many others. But then, around the time of Weil, the theory of abstract algebraic varieties started to play a more active role, possibly in relation to equations over finite fields, where the added abstraction was necessary to get geometric intuition to apply. And then, soon afterwards came Grothendieck with the even more abstract theory of schemes, partly in order to develop an intrinsic geometry over rings like $\mathbb{Z}$, which isn't a field of course. In the process, he brought in sheaves and homological algebra as well as the view of an equation as a special kind of functor. Then, he also started to equip categories with quite general and far-reaching notions of topology.

In short, the idea of using geometry for number theory is very natural, starting already with the problem of producing rational solutions to the 'circle' equation

$$x^2 + y^2 = 1.$$

But then, somewhat in relation to the needs of number theory, but also motivated by other concerns, the idea of what counts as a 'space' has grown quite broad and conceptually sophisticated, in conjunction with a systematic consolidation of a *duality* between space and progressively abstract systems of numbers. I think this is what accounts for most of the difficulty of this kind of number theory.

Analytic number theory, on the other hand, goes in a rather different direction, and still manages to produce many amazing insights. It is a major problem of our times to properly unify the two approaches. This unification happens to a certain extent within the Langlands programme (see also I and II), for example, even though one finds there

also perhaps more general theory than a hard-core analytic number-theorist would approve of. Roughly speaking, usual harmonic analysis is regarded as quite concrete, whereas much of the analytic side of the Langlands programme would be called non-commutative harmonic analysis and tend towards greater abstraction. Still, it's really quite remarkable that two quite different visions of mathematics like those of Langlands (analysis) and Grothendieck (abstract topology and geometry) came together with the realization that the world of automorphic forms and motives should have a substantial overlap.

I see that I've already brought up the notion of a 'theory' in order to discuss the difficulty of certain kinds of number theory. But it should be noted that it's possible to simply use the tools coming out of the theory without understanding them in complete detail, and many excellent mathematicians do this all the time. For example, many more number-theorists just use the consequences of the Weil conjectures than understand them. The situation is very similar to when a particle physicist who concentrates mostly on experiments doesn't need to understand the foundations of quantum field theory, or even to have taken a graduate level course in the subject. The maturity and naturality of a theory comes out in this flexible sort of utility, whether it's quantum fields or Grothendieck topologies.

DC: I don't know whether that was intentional to bring in quantum field theory while discussing number theory, but there are signs, are there not, of a relationship? For one thing, the Princeton mathematical physicist Edward Witten has proposed a six-dimensional supersymmetric quantum field theory, which 'compactified' in two different ways generates a duality (S-duality), which results in the *geometric* Langlands correspondence. There's a longstanding idea, due to Weil, that we need to work out a huge textual analogy in three languages, dubbed the Rosetta Stone, which would include different flavours of the Langlands correspondence. What does it tell us if physics-inspired ideas are relevant to one of Weil's texts?

MK: There's no question in my mind that ideas from physics are quite inspirational for number theory. Obviously, it's not so easy to go from inspiration to definite technology. However, the Hitchin integrable systems that appear in the mirror symmetry incarnation of S-duality have been used most spectacularly by Bao Chau Ngo in his proof of the Fundamental Lemma of the Langlands programme. Among other things, this enables a great deal of progress on Langlands' old vision that many arithmetic L-functions should be the same as standard L-functions on general linear groups. By the way, these L-functions, which are complex analytic functions usually regarded as the most important invariants of a wide class of arithmetic structures, are themselves somewhat similar in flavour to quantities that come up in physics, such as scattering amplitudes or partition functions. The Langlands programme is essentially concerned with classifying possible L-functions, and Ngo's work was the most important step to have been made in recent years towards this classification. My feeling is that the influence from physics will expand over the years in directions that are hard to imagine at the moment. The work that occupies me most right now, arithmetic homotopy theory, concerns itself very much with arithmetic moduli spaces that are similar in nature and construction to moduli spaces of solutions to the Yang-Mills equation.

But these (potential) connections are not the primary reason I mentioned quantum field theory. It's rather that I tend to think of mathematical theorising, reasoning, and experimentation as not very different from the same kind of processes in physics.

DC: English-language philosophy has typically treated physics and mathematics very differently. Lakatos was an exception, praising Polya for having seen that similar patterns of inference are to be found in science and mathematics, though faulting him for seeing these both as inductive, while ignoring Polya's work on analogy. Lakatos himself proposed a quasi-empiricism, where the discovery of entities with unexpected properties could suggest via proof analysis that various concepts needed to be modified. It sounds like you have a broader range of comparisons in mind.

MK: Obviously, I'm barely aware of the philosophical discourse. Recently, I had a brief conversation with Simon Saunders, in which he asked me my opinion on where mathematics comes from. I guess I favour the naive response: As far as I know, most of the mathematical objects I know of were around when I started studying the subject. My teachers told me about certain structures, pointed out some examples, and taught me basic properties. And then, I started investigating them and experimenting, pretty much as I investigated electricity and magnetism. I guess Lakatos discusses Euler numbers of polyhedra in his famous book. Computations of Euler numbers are excellent examples of experiments in mathematics, where one can discover fascinating patterns that demand an explanation. Of course, someone had to develop the theory of topology to give a satisfactory account as well as to formulate the correct statements. And then, to go further, I suppose the community had to be convinced that the theory was consistent with their experience of global properties of geometric objects. I honestly don't see a fundamental difference between such a process and experimentation, theorising, and explaining in physics. Number theory is really very interesting in this regard because it's really full of experimental evidence in favour of beautiful statements such as the conjecture of Birch and Swinnerton-Dyer.

DC: Pursuing the similarity of these activities, one doesn't expect someone working largely isolated from the rest of their community in either field to make a major theoretical contribution. Even if one has the impression of Andrew Wiles toiling away in his attic to solve Fermat's Last Theorem, his success relied heavily on the ideas of others in the field. But recently Shinichi Mochizuki has claimed to have proved the important ABC conjecture, using a theory he has developed himself known as Inter-universal Teichmüller Theory, as developed in a series of papers, to be found on his homepage. You yourself gave a very well-received "flimsiest bit of an introduction" to Mochizuki's work as an answer on MathOverflow. You're running a conference this November with him to try to find out what has been achieved. What can you tell us of your current views?

MK: First of all, I should say it's far from clear that something will happen in November. In any case, I didn't expect Mochizuki himself to participate. However, I do feel a bit like his intellectual isolation has been somewhat exaggerated by various people, perhaps including me. For one thing, as you point out, all the work is relying solidly on the tradition of arithmetic geometry in the style of Grothendieck. And then, there's the part that Mochizuki himself calls the 'geometry of categories.' The inspiration for this is not so different in nature from the work on mirror symmetry among

complex geometers. There as well, various canonical categories of sheaves associated to a geometric object admit useful automorphisms that do not come from automorphisms of the original object. In somewhat fanciful terms, categories associated to certain geometric objects exhibit hidden symmetries. As I understand it, Mochizuki is also trying to augment the paucity of automorphisms for number fields by passing to suitable categories. His work is entirely independent of the work on mirror symmetry, but it does appear that such ideas are in the air of our times. What's not at all clear (to me) is the role of universes. That is, my impression is that some change of universes is frequently convenient in arithmetic geometry when dealing with toposes (I should emphasise that I am far from an expert on such matters). In Mochizuki's work, the claim is that the flexible use of universes plays a truly essential and active role. In conversations a few years ago, what he emphasised was that the interuniversal framework he developed enabled him to solve quite general 'membership equations' in set theory, in a manner analogous to the passage from algebraic functions to analytic functions to distributions in the theory of differential equations (where the effect is to end up with 'generalised' solutions). I don't understand at all at the moment how such ideas are integrated into the papers. However, I should also stress that he seemed to think of the resolution of ABC itself as somewhat subsidiary. As with much substantial work in mathematics, the main point was to present a personal vision of how number theory is structured, and the resolution of ABC was merely supposed to indicate that the vision is possessed of the right sort of depth and power. Mochizuki seemed to feel strongly that the interuniversal business is an essential part of all this, so I would like to believe him.

Here are two more comments that you might find amusing in relation to the previous points:

1. The ABC conjecture is not stated in such a way to admit experimental evidence for or against it. For this reason, some number-theorists were somewhat negative about it since its first formulation.

2. Whatever interuniversal geometry is, there is a revealing aspect to Mochizuki's claims about it as it concerns mathematical practice. His interest in foundational set theory is almost entirely of a pragmatic nature: He wants to move between universes in order to solve equations. This is in contrast to motivation of the sort that's worried primarily about certainty or correctness of mathematical argumentation. One might compare the theory of distributions again. Of course there were objects like the Dirac delta function that needed a proper home. However, the definitions were mostly motivated by the need to deal with equations in a flexible manner rather than anxiety over the 'correct' definition of a function.

DC: I've heard some surprise that Mochizuki believes that moving between universes provides anything more than a convenience. I was rather under the impression that Grothendieck introduced his universes merely as a tool to deal with large categories, such as functor categories, which by exceeding what was allowed by ZFC, threatened the possibility of inconsistency. I never had the sense that they could be put to do conceptual work. We had a post at the *n*-Category Café by Mike Shulman on how homotopy type theory allows you to go about your business using *universe polymorphism* and *typical ambiguity*, but I took the suggestion to be that this was telling us not to worry too much about checking that there are consistent assignments of universe levels—the

formalism would take care of things.

Since the topic of homotopy type theory has cropped up, and last time I edited *The Reasoner* (September 2012) I spoke with Urs Schreiber on the subject, I wonder have you heard of any interest among the number theoretic community in it, or its close relative Univalent Foundations? Given that this looks like being the type theoretic syntax for which ∞-toposes are models, perhaps I'm just asking whether the work of people like Jacob Lurie and Bertrand Toën has made an impression. Urs is rewriting modern physics in this language. What prospects are there in number theory?

MK: I agree it's hard to believe that universes could be as useful as distributions. Mochizuki of course is claiming to go beyond Grothendieck in the application of universes. As I mentioned already, I don't think Mochizuki has the temperament of someone who really builds foundations in the set-theoretic sense. He still is a foundationalist in the sense of Grothendieck, concerned to re-examine pretty elaborate definitions and constructions in the hope of breaking genuinely new mathematical ground. In any case, as you know, very few mathematicians tend to get worried about whether or not they are exceeding ZFC. So, if his intuition about universes is correct, then I think he means them as more than conveniences.

Regarding homotopy type theory, I know next to nothing about it, so I can't really comment. I do know a tiny bit about Lurie and Toën, and I think it will be eventually relevant to number theory. Maybe I should express that more positively since my student James Haydon is writing up his thesis on rational points on Brauer-Severi varieties (these are 'twisted' forms of projective space), which makes use of parts of Toën's foundations of 2 and 3 stacks. I hope it makes some impact. However, number-theorists are a hard-nosed bunch, pretty reluctant to go after a huge amount of theory until someone convinces them it's really worthwhile. This may seem strange since Grothendieck topologies are pretty abstract, while being bread and butter for number theory these days. But historically, my impression is any such theoretical innovation was incorporated pretty gradually by the community. I was once told that étale cohomology became broadly accepted by number-theorists only after Deligne showed one could use it to reduce Ramanujan's conjecture on the coefficients of the tau function to the Riemann hypothesis for varieties over finite fields. It seems Langlands' grand vision of the relevance to number theory of reductive groups and their representations was also accepted only after certain cases of the Artin conjecture on analyticity of L-functions could be proved with them. This is the role, of course, of specific problems long known to be difficult and significant, exactly as in our discussion of ABC. Their resolution helps greatly in convincing people that a worthwhile new perspective has arrived on the scene. The statement of Fermat's last theorem, for example, has had essentially no mathematical impact. However, the deformation theory that Wiles developed for the proof has been the driving force behind an incredible quantity of new advances in the Langlands programme in the last 15 years or so. This was exactly the reason that Wiles was reluctant to follow up on his childhood dream and think about Fermat's last theorem, that is, until the work of Frey, Ribet and others connecting it to the Langlands programme. He predicted that Fermat by itself would end up an isolated fact. It was the connection to Langlands that gave him the excuse to really think it through with a degree of confidence that even partial results would contribute towards something global. The subsequent history,

you could say, vindicated his intuitive sense of mathematical significance essentially precisely.

I think I've argued in the past (to the *n*-Category Café) that this combination of conservatism, visionary zeal, and pragmatism in number theory (and mathematics in general) is a pretty healthy state of affairs. It's a good thing that some people really go after new machinery like infinity topoi with enthusiasm. It's also good that some other people are skeptical. It's even good that the two parties find each other frustrating (within reason).

DC: On that encouraging note, I'd like to thank you, Minhyong, for your giving us such a vivid sense of number theory today.

One's *modus ponens* is another's *modus tollens*: Why the argument from zombies against physicalism is question-begging

In this note, I argue that the argument from zombies against physicalism is question-begging unless proponents of the argument from zombies can justify the inference from the metaphysical possibility of zombies to the falsity of physicalism in an independent and non-circular way, i.e., a way that does not already assume the falsity of physicalism.

For the purposes of this note, by "physicalism" I mean something like Type Physicalism (TP) according to which "For every actually instantiated mental property F, there is some physical property G such that F = G" (Daniel Stoljar, 2009, Physicalism, in Edward Zalta, ed., *Stanford Encyclopedia of Philosophy*).

Proponents of the argument from zombies against TP argue that they can conceive of a possible world in which there are zombies, i.e., creatures that are physically like us in all respects but lack conscious experience. In other words, there is nothing it is like to be a zombie (Robert Kirk, 2011, Zombies, in Edward Zalta, ed., *Stanford Encyclopedia of Philosophy*). The fact that they can conceive of such a world, proponents of the argument from zombies claim, implies that zombies are metaphysically possible, and hence that TP is false, since the zombie world is, *ex hypothesi*, physically identical to the actual world (David Chalmers, 1996, *The Conscious Mind*, NY: OUP, pp. 93–171).

To sum up, then, the argument from zombies against TP is supposed to go roughly as follows:

(Z1) If TP is true, then zombies are metaphysically impossible.

(Z2) Zombies are metaphysically possible.

(Z3) Therefore, TP is false.

Unfortunately, this argument against TP is question-begging. To see why, consider doing a *modus ponens*, rather than a *modus tollens*, on (Z1):

(Z1) If TP is true, then zombies are metaphysically impossible.

(P1) TP is true.

(P2) Therefore, zombies are metaphysically impossible.

Indeed, some have argued that zombies are inconceivable, and hence metaphysically impossible (Eric Marcus, 2004, Why Zombies are Inconceivable, *Australasian Journal of Philosophy*, 82, pp. 477–490). So proponents of the argument from zombies against TP owe us an argument as to why we should do a *modus tollens*, rather than a *modus ponens*, on (Z1).

Of course, it would be illegitimate for proponents of the argument from zombies against TP to reason as follows:

1. The antecedent of (Z1) is false.
2. So, we should not affirm the antecedent of (Z1) and derive the consequent of (Z1).
3. Instead, we should deny the consequent of (Z1) and derive the negation of the antecedent of (Z1).

For this reasoning is clearly circular. If proponents of the argument from zombies against TP were to reason this way, they would simply be assuming that TP is false—see (1)—in an argument that purports to show that TP is false. So, in order for this debate not to deteriorate to mere intuition mongering (Moti Mizrahi, 2013, More Intuition Mongering, *The Reasoner*, 7(1), pp. 5–6), proponents of the argument from zombies against TP must find an independent, non-question-begging reason to justify the *modus tollens* move on (Z1). Otherwise, it is open to physicalists to argue that the right move to make is a *modus ponens* on (Z1).

Proponents of the argument from zombies might reply that they do have an independent, non-circular reason to do a *modus tollens*, rather than a *modus ponens*, on (Z1). Their reason is that they can conceive of zombies, and conceivability entails (or, at the very least, is evidence for) metaphysical possibility. So, proponents of the argument from zombies could argue as follows:

(C1) If zombies are conceivable, then zombies are metaphysically possible.

(C2) Zombies are conceivable.

(Z2) Therefore, zombies are metaphysically possible.

However, in this case, too, proponents of the argument from zombies would have to independently justify doing a *modus ponens*, rather than a *modus tollens*, on (C1).

(C1) If zombies are conceivable, then zombies are metaphysically possible.

(P2) Zombies are metaphysically impossible.

(P3) Therefore, zombies are inconceivable.

After all, TP entails the negation of (C2), i.e., (P3). To assume otherwise is to beg the question against physicalists. To see why, consider the morning star and the evening star. They are one and the same, i.e., the planet Venus, which is why the morning star is the evening star in every possible world (since Venus is Venus). If one thinks that one

is able to conceive of a possible world in which the morning star is not the evening star, then one is simply mistaken, since Venus is Venus in every possible world. Similarly, proponents of the argument from zombies against TP think that they have conceived of the mental and the physical as distinct, which is what a zombie is supposed to be. But, physicalists could argue, this is a mere misconception. Just as it is a misconception that the morning star is distinct from the evening star, since they are one and the same thing, i.e., the planet Venus, it is also a misconception that the mental is distinct from the physical, since they are also one and the same thing. It is our ignorance that merely creates the appearance of having conceived of the mental and the physical as distinct.

If this is correct, then without independent, non-circular reasons to prefer the *modus tollens* over the *modus ponens* move on (Z1) and the *modus ponens* over the *modus tollens* move on (C1), the argument from zombies against TP is question-begging.

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Normative (Dis)Unity: Reply to Stephen Ingram

In his 'Reasoning and Normative Unity' (*The Reasoner* 7(4), p. 43), Stephen Ingram argues in favour of unifying our normative concepts. He claims that a unified account avoids a problem that a disunified account would face regarding our understanding of rational judgement. My interest is not in showing that we should or should not adopt a unified account. Rather, my aim is to show that Ingram's argument needs more flesh in order to be convincing.

On a unified account, there is a single fundamental normative concept to which all other normative concepts can be reduced. On a disunified account, there are at least two such concepts, each of which is fundamental and cannot be reduced to another. A problem arises when we are faced with a normative conflict. Ingram distinguishes between two such types of conflicts: practical and deliberative ones. Practical conflicts are conflicts between two possible practical judgements. Deliberative conflicts are conflicts between two competing ways of making reasoned judgements.

Practical conflicts arise on both unified and disunified accounts. However, deliberative conflicts arise only on disunified accounts, since competing grounds for making rational judgements arise only in case we allow for more than one fundamental concept. This possibility of deliberative conflicts on disunified accounts is what leads Ingram to favour unified over disunified accounts, as unified accounts do not face the problem of deliberative conflict.

This argument is empty as it stands. *By definition*, unified accounts do not face the problem of deliberative conflict. Deliberative conflicts were defined in such a way that they cannot possibly arise on unified accounts of our normative reasoning. In order for Ingram's argument to have any force, it needs to show—in general—that at least some normative conflicts that are irresolvable on a disunified account, can be resolved on a unified account. Only then do disunified accounts face a problem that unified accounts do not.

Let us make things a bit more precise. When working on a disunified account (DA)

with (at least) two fundamental concepts C1 and C2, the paradigm example of a deliberative conflict would be a conflict between two incompatible actions A and B, where A, resp. B, is recommended by the way of reasoning suggested by C1, resp. C2. Let, for instance, C1 contain all norms arising from *moral* considerations, and C2 all norms arising from *legal* considerations. We can imagine a situation in which the moral principle that promises should be kept comes into conflict with the legal principle that one should conduct oneself with candour before the court. We may be morally required to keep a promise not to give away information that we are legally required to pass to a judge. In order for Ingram's argument to work, he would have to show—*in general*—that there are cases of conflict which are irresolvable on a DA, while a unified account (UA) would provide us with a unique solution, 'perform action A' or 'perform action B'. I am sceptical of this enterprise for the following three reasons.

First, the conflict we are facing may be irresolvable on both accounts. The conflict-solving method provided by a UA may not always lead to a solution that is uniquely action-guiding. Applied to our example, the UA in question need not recommend any of the actions 'keep your promise' or 'pass the information to the judge'. Suppose, for instance, that on this account the concept of a *reason* is the only fundamental concept. Then the reasons created by both conflicting norms may turn out to be equally strong on our theory, leaving us undecided as to what to do. Although the conflict in question would no longer be 'deliberative' on this account, since it reduces moral and legal considerations to a single ground for judging norms (i.e., reasons), it fails to illustrate that unified accounts can solve conflicts that disunified accounts cannot.

Second, the conflict may be solvable even on a DA. Even though the two fundamental concepts ultimately cannot be reduced to one another, there may be particular situations in which even a DA allows us to tie the knot. Our theory may, for instance, contain a rule according to which, in situation S, considerations arising from C1 take precedence over considerations arising from C2. Applied to our example, a DA may contain the rule 'if the case in question concerns a very minor offence, then let moral considerations take precedence over legal ones'. If this rule were applicable to the conflict at hand, our theory would resolve the conflict by recommending us to keep our promise.

Third, in order for normative conflicts to be solvable, we need a *method* to attain a unique outcome, 'perform action A' or 'perform action B'. The more rigorous our method, the more chance we have of solving the conflict. However, rigour is hard to attain in these matters. A quantitative approach, e.g., to assign a numeric weight to each relevant consideration, is not very realistic. Moreover, when aggregating relevant considerations we cannot simply calculate their sum, as this would rule out organic interactions among them. Instead, we can adopt a more qualitative approach and assign to each relevant consideration a 'metaphorical' weight, an entity of some vaguer sort. But then what are these entities, and how can we aggregate them? (For a more detailed discussion on the methods available for deciding between conflicting norms I refer to John Horty's 2012: *Reasons as Defaults*, OUP. Horty's own method, the *default conception*, is compatible with both a unified and a disunified account.)

In order to show that on unified accounts of normative reasoning we can resolve normative conflicts that we cannot resolve on a disunified account, introducing the dis-

tinction between practical and deliberative conflicts will not do. Rather, Ingram must show that at least some conflicts are resolvable on a unified account while irresolvable on disunified accounts. The three considerations above cast serious doubts on the possibility of such an enterprise. I remain unconvinced that any good account of our understanding of normative reasoning is a unified one.

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News

Speech Acts and Arguments, 18 May

On the 18th May 2013 in Warsaw, the Institute of Philosophy and Sociology of the Polish National Academy of Sciences (IFiS PAN) was hosting the 10th ArgDiaP Conference, *Speech Acts and Arguments*, organized by the research group of formal applied rhetoric ZeBRaS and supported by the European Network for Social Intelligence SINTELNET. The conference was preceded by the two days of the Interdisciplinary Graduate School on Argumentation and Rhetoric, IGSAR.

The special guest was John Searle (Berkeley) who gave a presentation on how to ground language in pre-linguistic forms of intentionality, and how the existence of complex kinds of language makes human civilization possible.

Jacek Malinowski (Polish Academy of Sciences) discussed two types of formalization: formalization as a method and formalization as a tool, using as an example Tokarz' formal system of epistemic logic designed to describe Grice's theory of conversational implicature. Maciej Witek (Szczecin) distinguished three types of externalism about illocutionary practice: externalism about felicity conditions, externalism about illocutionary agency and externalism about uptake. Then, a phenomenon of 'accommodation of Austinian presuppositions' was discussed and it was argued that this phenomenon can be best accounted for along the externalist lines.

The afternoon session started with the talk by Katarzyna Budzynska (Polish Academy of Sciences) and Chris Reed (Dundee). They presented the Inference Anchoring Theory (IAT) that explains the connection between formal theories of argument and inference, and dialogical processes of debate and disagreement. Using the theory of speech acts as its foundation, IAT tackles a number of challenging theoretical issues, including argument that refers to the statements of others, and argument that is established purely in virtue of its dialogical context.

Patrick Saint-Dizier (Toulouse) presented the linguistic application of IAT to the automatic extraction of argumentative structures in dialogical contexts. The technique uses the TextCoop platform for discourse processing with the Dislog programming language which allows a declarative expression of discourse constructs and the introduction of reasoning mechanisms directly in the parsing system.

The final talk by Manfred Stede (Potsdam) showed another linguistic application of speech act theory for connecting the illocutionary status of discourse segments with the usage patterns of particular causal and argumentative connectives. Focusing on the

group of causal connectives in German, it was shown that distinct pragmatic 'usage profiles' of the most frequent causal connectives can be derived from a corpus annotation study.

ArgDiaP is the Polish nationwide initiative dedicated to argumentation, dialogue and persuasion. Its main goal is to coordinate the activities of the Polish School of Argumentation. Since 2008, a series of biannual one-day conference meetings have been organised. The *Stanford Encyclopedia of Philosophy* recognised the ArgDiaP conferences as one of the top five most important events in theory of argumentation. A collection of extended papers presented at the international ArgDiaP editions will be published as a special issue of Springer's journal *Argumentation* devoted to the Polish School of Argumentation (vol. 3, 2014).

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Heuristic Reasoning Workshop, 13–15 June

"The art of discovery may improve with discoveries": Bacon's famous claim is a good way to introduce the two main topics of the eight talks given at the Heuristic Reasoning Workshop held at the Department of Philosophy at the Sapienza University of Rome. One side of the workshop dealt with the ongoing inquiry into methods for discovering, and the other examined how cases of discovery can be rationally evaluated, reconstructed and offered as a means to improve the art of discovery itself.

Cellucci looked at inferential frameworks for scientific discovery, arguing that such a framework is provided by a revised version of the analytic method plus an open set of ampliative, non-mechanical, rules of inference. He maintained that that they can be employed both to solve problems and to find new problems. Likewise Magnani moved from an eco-cognitive perspective and showed that the study of heuristics, even though non-mechanical, local and contextual, is the only means to extend our knowledge, defending the idea that its outcomes are not fictional. Nickles dealt with the problem of heuristic appraisal (HA) at the frontier of research and its impact on policy. Nickles reasoned from Meno's *aporia* and the No Free Lunch theorems to the conclusion that only a local, domain-specific view on a 'logic of discovery' is possible. Then he applied HA to decision-making in the funding of pioneering research and suggested ways to stimulate 'transformative research' policies.

Gillies presented two patterns for scientific revolutions. In the 'tech first' model, advances in technology come first, enabling new observations and experiments, which result in discoveries that give rise to scientific revolutions. In the 'tech last' model,

urgent practical hard-to-solve problems stimulate solutions by changing the paradigm and advances in tech occur as a consequence of scientific revolutions. De Langhe offered an evolutionary pattern of changes of paradigm, arguing that the 'mechanism' of paradigm change is co-evolutionary, endogenous, non-gradualist, and largely stationary with violent bursts. Seselja and Strasser approached the issue of disagreement in science and how this can be shown to be rational, looking at similarities to epistemic paradoxes. They offered the solution of epistemic tolerance: a normative framework allowing scientists to continue to pose a fruitful challenge, without dismissing their opponents' stance as epistemically futile. Grandori approached the application of heuristics to economic problems, showing the importance and performance implications of rational heuristics in economics. She argued that there are areas where this heuristics can be applied very fast, and errors reduced drastically. In order to investigate ways of generating hypotheses, Ippoliti examined four hypotheses for dealing with the behavior of stock market prices, arguing that the generation of new hypotheses draws on a preliminary bottom-up, verbal, non-formal conceptualization, and maintained that this is the only way to incorporate the domain-specific features of the subject.

Videos of all the talks are available on the workshop website.

Emiliano Ippoliti
Philosophy, Sapienza University of Rome

International Network for Economic Method, 13–15 June

This year's International Network for Economic Method (INEM) conference—which took place from June 13–15—was hosted in Rotterdam by the Erasmus Institute for Philosophy and Economics (EIPE). It attracted some 75 speakers from around the world including economists as well as philosophers.

Although the Network is focused on economic methodology, this year the organisers selected the themes of the conference around the four pillars on which EIPE stands, namely, history, methodology, theory, and ethics. The parallel sessions as well as the lectures of the keynote speakers reflected this broad spectrum, making the conference relevant for a wide range of philosophers and economists. The presentations and discussions not only concerned methodological problems with economic concepts and methods, but also fresh ideas coming from areas not obviously related to methodology. A case in point was the keynote lecture *Rethinking the Ethics of Incentives* by Ruth Grant, who argued that the emphasis on voluntariness in the discussion of incentives has obscured the issue of power: the ability of those who set up incentive schemes to coerce others to specific behaviours.

The other keynote lectures, similarly interesting but perhaps more conventional, were Deirdre McCloskey's, *How do we know? The Breadth of Human Knowledge and the Narrowness of Official Economic Ways of Knowing*, in which she identified the original sin of contemporary 'Samuelsonian' economics as a narrow concern with qualitative rather than quantitative knowledge, i.e., with existence theorems and statistical significance rather than with actual significance. She argued for a 'humanomics' that incorporates the many other ways of knowing, from casual observation, to simulation,

to myth—to name just a few. Itzhak Gilboa's *Rationality and the Bayesian Paradigm* explored a notion of rationality as deliberative robustness of an agent. On this account, an agent is rational if she is convinced of her preferences on reflection. Gilboa's lecture was particularly significant as an example of a 'pure' economist actively participating in a conference that has historically been dominated by philosophers.

Finally, Mary Morgan's lecture on *Nature's Experiments and Natural Experiments in the Social Sciences* argued for a distinction between Nature's or Society's experiments and Natural experiments. In her view, the former are events that occur in the world and are sufficiently controlled—by nature—to be directly analysed, whereas the latter are events that social scientists "retro-fit" into the traditional forms of field or randomised trial experiments.

A panel discussion on *The future of the philosophy of economics* also took place, with participants representing not only the different themes of the conference but also different career stages. The issue that dominated the discussion was how philosophy of economics could remain relevant to its object of study: economics. Some of the difficulties that have characterised the field are economists' apparent lack of interest in philosophical discussions and, relatedly, the institutional barriers to pursuing a career in the interdisciplinary field of philosophy of economics. Some discussants were optimistic, highlighting that the difficult times the economic discipline is going through has stimulated greater interest, within and without the economics profession, in what philosophers of economics can offer.

Melissa Vergara Fernández
Thomas Wells
EIPE, Erasmus University Rotterdam

Causality and Experimentation in the Sciences, 1–3 July

This July, the 8th Causality in the Sciences (CitS) conference was held at the Sorbonne in Paris, organised by Isabelle Drouet (SND, Paris-Sorbonne University) and Max Kistler (IHPST, Université Paris 1 Panthéon-Sorbonne).

2013's conference emphasised experimentation in the sciences. The first invited speaker, Tamar Kushnir, drew on this theme by discussing her investigations of the impact of social knowledge on young children's causal inferences. Some invited speakers discussed the very notion of experiment in certain fields. For example, Francesco Guala gave a presentation on the role of ultimatum game experiments performed across diverse cultures. Uljana Feest discussed experiment in psychology, arguing for a method of converging operations, in which experiment is used to explore phenomena and guide hypotheses rather than to causally explain data. There was also a focus on causal modelling from invitees. Peter Spirtes discussed the application of Bayesian network techniques to causal inference. Gianluca Manzo presented the use of agent-based modelling techniques for establishing the causes of preference patterns towards higher education in France. Marcel Weber argued that experimental models, e.g., involving cellular evolution, have more in common with synthetic modelling than experiments proper because they aim to represent structural facts about the dynamics of target systems rather than to

reveal their causal structure.

Continuing discussion of experimentation, Baumgartner and Céspedes argued for the limited role of experimental methods in deciding issues about mental causation and overdetermination, respectively. Fedyk discussed the possibility of gaining causal knowledge (in the 'ethical domain') non-experimentally.

Other talks at the conference drew on themes from economics: Marchionni (with Kuorikiski), on the role of neuroeconomics as triangulation; Jimenez-Buedo, on internal and external validity; Casini, on the benefits of agent-based modelling techniques in the explanation of the stylised facts of asset pricing; and Henschen on the use of exogeneity tests in the context of causal inference in econometrics. There were also presentations about causation in physics by Egg, on the possibility of a causal explanation of non-locality, and by Farr on the notion of an 'initial condition' in our understanding of the apparent asymmetry of causation. Hubbeling and Abeysinghe (with Parkhurst) presented cautions on evidence-based medicine regarding, respectively, the importance of generative causal knowledge in mental health and the range of evidence suitable for health policy-making. There were also talks by Hutchison (with Kleinberg), on incorporating uncertainty into causal modelling, and by Kronfeldner, on the 'genes-for' conception of phenotypes.

Several talks took issue with Woodward's interventionist theory of causation. Marcellesi, Gebharter, Reutlinger, Russo and Prescott-Couch raised problems for the theory stemming from the nature of its modal claims about possible interventions, stochastic interventions and probabilistic causal chains, parameter-choice on invariance, and the theory's application to socio-causal systems. Other talks defended Woodward's account. Gijsbers and de Bruin presented on the issue of our acquisition of the concept of 'intervention', and De Bal (with Leuridan and Weber) presented on the concept's interpretation and the potential for answering concerns regarding practically and physically impossible interventions.

Further talks aimed to develop our understanding of causation in different ways. Missal discussed the outcome of experiments aimed to test the complexity of anticipatory reflexes in causal perception, Illari explored a conception of productive causation as 'information transmission', and Reiss offered introduction rules for causal claims based on weighted categories of evidence.

The conference was a great success and we can look forward to next year's CitS conference in Cologne, which has an emphasis on 'complexity' in the sciences.

Toby Friend
Philosophy, UCL

Games and Decisions, 8–10 July

The interdisciplinary three-day workshop *Games and Decisions* was held on July 8–10 at the Centro di Ricerca Matematica Ennio De Giorgi of the Scuola Normale Superiore di Pisa. It was organized by Hykel Hosni (Scuola Normale Superiore, Pisa) and Massimo Marinacci (Università Bocconi, Milano) and related to the research activities of the Quantitative Modelling in the Social Sciences group of the Scuola Normale. The

workshop brought together researchers and students working on economic theory, mathematics and logic with an interest in modelling phenomena which are relevant to social sciences. Videos of the talks are available from the YouTube channel of the Scuola Normale Superiore.

The workshop featured four keynote speakers: Richard Bradley (London School of Economics), Brian Hill (HEC, Paris), Glenn Shafer (Rutgers Business School) and Gregory Wheeler (Carnegie Mellon University). In the first talk, Shafer illustrated a game-theoretical framework for probability in which probabilities are derived from a betting protocol and showed how such a framework is suitable for probabilistic forecasting. Bradley described the so-called Ellsberg paradox and showed that a preference relation on a given set of acts cannot satisfy (i) the Savage axioms (ii) the von Neumann-Morgenstern axioms and (iii) aversion to ambiguity. As a solution to the trilemma, Bradley proposed to reject linearity, one of the von Neumann-Morgenstern axioms, and analysed the conceptual consequences. Brian Hill illustrated how an agent's doxastic state can be analysed two-dimensionally according to "beliefs" and "degrees of confidence in beliefs". He claimed that confidence plays a central role both in belief formation and in decision-making and focused on the problem of modelling it.

In the last keynote talk of the workshop, Wheeler developed some ideas of bounded rationality first proposed by Herbert A. Simon and connected them to heuristic decision-making. He described a formal framework for studying relationships among "cues" based on the notions of correlation, confirmation and causation. He argued that this is useful to assess the performance of heuristics.

In addition to keynote lectures, the workshop featured a number of tutorials aimed at establishing a common language for the interdisciplinary audience. Pierpaolo Battigalli (Università Bocconi) gave a tutorial on *Strategies and Interactive Beliefs in Dynamic Games*. Simone Cerreia-Vioglio (Università Bocconi) gave a lecture on *Convexity and Risk*. Hykel Hosni (Scuola Normale Superiore) illustrated some key problems in economic theory *Through the logician's glass*. Fabrizio Lillo (Scuola Normale Superiore) gave *An introduction to asymmetric information and financial market microstructure*. Fabio Maccheroni (Università Bocconi) lectured on *Mixed Extensions of Decision Problems under Uncertainty*.

Interestingly all the tutorials combined basic material with research questions.

Finally, work in progress presentations covered a number of topics including mathematical modelling, history of probability and quantitative analysis, decision theory, game theory, economics and quantitative finance. Here is the list of speakers and titles. Jacopo Amidei (Scuola Normale Superiore): *Non-Archimedean decision theory*; Giacomo Bormetti (Scuola Normale Superiore): *Evaluation and pricing of risk under stochastic volatility*; Emiliano Catonini (Università Bocconi): *Common assumption of cautious rationality and iterated admissibility*; Camilla Colombo (Scuola Normale Superiore): *Bernoulli and D'Alembert on smallpox inoculation*; Tommaso Denti (MIT): *Rationally inattentive preferences*; Mirko Diamanti (Scuola Normale Superiore): *Huygens's analysis of expectation*; Paolo Galeazzi (ILLC, Amsterdam): *Comparing models in epistemic game theory*; Francesco Girlanda (Universit'a Bocconi): *From Preferences to Choice: a Completion Approach*; Umberto Grandi (Università di Padova): *Computational Perspectives on Judgment Aggregation and Voting Theory*; Gabriele La Spada

(Princeton University): *Risk-taking incentives in delegated asset management: The effect of relative-performance based compensation*; Alex Marcoci (London School of Economics): *Beliefs and Strategies in Decision Problems with Imperfect Information*; Rossella Marrano (Scuola Normale Superiore): *Mathematical Abstraction: Turing's analysis of computation*.

Overall, the workshop provided a great platform for exchange among different research communities and across different levels of experience. The format (keynotes, tutorials and work in progress presentations) allowed for the development of mutual awareness of the research questions and methodology of the groups involved. Everyone had a great time and is very much looking forward to next year's edition!

Rossella Marrano
Scuola Normale Superiore, Pisa

New Perspectives on External World Scepticism, 9–10 July

How can we rule out the possibility that we are constantly deceived by a Cartesian demon or the Matrix? The sceptic contends that we cannot rule out possibilities like these to the effect that we cannot know the external world. The scepticism debate is entangled with hot epistemological controversies such as those about the existence of immediate justification, the characterization of the notion of evidence, the nature of epistemic rationality and its norms, epistemic internalism and externalism. Some of these issues can be approached formally, for example by Bayesian reasoning or epistemic logic. On 9 and 10 July, the Munich Center for Mathematical Philosophy (MCMP) hosted a two-day workshop on New Perspectives on External World Scepticism organised by Luca Moretti (Aberdeen) and Lars Weisbrod (MCMP).

The workshop started with a talk by Ralph Wedgwood (Southern California) arguing that if external world scepticism is false, then the rational impact of experience on credences can be modelled by some type of probabilistic conditionalization. Wedgwood's account included an explanation of how perceptual justification can be defeated that draws from probabilistic responses to inductive scepticism. On his account external world scepticism and inductive scepticism have essentially the same solution. Martin Smith (Glasgow) contrasted the familiar theory of epistemic justification as high probability (or low risk) given evidence with the less familiar theory of epistemic justification according to which belief in P is justified by some evidence just in case it would be abnormal for P to be false given that evidence. Smith examined how these two theories fare in the face of sceptical paradoxes based on lotteries (cf. John Hawthorne's *Knowledge and Lotteries*) and suggested that the second theory may be able to resolve them.

Thomas Grundmann (Cologne) argued in favour of reliabilism by exploiting versions of the Cartesian demon intuition. He also proposed a way to reconcile this intuition with the new evil demon intuition—typically used to provide evidence for mentalism and so against reliabilism—within an overall reliabilist framework. Michael Blome-Tillmann (McGill) proposed an ecumenical solution of the puzzle arising from Moorean antisceptical reasoning and the Wrightean phenomenon of transmission failure, which

appear to be incompatible. According to Blome-Tillmann if we carefully distinguish between two different ways of thinking about justification and evidence, we have a way to model respectively the Moorean position and the Wrightean position. The puzzle would arise because we neglect these distinctions.

Jim Pryor (NYU) argued that since vulnerability of immediate justification to undermining defeat by higher-order considerations is ubiquitous, the least unreasonable doxastic stance to have in many cases is an incoherent one. Given this and given that mere doxastic attitudes (not necessarily based on evidence) have some doxastic effect, Pryor concluded that simply considering sceptical arguments may lead us to "epistemic dilemmas" in which no available doxastic response is fully rational. Berit Brogaard (St Louis) contended that dogmatism offers an adequate response to the sceptic. She considered strategies to resolve the cognitive penetrability problem and the bootstrapping problem that affect immediate justification theories. According to Brogaard these strategies introduce new features into the theory of immediate justification, some of which are externalist, others only appear to be so but are compatible with internalism. Yuval Avnur (Scripps College, Claremont) responded to sceptical arguments that exploit principles of epistemic closure under entailment based on probabilistic coherence. He contended that these arguments stem from misinterpreting the relation between epistemic justification and probabilistic coherence by not recognising that justification is a "loaded" notion, as it has been proposed by Strawson, Cohen, and Goldman. Carlos Ulises Moulines (LMU Munich) focussed on the question "Is there anything besides me?" By appealing to the scenario laid out by Calderón de la Barca in his *Life Is a Dream*, Moulines argued that this question does make sense, against contemporary views that deny this. Moulines also argued that the usual arguments for answering this question affirmatively fall short of being fully convincing.

The videos of the talks by Wedgwood, Smith, Grundmann, Brogaard and Moulines are available on the iTunesU site of the MCMP.

Luca Moretti
Philosophy, University of Aberdeen

Calls for Papers

The Life and Work of Leon Henkin: Mara Manzano, Ildiko Sain and Enrique Alonso eds, deadline 1 September.
Infinite Regress: special issue of *Synthese*, deadline 1 October.
Belief Change and Argumentation Theory: special issue of *Annals of Mathematics and Artificial Intelligence*, deadline 15 November.

What's Hot in ...

Logic and Rational Interaction

Revolutions are rare, but more than a few people believe there is currently a major one happening in the foundations of mathematics. The Univalent Foundations program

initiated by Vladimir Voevodsky has thrilled mathematical logicians all over the world for the last couple of years. Progress in this young field was fueled by a year program at the Institute of Advanced Studies in 2012-2013, organized by Vladimir Voevodsky, Steve Awodey and Thierry Coquand. A major outcome of this program was the first ever textbook presentation on the univalent foundations program. Just published last month, the data of Homotopy Type Theory – Univalent Foundations of Mathematics, or *The HoTT book* for short, are impressive. In no more than nine months 40 authors put together a 500 page introduction to the program, all published under a creative commons license, thus inviting everyone willing to contribute.

Up to now, set theory, mainly the axiomatic system of ZFC, was generally accepted as the foundational framework for mathematics. While being well accepted from a philosophical point of view, ZFC was of rather limited use to mathematical field work outside logic proper. Classically, the aim of ZFC was to provide an axiomatic system rich enough to represent all of mathematics. While technically every mathematical proof can be represented as a completely formal derivation, these derivations are in practice so long, incomprehensible and uninformative, that no actual proof is ever written in this fashion. Rather, fully formal proofs were relegated to the role of a lender of last resort: the various mathematical fields have created their own semi-formal frameworks with peers generally agreeing on when a proof is a proof. Formal ZFC translations would only be invoked in a case of major disagreement as a universal tool to decide such conflicts. However formal derivations tend to be exponentially longer than the corresponding classic proofs, and proof translation is all but a straightforward procedure. Thus it is unclear as to whether ZFC could ever hold this promise of a lender of last resort in practice. Also set theoretic proofs did not fare that well in a second respect. Since proof checking is as tedious as error prone, one might not only be interested in a formalisation for settling disagreement, but also as an input for automated proof checkers. Unfortunately, classical mathematics makes use of non-constructive principles such as the law of excluded middle or the axiom of choice that are a major obstacle for classic proof checkers, such that even a completely formalized version does not guarantee for a checkable proof.

The univalent foundations program attempts to fare better on both problems, leading the authors to express the hope that univalent foundations "will eventually become a viable alternative to set theory as the 'implicit foundation' for the unformalized mathematics done by most mathematicians."

HoTT is based on intuitionistic type theory as developed by Per Martin-Löf. There the type of a formula resembles the set of constructive proofs of that formula. The crucial and absolutely surprising insight leading to the development of homotopy type theory is that these types behave in a similar way as topological space. A formula and its corresponding type can be thought of as a point in a topological space. To be a bit more precise: a type does not correspond to a single space, but a class of spaces called a homotopy type, hence the name homotopy type theory. This connection

gives the class of homotopy types a constructive flavor: every such space can be seen as explicitly constructed via the corresponding constructions on formulas. Thus many mathematical statements connected to homotopy theory are easily expressible in the univalent foundations. But the HoTT book shows that the domain of application is not only restricted to topology alone, but also other fields such as set theory can be dealt with in homotopy type theory.

On the axiomatic side, the constructive part of classic Martin-Löf type theory is enriched with Voevodsky's axiom of univalence, basically saying that isomorphic objects are equal, a principle happily used in mathematical practice.

The book presents a snapshot of one of the most thrilling and rapidly developing research programs in mathematics these days. It is organized in two parts, where the first gives a fairly extended introduction to univalent foundations and all the logical and mathematical concepts involved. The second part provides applications of HoTT to various mathematical fields. The authors tried to keep the parts as independent as possible, making the second part accessible without having read but the crucial chapters of the first part.

LORIweb is always happy to publish information on topics relevant to the area of Logic and Rational Interaction—including announcements about new publications and recent or upcoming events. Please submit such news items to Rasmus Rendsvig, our web manager or to the loriweb address.

Dominik Klein
TiLPS, Tilburg University

Uncertain Reasoning

With taxes being far from certain anywhere on the globe, the only certainty we are left with appears to be death—*pace* Benjamin Franklin. And that we all have a 100% lifetime risk of dying is no climax in *The Norm Chronicles: Stories and numbers about danger* written by Michael Blastland and David Spiegelhalter, and published by Profile Books in 2013.

David Spiegelhalter is Winton Professor for the Public Understanding of Risk at the University of Cambridge and besides being a prominent Bayesian statistician, is a well-known populariser of the mathematics of uncertainty. His blog understandinguncertainty.org is mostly devoted to debugging misuses of statistical reasoning in the media (mostly UK). Michael Blastland is the creator of the BBC Radio 4 program *More or Less*, presented by Financial Times' Undercover Economist, Tim Harford. The result is a very original mixture of fictional and essayistic writing.

The book is centered around Norm, one of three passengers who happen to be travelling independently on the London Tube, one unspecified day. The story begins when the three see some piece of unattended luggage in the carriage. Norm is worried at first, but soon realises that the most plausible explanation for the presence of the unsettling item, is that somebody must have forgotten their bag. Be it as it may, he calmly gets off at

the next stop. Norm's reflective reaction isn't matched by Prudence, who panics, as it turns out for no reason at all. Kelvin, the third and risk-loving character of the book, opens the bag and recklessly evaluates its unimpressive content.

Norm, Prudence and Kelvin capture three key attitudes towards risk and connect the *stories* about danger to the *numbers* that help us to manage it better. In developing this connection the book strikes a blow for sanity in the use of statistical information, especially in relation to matters of great public importance. I think this is well reflected by the authors' overall preference for the low-tech word "danger" over the fashionable "risk". In addition, the book begins (p. 5) and ends (p. 277) with (uncredited) paraphrases of de Finetti's slogan to the effect that probability does not exist. Less indirect is the following passage:

> Numbers and probabilities tend to show the final account, the risks to humans en masse, chance in aggregate summarised for whole populations. These numbers reveal hypnotic patterns and rich information. But they are indifferent to fate and its drama. Numbers can't care and don't care; life and death are percentages, unafraid of danger, shrugging at survival, stating only what's risky, what's not, or to what degree, on average. They are silent about how much any of this, right down to a love or fear of sausages or ski slopes, matters. (p. 4)

Specialists, and in particular economic theorists, may find this overly conservative. Decision theory does indeed take all that into account in its models—including how much we love sausages. Yet, I think the above should be evaluated in the light of the expected readership of a book which belongs to the 'smart thinking' section of commercial bookshops—managers, financiers, journalists. In those professions (among many others) there is currently a pernicious culture of taking the output quantitative analyses of highly complex phenomena as items of 'scientific'—hence unquestionable—truth. For this I think we should warmly welcome the effort made by Blastland and Spiegelhalter to counter that culture in an accessible and authoritative way, and without indulging in sterile provocations.

Hykel Hosni
Scuola Normale Superiore, Pisa
CPNSS, LSE

Events

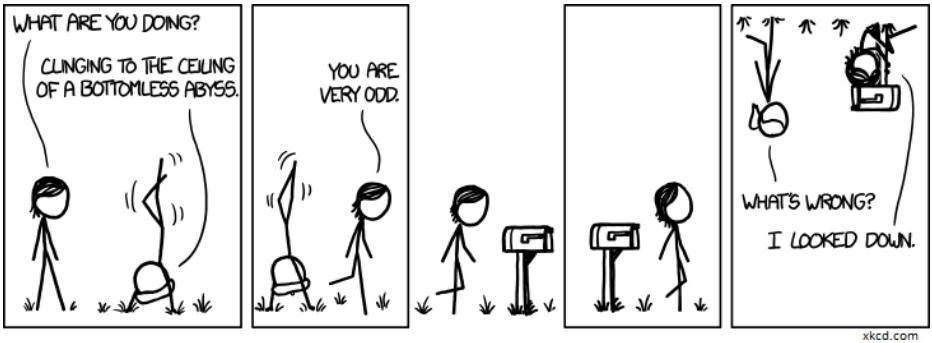
August

AIBD: 1st Workshop on Artificial Intelligence for Big Data, Beijing, China, 3–4 August.
ITDAS: International Workshop on Information and Trust Dynamics in Artificial Societies, Beijing, China, 3–5 August.
WL4AI: Weighted Logics for AI workshop, Beijing, China, 3–5 August.

GKR: Graph Structures for Knowledge Representation and Reasoning, Beijing, China, 3–5 August.
NRAC: 10th International Workshop on Nonmonotonic Reasoning, Action and Change, Beijing, China, 3–5 August.
TAFA: 2nd International Workshop on Theory and Applications of Formal Argumentation, Beijing, China, 3–5 August.
IJCAI: 23rd International Joint Conference on Artificial Intelligence, Beijing, China, 3–9 August.
WCP: 23rd World Congress of Philosophy, Athens, Greece, 4–10 August.
BLAST: Chapman University, Southern California, 5–9 August.
KSEM: International Conference on Knowledge Science, Engineering and Management, Dalian, China, 10–12 August.
MLG: 11th Workshop on Mining and Learning with Graphs, Chicago, 11 August.
LMoGDM: Logical Models of Group Decision Making, Düsseldorf, Germany, 12–16 August.
WoLLIC: 20th Workshop on Logic, Language, Information and Computation, Darmstadt, Germany, 20–23 August.
Prior: Arthur Prior Centenary Conference, Oxford, 21–22 August.
RACR: 4th International Conference on Risk Analysis and Crisis Response, Istanbul, Turkey, 27–29 August.
EPSA: European Philosophy of Science Association, University of Helsinki, Finland, 28–31 August.
EoM: Epistemology of Modality, University of Lisbon, 29–31 August.

September

ICSCCW: 7th International Conference on Soft Computing, Computing with Words and Perceptions in System Analysis, Decision and Control, Izmir, Turkey, 2–3 September.
Counterfactuals: Thought Experiments, Modal Knowledge, and Counterfactuals, Humboldt University, Berlin, 2–3 September.



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LSFA: 8th Workshop on Logical and Semantic Frameworks with Applications, Sao Paulo, Brazil, 2–3 September.
DIAL: Dialectic in Aristotle's Logic, Groningen, Netherlands, 2–4 September.
CSL: 22nd EACSL Annual Conference on Computer Science Logic, Turin, Italy, 2–5 September.
ECAL: 12th European Conference on Artificial Life, Taormina, Italy, 2–6 September.
ENPOSS: European Network for the Philosophy of the Social Sciences and the Philosophy of Social Science, University of Venice Ca' Foscari, 3–4 September.
DUMMETT DAY: University of Leeds, 4–5 September.
MANY-VAL: Games, Decisions, and Rationality, Prague, Czech Republic, 4–6 September.

BLC: British Logic Colloquium, University of Leeds, 5–7 September.
WPMSIIP: 6th Workshop on Principles and Methods of Statistical Inference with Interval Probability, Switzerland, 5–10 September.
MCU: Machines, Computations and Universality, University of Zurich, 9–12 September.
ITA: 5th International Conference on Internet Technologies and Applications, Glyndwr University, Wrexham, North Wales, UK, 10–13 September.
HAIS: 8th International Conference on Hybrid Artificial Intelligence Systems, Salamanca, Spain, 11–13 September.
SOCO: 8th International Conference on Soft Computing Models in Industrial and Environmental Applications, Salamanca, Spain, 11–13 September.
SEFA: Seventh Meeting of the Spanish Society for Analytic Philosophy, University Carlos III, Madrid, 11–14 September.
SOPhiA: Salzburg Conference for Young Analytic Philosophy, University of Salzburg, Austria, 12–14 September.
SMLC: Synthetic Modeling of Life and Cognition: Open Questions, Bergamo, 12–14 September.
AIGM: 3rd Workshop on Algorithmic issues for Inference in Graphical Models, Paris, 13 September.
CLIMA: 14th International Workshop on Computational Logic in Multi-Agent Systems, Corunna, Spain, 16–17 September.
SUM: 7th International Conference on Scalable Uncertainty Management, Washington DC, 16–18 September.
SIFA: Graduate Conference on Language, Logic and Mind, University of Cagliari, 16–18 September.
CLPS: International Conference on Logic and Philosophy of Science, University of Ghent, 16–18 September.
ASAI: Argentine Symposium on Artificial Intelligence, UNC, Córdoba Capital, Argentina, 16–20 September.
ALC: Asian Logic Conference, Guangzhou, 16–20 September.
KI: 36th Annual Conference on Artificial Intelligence, Koblenz, 16–20 September.
DKB: Dynamics of Knowledge and Belief, Koblenz, Germany, 16–20 September.

PROGIC

The sixth workshop on Combining Probability and Logic. Special focus: combining probability and logic to solve philosophical problems. Munich, 17–18 September

MATHEMATICAL VALUES: London, 17–19 September.
CAEPIA: 15th Conference of the Spanish Association for Artificial Intelligence, Madrid, Spain, 17–20 September.
DF& N: Doxastic Freedom and Normativity, University of Regensburg, Germany, 19–21 September.
IJCCI: 5th International Joint Conference on Computational Intelligence, Algarve, Portugal, 20–22 September.
FotFS: History and Philosophy of Infinity, Cambridge, UK, 20–23 September.

PT-AI: Philosophy and Theory of Artificial Intelligence, Oxford, 21–22 September.
MFCA: 4th MICCAI Workshop on Mathematical Foundations of Computational Anatomy, Nagoya, Japan, 22 September.
SCALE: Scalable Decision Making: Uncertainty, Imperfection, Deliberation, Prague, Czech Republic, 23 September.
TbiLLC: 10th International Tbilisi Symposium on Language, Logic and Computation, Georgia, 23–27 September.
Type: Type Theory, Homotopy Theory and Univalent Foundations, Barcelona, 23–27 September.
AIAI: 9th IFIP International Conference on Artificial Intelligence Applications and Innovations, Paphos, Cyprus, 30 September–2 October.

October

APMP: 2nd International Meeting of the Association for the Philosophy of Mathematical Practice, University of Illinois at Urbana-Champaign, USA, 3–4 October.
LORI: 4th International Workshop on Logic, Rationality and Interaction, Zhejiang University, Hangzhou, China, 9–12 October.
Investigating Semantics: Ruhr-University-Bochum, 10–12 October.
Experimental Philosophy: State University of New York, Buffalo, 11–12 October.
Probabilistic Modeling: in Science and Philosophy, Bern, Switzerland, 11–12 October.

Inductive Logic and Confirmation in Science
University of Kent, Paris Campus, 17–18 October

IDA: 12th International Symposium on Intelligent Data Analysis, London, UK, 17–19 October.
FPMW: French PhilMath Workshop, Paris, France, 17–19 October.
ICPI: International Conference on Philosophy of Information, Xian, China, 18–21 October.
LENLS: Logic and Engineering of Natural Language Semantics, Kanagawa, Japan, 27–28 October.
HaPoC: 2nd International Conference on the History and Philosophy of Computing, Paris, France, 28–31 October.

November

CHPS: 29th Boulder Conference on the History and Philosophy of Science, University of Colorado at Boulder, 1–3 November.
Madrid IV: Inferentialism in Epistemology and Philosophy of Science, Madrid, 11–13 November.
ACML: 5th Asian Conference on Machine Learning, Canberra, Australia, 13–15 November.
Reduction and Emergence: Reduction and Emergence in the Sciences, LMU Munich, 14–16 November.

Philosophy of Medicine Roundtable: Columbia University, New York, 20–21 November.
SCAI: 12th Scandinavian Conference on Artificial Intelligence, Aalborg, Denmark, 20–22 November.
AICS: International Conference on Artificial Intelligence and Computer Science, Bayview Hotel, Langkawi, Malaysia, 25–26 November.

December

PRIMA: 16th International Conference on Principles and Practice of Multi-Agent Systems, Dunedin, New Zealand, 1–6 December.
AIC: International Workshop on Artificial Intelligence and Cognition, Turin, Italy, 3 December.
TPNC: 2nd International Conference on the Theory and Practice of Natural Computing, Cáceres, Spain, 3–5 December.
AJCAI: 26th Australasian Joint Conference on Artificial Intelligence, Dunedin, New Zealand, 3–6 December.
PhiloSci21: Challenges and Tasks, Lisbon, Portugal, 4–6 December.
ICDM: International Conference on Data Mining, Dallas, Texas, 8–11 December.
LPAR: Logic for Programming, Artificial Intelligence and Reasoning, Stellenbosch, South Africa, 14–19 December.
OBayes: International Workshop on Objective Bayes Methodology, Duke University, Durham, NC USA, 15–19 December.
DialDam: 17th Workshop on the Semantics and Pragmatics of Dialogue, ILLC, University of Amsterdam, 16–18 December.
IICAI: 6th Indian International Conference on Artificial Intelligence, Tumkur, India, 18–20 December.

Courses and Programmes

Courses

ESSLLI: 25th European Summer School in Logic, Language and Information, Heinrich Heine University in Düsseldorf, Germany, 5–16 August.
IFAAMAS: Summer School on Autonomous Agents and Multi-agent Systems, Beijing, China, 9–12 August.
CN& C: Concepts, Normativity, and Cognition: Philosophical and Empirical Perspectives, Pärnu, Estonia, 26–30 August.
MLSS: The Machine Learning Summer School, Max Planck Institute for Intelligent Systems, Tübingen, Germany, 26 August–6 September.
EthicSchool: Virtual Summerschool on Ethics of Emerging Technologies, 9–13 September.

Programmes

APhil: MA/PhD in Analytic Philosophy, University of Barcelona.
Doctoral Programme in Philosophy: Language, Mind and Practice, Department of Philosophy, University of Zurich, Switzerland.
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 & 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.
Master Programme: Philosophy of Science, Technology and Society, Enschede, the Netherlands.
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 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 Cognitive Science and Humanities: Language, Communication and Organization: Institute for Logic, Cognition, Language, and Information, University of the Basque Country, Donostia, San Sebastian.
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.

MA in Reasoning

A programme at the University of Kent, Canterbury, UK. Gain the philosophical background required for a PhD in this area. Optional modules available from Psychology, Computing, Statistics, Social Policy, Law, Biosciences and History.

MSc in Cognitive & Decision Sciences: Psychology, University College London.
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 Mathematical Logic and the Theory of Computation: Mathematics, University of Manchester.
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 Sebastian).
Open Mind: International School of Advanced Studies in Cognitive Sciences, University of Bucharest.
PhD School: in Statistics, Padua University.

Jobs and Studentships

Jobs

Associate Professor: In Philosophy of Science, University of Geneva, until filled.
Post-doc Position: in Metaphysics of Causation, Philosophy, University of Geneva, until filled.
Post-doc Position: in Set Theory, Torino University, until filled.
Assistant Professor: in Logic or Analysis, Department of Mathematics, University of Connecticut, until filled.
Post-doc Position: in Artificial Intelligence, Institute for Artificial Intelligence, University of Georgia, until filled.
Post-doc Position: in Causation and Explanation, Philosophy, University of Cologne, deadline 10 August.
Post-doc Position: in Philosophy of Science, KU Leuven, deadline 30 September.
Professor: in Philosophy of Science, New York University Shanghai, deadline 1 October.

Studentships

PhD Position: on project "Non-Classical Foundations of Mathematics," Department of Mathematics and Statistics, University of Canterbury, New Zealand, until filled.
PhD Position: on the project "Models of Paradox," Philosophy, University of Otago, until filled.
PhD Position: in Philosophy of Simulation, Institute for Philosophy, University of Stuttgart, deadline 20 August.
PhD Position: in Foundations of Individual Choice, TiLPS, Tilburg, deadline 1 September.