

# **Three Cultures**

## **or: what place for logic in the humanities?**

Greg Restall

*School of Historical and Philosophical Studies*

*The University of Melbourne*

[restall@unimelb.edu.au](mailto:restall@unimelb.edu.au)

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I am faced with a question—how can I introduce logic and its place in the humanities to a broad audience?

I suppose I could try show you what I *do* when I do logic, but a lot of that work is, frankly, forbiddingly technical. It requires a great deal of background knowledge to explain, so that sort of essay is *Not Very Accessible* for a general audience. I would just end up showing you *pictures* of logic, and this would either baffle you with technicalities that I would leave unexplained, or bore you or lose you with them if I tried to explain them. I would end up *describing* work in logic. This wouldn't give you any way to *enter into it* any more than talking about swimming manages to get you wet. You would be a spectator, not a participant.

You can do more in an essay than to place your reader in the role of a spectator. A *philosophical essay* in the traditional mode aims to address *Grand Themes* in a way that somehow manages to be entertaining, yet thoughtful, accessible to a wider audience, while touching on current research. It's a difficult bar to jump, but that's what I am going to try to do. I am going to *do* some philosophy here, and along the way, I hope to draw you into the activity. However, at the very same time, I am going to invite you to think about logic.

The problem I would like us to think about, is the place of logic in the university, in particular, its place in the *Humanities*. To put it simply, this is a problem of *Location*. I spend my time in a Philosophy program in a School of Historical and Philosophical Studies, inside a Faculty of Arts. I am surrounded not only by Philosophers (most of whom don't do logic), but also by colleagues who work in History and Philosophy of Science, Classics, Archaeology and History, and then, in other schools in the Faculty, I have colleagues in Literature, Theatre Studies, Anthropology, Linguistics, Languages, Sociology, Political Science, Criminology, and many other fields besides. Given that more than half of what I write is technical, formal and mathematical, you would do well to ask why a logician is

situated there rather than with my colleagues in the Sciences, or in Engineering. Perhaps logic—and logicians—best belong there, not in an Arts Faculty.

This question of location was a significant personal choice when I began my academic journey. After I completed honours in the Mathematics Department at the University of Queensland in at the end of the 1980s, I moved across campus to the Philosophy Department for Doctoral study with Professor Graham Priest, the notorious radical, who had recently arrived in Brisbane to take up the Chair in Philosophy. The move from one part of the campus to the other was a very short distance on the ground, but the cultural distance between Mathematics and Philosophy could not have been greater. I felt at home in my new setting, it was clear that Philosophy was the best home for the kind of work that I wanted to do, the kind of work that made my interest, and skills come alive.

Here I want to explain that choice, to explain why this is not just a personal and idiosyncratic decision—it's not just based on the fact that, frankly speaking, philosophers are a lot of fun to be around—and it's not even because working with philosophers is intellectually engaging and productive for a logician like me, but rather, it is that the kind of work that a logician like me *does* has a role to play in the wider community of the Humanities.

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One of the things that Philosophers do when confronted with a conceptually complicated issue is to *draw distinctions*. Having a concept is good, but for a philosopher, dividing it into two distinct concepts is better. So let's start here, by drawing distinctions between different kinds of questions about logic and its location in the humanities.

Friends of the Humanities will be relieved, I hope, that this will not be yet another presentation of the so-called “crisis in the humanities.” I will not be talking about the parlous state of the humanities, or why it is that the world needs the humanities, or the ructions in university financing which sometimes imperil the humanities, or the way the humanities are either wrong (or right) to ignore the sciences...

(As an aside, perhaps I should make the point that in a country where the then Shadow Treasurer spends precious time in a press conference about election costings in the final days of an election campaign openly mocking an Australian Research Council funded project on “The God of Hegel's Post-Kantian Idealism” by name,<sup>1</sup> you must understand that we have some way to go before the Humanities will be widely accepted as a valuable component of a thriving society. As tempting as it is, in this context, to give a full-throated

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<sup>1</sup> “Academic ridiculed by Coalition, says Sydney University vice-chancellor,” Josephine Tovey, *Sydney Morning Herald*, September 5, 2013 <<http://www.smh.com.au/national/education/academic-ridiculed-by-coalition-says-sydney-university-vicechancellor-20130905-2t86l>>.

defence of the importance of the philosophy and the wider humanities, I am not going to do this here.)

Furthermore, I am not going to try to convince you that the humanities should be ‘more logical,’ whatever that would mean. By temperament, I am a pluralist. I identify with the first part of the famous Maoist slogan “Let a hundred flowers bloom, let a hundred schools of thought contend”. I prefer the first half of the slogan to the second, because I would very much prefer it if we could simply let the flowers bloom and get along with each other rather than require that they contend with each other.

So, this is not going to be one of those essays where someone from a vantage point of supposed superiority berates those who don’t follow their particular set of disciplinary norms. It’s not for me to say how other disciplines in the Humanities regulate themselves and do their work. As I hope to make clear, there are very many different disciplinary norms and conventions, and very many different ways we can explore what there is to be understood. It would be a very drab place if every endeavour of each different Humanities discipline looked like the kind of work that *I* do in philosophical logic—or if the norms of any one discipline were followed in every other discipline. Instead of a *competition* or *contention* between different disciplines, I am going to show you some of the features of one disciplinary flower I’m rather fond of, and attempt to explain its place among other flowers and plants in the garden that is the humanities.

So, I am *not* going to add to any of the usual discussions over the state of the humanities, other than very tangentially. I am going to take the humanities as a *given*, not as something in need of justification or critique, or in need of grounding in anything else more fundamental. I will examine these issues from what is a quite different angle.

Remember, my problem is the problem of location. What place does logic have here in the Humanities? Doesn’t it belong with mathematics, or with computer science, or somewhere else in the University, or perhaps not in the University at all?

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It is worth taking the historical perspective, because this is a problem which is manifest in the second half of the 20th Century and into the 21st. It was not a pressing problem before that. The study of logic was a central component of all undergraduate studies at many of the traditional universities from the 13th Century onwards.

More recently, and closer to home, at the University of Melbourne at its foundation, Logic was one of the central disciplines, with every student in the incoming classes required to study it.

It's not the same at the University of Melbourne today. Our introductory logic class,<sup>2</sup> while available to all incoming undergraduate students, is taken by only around 120 of the thousands who are eligible. In the modern university, logic has flourished as a research discipline. It has taken leaps and bounds in the 20th and 21st Centuries, so that it is transformed beyond the wildest dreams of any logician working even in the first part of the 20th Century, but with all of this flowering of research, it has lessened in relative importance in the academy's teaching portfolio since its glory days of the 19th Century.

One reason for this is greater specialisation and differentiation. This isn't the renaissance. Most of us aren't blessed with an all-round education, because there is too much to learn. Not only do most incoming students avoid logic. None of the subjects of the 19th Century curriculum are taken by most incoming undergraduates, because there is no single subject taken by most of these students. There are many more students, many more options, and there is no set menu for everyone. *All* disciplines are minority efforts when viewed against the vast student body of the modern university.

Specialisation also occurs on the supply side of the system. It's not just students who specialise, academics specialise more. Back in the 19th Century University, the person who taught *Logic I* may also have taught *Hegelian Philosophy*, or *Latin*, or *Psychology* or *Literature*. These days, that kind of generality in expertise is unheard of. Logic is often taught in the modern university by someone with a specialisation in some other area of philosophy (or mathematics, or computer science or engineering), but nonetheless, academics are much more specialised than we were only 50 years ago, let alone 150 years ago.

Increasing specialisation involves increasing differentiation between disciplines, each acquiring more specific and idiosyncratic topics, traditions and techniques. With greater *differences* between disciplines, there is less shared ground, and communication between disciplines becomes correspondingly more difficult.

This is, primarily, a cultural problem: the research culture of logic—the kind of work that it produces—seems radically alien to that of its neighbours elsewhere in philosophy, let alone in nearby disciplines like *History*, *Cultural Studies*, or *Anthropology*. To understand the differences and the similarities between these disciplines, and the scope for fruitful communication between them, it would be good to tackle this question head-on by looking at research cultures.

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<sup>2</sup> The unit is UNIB10002 *Logic: Language and Information* <<https://handbook.unimelb.edu.au/view/2013/UNIB10002>>.

Ever since C. P. Snow's influential 1956 essay "The Two Cultures",<sup>3</sup> it has been a commonplace to consider the cultural differences between the sciences and the humanities, and to examine and explain these differences, and perhaps to argue for the need for people to communicate across the divide—for a new renaissance ideal intelligence which would be familiar with both the sciences and the humanities, resulting in more humane scientists, or more scientifically literate humanists.

I take Snow's distinction to be an important insight into cultural differences between physics and poetry, between chemistry and cultural studies. However, other disciplines in the modern university don't fit so well into this binary classification of the humanities and the sciences. We might think that computer science is a science, but what of *education*? What of *architecture and design*? What about *social work*? None of these disciplines fit neatly into the binary classification, and more is going on in the world of knowledge structured by university Faculties and Departments than the split between the humanities and the sciences.

Instead of Snow's classification, I propose a *threefold division*, between the *humanities*, the *sciences* and *engineering*—but in what follows I don't want you to think of them as providing a sharp division of the field. Instead, consider them as partially overlapping, for some disciplines and approaches will draw from more than one emphasis (and possibly all three). Let's consider them one-by-one.

The *Sciences*, include physics, chemistry, biology, but also mathematics, computer science and related fields. When we examine what is shared between these disciplines, we find that they aim to give objective, third-person descriptions of the world (whether the world of physical processes or ecologies, or mathematical reality, or the spacetime manifold.) Many branches of the sciences trade in *prediction* and testing of hypotheses, on the basis of observation and the development of theory. Not all sciences partake in these approaches equally—mathematics as an '*a priori*' science doesn't go in for observation and testing as much as chemistry does—though perhaps computational techniques in mathematics bring these closer to the fore—but this cluster of features seems to describe the kind of family resemblance among the sciences reasonably well.

The *Humanities*, on the other hand, include literature, poetry, history, classics, philosophy, much of cultural studies, and other related fields. This is not the world of observation and prediction, of objective third-person descriptions of reality. To put the difference starkly, if we made contact with aliens, if we could ever get to talking at all, we would expect to be able to eventually translate between their mathematics and ours, their physics and ours, and so on—it's the same world we inhabit, and although we may describe its features in

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<sup>3</sup> C. P. Snow "The Two Cultures", *New Statesman* 1956. Published online in 2013 <<http://www.newstatesman.com/cultural-capital/2013/01/c-p-snow-two-cultures>>. Snow expanded on the essay in a 1959 lecture in Cambridge, which was then published as *Two Cultures and the Scientific Revolution* (1959), Cambridge University Press.



very different ways, and they and we might have learned different things, our sciences, insofar as they are about the same thing, should cohere. If they didn't, then the aim would be for one to revise and correct the other, or for us to both expand our horizons to include both. This is a part of what it would be to take those theories to be describing a shared world.

There is no expectation that the same thing need occur in the humanities. The humanities, at heart, aren't just about an objective reality to be described from a third-person, observer-independent view from nowhere. They are, at their core, expressive, first-person, involving agency and subjectivity. We should not expect that the poetry or historical narrative or philosophy of some alien race—if they were to have such things—would be *at all* comparable or coherent with our own. These subjects involve us, and the view from here is a part of their *content* in a way doesn't seem matched in the sciences.

None of this should be understood as saying that the sciences do not involve creativity or agency. However, it is a part of the subject matter of the humanities in a way that it isn't for the sciences. The disciplinary norms of the sciences direct us toward observer-independence, repeatability, objectivity, etc. Not so, in the humanities.

However, these two clusters of disciplines and approaches do not exhaust what is distinctive about knowledge and research in the contemporary university. We aren't here just to understand the world around us, or to understand ourselves. We have disciplines in our university which take it on themselves to also intervene and change the world. This is not the world of the sciences or the humanities—it is the world of the engineer.

An engineering discipline does not just seek to describe the world, whether objectively or in a way essentially involving subjectivity—it aims to intervene in the world, to study that intervention, and to provide new means with which to intervene in the future. The aim is to solve problems involving our *action* in the world around us and not merely concerning our knowledge of that world. Engineering disciplines are focussed on specification, design, intervention, construction and action. These disciplines include not only the traditional disciplines of mechanical, electrical and civil engineering and the like, but also much of architecture, and parts of law, medicine, education, and social work.

So, we have at least three different clusters of disciplines. These are not meant to be mutually exclusive categories of course. There are all sorts of overlaps and boundary cases: Political Science may have a good claim at being in the boundary of the sciences, the humanities and in engineering. The same could be said for architecture.

I don't offer this analysis as an ultimate explanation of why the disciplines are like they are, or how they are situated in the University. The boundaries I have drawn aren't designed to cut at historically significant joints in our traditions or institutions. Rather, it seems to me

that these are useful enough ways of understanding salient differences between disciplines which fall under each umbrella. The criteria cluster together well, they bear some resemblance to the disciplinary families of the *Humanities*, the *Sciences* and *Engineering*, and they can do some explanatory work for us—we can explain differences between disciplines in terms of the different approaches and techniques they employ.

This attention to disciplinary differences raises my initial question much more starkly. Why does *Logic*, which can look as abstract as the most abstruse mathematics, belong in the Humanities? Surely it is a paradigm science? And the way logic can be implemented in computer software has more to do with engineering than anything else. Logic has been found inside linguistics, mathematics, computer science and electronic engineering. Is its allegiance with philosophy simply a hold-over from its 19th Century roots? Has the transformed technical, formal logic of the 21st Century stayed with Philosophy inside the Humanities merely because of inertia, rather than anything intrinsic to the discipline?

To give an answer this question, we need to attend more closely to the nature of academic disciplines, and how to understand cultural differences between those disciplines.

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There are many different features of research cultures that distinguish one from another. Different disciplines have distinct aims and values, different traditions, different problems to tackle, different questions to ask. They have different techniques, they apply different *tools*. They have different narratives which are told to pass down the culture and to inculcate expectations in researchers. There are distinct gatekeepers, who police admission into the various levels of the discipline: whether journal referees, conference organisers, and so on. Disciplines are distinguished by having different heroes and villains—they have their own distinct examples of how to do things *well* and how to do things *badly*. Each of these different features distinguishes one discipline from another.

To use an image, a discipline is a kind of *tool* for solving problems and for engaging with the world in a particular way, and different tools have different affordances. If you pick up a hammer, then it's prone to be used in a particular way—most likely, to hit things. It lends itself to that in a way that it doesn't lend itself to tightening bolts. If you have a hammer, then the kinds of problems you're prone to look for are nail-involving ones. If you have a wrench, you won't be looking at dealing with nails, but with nuts and bolts.

Different tools have different affordances: they will be engaged with and applied in different ways.

What kind of tool is logic? How is it apt to be used? If you take a look at contemporary work in logic, one thing immediately stands out: it's *abstract* and *formal*. Much of it looks just like mathematics.

This mathematisation of logic is a significant development over the last 160 years, with the algebraisation of logic begun in our tradition in the work of George Boole in 1840s and 50s and Augustus de Morgan in the 1850s and 60s.<sup>4</sup> However, the application of mathematical techniques to logic dates back much further, to the work of Gottfried Leibniz in the 17th Century.

It's very tempting to think of this mathematical logic as primarily a form of *calculation*: the parallels with arithmetic seem compelling, especially in the first flush of the realisation that some simple transformations in arithmetic have parallels in logic. This attitude is reached its highest expression in Leibniz himself, when he writes in *The Art of Discovery*:

The only way to rectify our reasonings is to make them as tangible as those of the Mathematicians, so that we can find our error at a glance, and when there are disputes among persons, we can simply say: *Let us calculate*, without further ado, in order to see who is right.<sup>5</sup>

As attractive as this idea is to many, we now find it charmingly naïve. It is not how logic works—at least, not to those who understand logic. Logic does not provide us with the means to conclusively settle each and every dispute of any matter of fact or of opinion.

Yes, logic, like mathematics, is formal and abstract. One of its affordances is the move to *abstract away* from the particulars of subject matter, to focus on forms. In this way our attention is fixed on propositional structure, not on content.

Logical analyses give rise to different ways of looking at how propositions are connected to one another, different analyses of notions like *contradiction*, of *equivalence*, or *entailment*. None of these analyses give us an epistemology that could even possibly dictate agreement on all questions, because no account of the structure of claims or the ways that propositions are connected to each other will in itself supply an undisputed ground from which all truths can be derived. Logic it's not designed to solve every question of epistemology.

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<sup>4</sup>George Boole, *An Investigation of the Laws of Thought on Which are Founded the Mathematical Theories of Logic and Probabilities*, (1854) Macmillan. Augustus de Morgan, *Formal Logic or The Calculus of Inference* (1847) Taylor & Walton; Augustus de Morgan, *Syllabus of a Proposed System of Logic* (1860) Walton & Malbery.

<sup>5</sup> *The Art of Discovery* 1685. See *Leibniz: Selections*. Edited by Philip P. Wiener. Charles Scribner's Sons, 1951.



What sorts of questions is it designed to answer? There are many things, but I will focus on three, to give you a sense of what logic is able to do. We have already seen one:

*What is Logical Form?*

20th Century Logic has seen a flowering of analyses of logical structure, from the halting steps of Boole and de Morgan, to the thriving industries of formal syntax in the tradition of Richard Montague, who showed that a coherent, uniform and enlightening account could be given of the logical structure of statements in complex and messy natural languages.

This is one affordance, the move to abstraction and the quest for structural features which can help us give a uniform account of the way that the meaning of a complex expression is given by the meanings of its parts and the way they are put together. The aim is to understand how that statements can be combined, and to see what this account of structure can tell us about the connections between sentences and how they are to be interpreted.

Two further traditional affordances in work in modern logic are found by looking at the two main branches of the discipline of logic: *Proof Theory* and *Model Theory*.

In *Proof Theory*, the objects of study are individual inference steps and ways to combine these into proofs from premises to conclusions and other sorts of deductive structures. These provide a bridge of reasoning, leading you from premise to conclusion. The aim is to provide a simple toolkit of basic inference rules and to show how a vast range of proofs can be constructed out of these simple rules. Then you demonstrate various properties of these proofs, how to transform them, etc. The aim is to learn the properties of these bridges, which establish connections between statements: in understanding proofs you understand how propositions are linked together. The search for a proof which leads to our desired conclusion results in a search for all of the considerations required to establish that proposition. If we have a strict limit and control on the acceptable steps that are to be used, then this forces us to make explicit every piece of information that is needed to establish the conclusion. The search for proofs doesn't conclusively tell you whether your conclusion is true or not—because the question of truth arises for the premises you use—but the search for a proof helps you chart out where you might next look, to figure out whether or not your conclusion is true.

In *Model Theory*, we learn the reverse: we learn how to *separate* statements, not how to connect them. Models provide a way of interpreting statements, of showing how they could be made true or false. If you are unsure if you can find a proof which leads you from one statement to another, from a putative premise to a possible conclusion, if you can find

a model according to which your proposed premise is true and your tentative conclusion is false, then you can stop looking for your proof. This model provides a *barrier* to that journey. If you want to get from your premise to your conclusion, you can't get there from here alone—you need to add more information to your premise. The model shows you one way that the premise could hold without bringing the conclusion along with it.

Those are the kinds of tools that logicians use in their studies: formal languages, proofs and models. The forms take many shapes, as do the proofs and the models, but the core techniques are refined and applied again and again.

One of our great heroes of the 20th Century is Kurt Gödel,<sup>6</sup> who proved what we now know as a *Soundness and Completeness Theorem*: to the effect that (in certain, well-specified languages) if we have an argument from given premises to a conclusion, then that argument either has a proof which leads from the premises to the conclusion, or there is some model that shows how the premises can be true without the conclusion being true but not both. Proofs and models split that space right down the middle. Simply stating this result clearly was a conceptual advance, and precisely and formally proving it was an intellectual triumph, using techniques which we use again and again in the discipline.

(Gödel is famous for many more things than his completeness theorem. He is also famous for his so-called *incompleteness* theorems, which provide limitations to the completeness theorem for more complex languages. This result—like the completeness theorem—comes from the application of rigorous formal logical techniques to the language of logic itself.)

With that sketch of the kinds of things logic does, I fear that I have made things *worse* for my case, rather than better. This sketch of the tools and affordances of contemporary work in logic has painted a picture that looks nothing like what you find in other humanities disciplines.

What we have is a different sort of flower, I agree—unlike anything else in the Humanities garden, but in the rest of this essay, I'll explain why it has a home there.

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First, it seems that the attention to *form* and *structure* places logic closer to mathematics than the humanities. There are mathematical aspects to what we do as logicians, but that does not take us out of the realm of the first-person and expressive, the kinds of considerations important in the humanities. After all, form and abstraction have played a role in other disciplines, such as the visual arts. The sketches of Picasso and the paintings

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<sup>6</sup>Juliette Kennedy's *Stanford Encyclopedia of Philosophy* article "Kurt Gödel" (2011) is a good introduction to Gödel's work and its significance <<http://plato.stanford.edu/entries/goedel/>>.

of Mondrian, are highly abstracted—they play with form. They help us see very particular aspects of a scene, or focus on very particular behaviours of combinations of colours and shapes. There is nothing inexpressive in the move to abstraction. Abstraction plays a role in the expressive as well as the descriptive. It is a means to facilitate focusing on one aspect of a phenomenon, and to identify features which may repeat in other phenomena. This has a role in the expressive disciplines of the arts and humanities, as well as in mathematics and the other sciences.

So let me attend directly to how logic can inform the humanities, and be informed by the humanities. Let's see a little of the potential ecology of this part of the garden.

The way that logic is often taught might lead you to believe that its role is that of an intellectual antiseptic, disinfecting us from error and setting reasoning straight. This is the least of logic's roles, if it is logic's role at all. How arid it would be for logic if all its task were to discipline other fields of inquiry? Perhaps something can be learned if we engage in this task, but it will not take us very far. There is so much more that logic can do. It is more interesting we look more carefully at how logic is realistically applied. What are the natural applications of the affordances available in logic?

The habits of thought formed in building barriers and bridges of reasoning, of connecting our concepts in proofs and separating them in models are so important when it comes to developing theories, in weighing them up, in comparing and contrasting them.

The habits and form of thought that are gained in working on logic (and which are then taken as the object of study in logic, but are used elsewhere) will have their place as a tool, as a suite of examples, to be used as a part of one's conceptual repertoire, if you're developing theory, in the Humanities or elsewhere.

In logic, we learn how to inhabit a theory from the inside (*using* that theory, deducing things from it, seeing how its claims can be derived, taking its claims as premises to be used in deriving other things), and we learn how to examine a theory from the outside (*mentioning* that theory, considering ways it could be interpreted as true, or interpreted as false, considering different models of the theory). This is a powerful and important skill to learn, and learning it is not at all straightforward. It requires both a kind of *distance* (disengaging with what the theory enough to consider different ways to interpret it) and a kind of *presence* (a kind of empathy involved in "trying the theory on for size"). You're not merely categorically judging the theory as correct or as incorrect, but you make conditional and partial judgements of the form: *if the theory is correct then...*, and if the world were like *that*, then this theory would be..., and so on.

The skills, of a kind of empathy and distancing, viewing theories from the inside and from the outside, are ways of engaging with views of the world. These are the skills of the same

kind that you might learn in literature, drama, psychotherapy or history, but they are learned through very different means. In logic, we learn them in a distinctive mode, where the theories or descriptions of the world, claims of how things are form our focus, and in which the structural and formal features of these judgements are the linchpin for our analysis.

Regardless, like these other disciplines of interpretation, logic—when learned well—helps form in us, shaping in us distinct ways of engaging with judgements. It teaches us different ways of seeing, and those ways of relating to theories are themselves a part of the study of logic itself. Proof and inference on the one hand and models and interpretation on the other, are different ways of engaging with meaning, with judgements. *Pragmatics*, the kinds of things we can do with our thoughts and our talk is bound up with *semantics*, our account of what those thoughts and talk *mean*.

It is clear, I hope, how these tools and techniques can play a role in philosophy and other humanities disciplines. To take our lead from Wilfrid Sellars' famous slogan about the nature of philosophy:

The *aim* of philosophy, abstractly formulated, is to *understand* how *things* in the broadest possible sense of the term *hang together* in the broadest possible sense of the term.<sup>7</sup>

It's clear how logic will play a role in the development of philosophy viewed in this way. Understanding how things hold together requires relating and combining our partial, tentative, theories of things. We want to understand how our talk of minds can hang together with our talk of molecules; how talk of morals relates to our talk of mathematics. Logic provides tools for relating theories, for making clear how they hang together or can be kept apart.

The logical analyses of the concepts of possibility and necessity, in the work of pioneers such as Ruth Barcan Marcus have played an important role in the development of different positions in metaphysics throughout the second half of the 20th Century.<sup>8</sup>

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<sup>7</sup> Wilfrid Sellars, "Philosophy and the Scientific Image of Man," in *Frontiers of Science and Philosophy*, edited by Robert Colodny (Pittsburgh: University of Pittsburgh Press, 1962), page 35.

<sup>8</sup> See Ruth Barcan Marcus, *Modalities: Philosophical Essays*, Oxford University Press, 1993, for a collection of her important papers.

The formal and logical semantics originating with the work of Richard Montague<sup>9</sup> provides a framework for showing ways that large classes of claims may “hang together” by showing how they can be interpreted together, in a large and wide-ranging semantic framework. These tools in formal semantics have provided a impetus and insight into work not only in philosophy of language, but also those parts of linguistics that deal with the semantics of ordinary languages, as well as in psycholinguistics, and cognitive science.

So, logic can provide cognitive skills of use throughout the humanities, as well as providing frameworks that have been taken up in philosophy and linguistics. Logic can be a *contributor* to those fields around it in a way that is far more productive than merely being arbiter of ‘correct reasoning.’

I am more interested, however, in the reverse part of the ecology of the garden. Logic can not only inform the humanities, it has much scope to be informed by them.

I have already hinted at one avenue for such a connection, the link between semantics and pragmatics. A growing theme of 20th Century and early 21st Century philosophy is the move to *expressivism*. We explain a concept not at first in terms of what it says, but in terms of what one can do when one has the concept. Instead of explaining what *truth* is, contemporary theories of truth start by asking what one is saying when one says that a proposition is true. (Minimalism about truth holds that to say that “The Upfield Line goes through Brunswick” is true if and only if the Upfield Line goes through Brunswick.) Deep questions in the philosophy of logic arise when we ask how it is that concepts get the meanings they have—and in particular, how logical concepts get the meanings they have.

An example of recent work here is a provocative paper by Mark Lance and Heath White, “Stereoscopic Vision: Persons, Freedom and Two Spaces of Material Inference.”<sup>10</sup> They argue that agents who are able to *act* together in a world in the basis of their *view* in a *community* will need to be able to engage with information in two different ways. If I act on the basis of my beliefs, I need to be able to *plan*, to be able to ask would happen *if* I chose to do this—what might happen? That’s how I make an informed choice about whether or not make that choice, by way of my understanding of its consequences. Reasoning about possible actions involves a kind of subjunctive reasoning.

If we are in a world together, I do well if I can come to agreement with you, or at least be informed by your view of that world; for at least sometimes you have information I do not, and sometimes you are right and I am wrong. I need to be able to ask *if* you are correct, and

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<sup>9</sup> See, for example Richard Montague, *Formal philosophy: selected papers of Richard Montague*, edited and with an introduction by Richmond H. Thomason, Yale University Press, 1974.

<sup>10</sup> Mark Lance and Heath White, “Stereoscopic Vision: Persons, Freedom and Two Spaces of Material Inference,” *Philosopher’s Imprint* 7.4 (May 2007) pp. 1-21 <<http://hdl.handle.net/2027/spo.3521354.0007.004>>.



to consider what things might be like if your judgement were correct, not mine. That's not subjunctive reasoning, but a kind of indicative reasoning.

These two kinds of conditional judgements are similar, but not the same. They are grounded in two different kinds of acts of suppositions: the indicative act of supposing you are right (contemplating changing one's view on the world), and the subjunctive act of supposing things were different (contemplating changing how the world is). Lance and White argue that these distinct capacities help ground different features of our concepts. Supposing Oswald *didn't* shoot JFK is evaluating things from a different view of the world (assuming that I'm wrong, and trying out a revised picture of how things are). Supposing Oswald *hadn't* shot JFK is considering another way that things could have gone.

Lance and White provide an important and novel account of some of what is involved in being in the world for creatures like us. It's a kind of transcendental philosophy in the tradition of Kant's *First Critique*, in which our capacities help constitute the boundaries of our conceptual space. This work sits in that grand tradition.

But like much of 20th and 21st Century work in that tradition, Lance and White move beyond the solitary individual analysis of concepts in terms of our capacities for thinking inside our own skulls. Reasoning and supposing and representing are tied up with the essentially *social* practices of communicating with each other. We would not be able to represent the world to ourselves in language if we were not able to represent our views to each other. In the tradition of Sellars, they think of belief as internalised speech, rather than speech as externalised belief.

Whatever direction *you* take the connection between talk and thought to be, there is no doubt that our conceptual capacities are bound up with each other: we learn from each other, we acquire concepts from each other, and the vast bulk of the way I have of representing the world is acquired from my teachers and forebears. The norms we have for reasoning and inferring are at least in part, *social* norms governing how we are to communicate together. By the mere fact of our being in the one speech community, what you say bears on what I say. We learn to navigate around one another, treating each other not only as obstacles to be dealt with, but as agents who have their own views. To learn to reason well involves treating each other with a certain kind of due concern, which Miranda Fricker has called "epistemic justice".<sup>11</sup> Norms governing interpretation of each other, at the very bare level of taking another to be a part of my speech community, to interpret you as having something to *say* draws logic and semantics much closer to ethics than has traditionally been understood.

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<sup>11</sup> Miranda Fricker, *Epistemic Injustice: Power and the Ethics of Knowing*, Oxford University Press, 2009.

My own work in two dimensional modal logic, which I have pointed to as an example of exceedingly technical and abstract formal logic<sup>12</sup> was in fact, crucially informed by Lance and White's work. I used that paper to motivate a new kind of proof structure which makes room for indicative and subjunctive supposition, and therefore makes for a new kind of meaning analysis for the philosophically important concepts of *necessity* and *a priori knowability*. That work in *logic* would have been impossible without the pioneering philosophical work of Lance and White.

This role of *pragmatics*—of paying attention to things that we can *do* with our concepts, and using this in developing our theories of meaning—goes far beyond attention to two kinds of supposition. One of my personal heroes of logic, Nuel Belnap, has argued quite forcefully that logicians' attention to declarative sentences—sentences which make statements that are either true or false—is a parochial restriction of attention to particular conceptual capacities in our development of our theories.<sup>13</sup> He argues that the many other things we can do with our words—to request, to question, to exclaim—all of these other speech acts are worth equal attention with declaratives, and that wherever we logicians and philosophers need to pay attention to language, we need to pay much more attention to these other speech acts.

This is where logic, as traditionally studied, needs its neighbours in the humanities, to help us expand our field of view. There are plenty of things we can do with words and concepts. Logicians need to pay attention. The forms that our thought and talk can take are delightfully rich and subtle, and so are the norms that govern those different kinds of thought and talk.

Our colleagues in the other humanities disciplines deal with different genres and forms of thought and talk all of the time, and it would do us well to become more familiar with the vast range of expressive capacities we have, if logic is going to play its role in informing us and guiding us about how our ideas and concepts can hang together, and how they can be interpreted. The different modes we have for representing our world and our places within it involve a vast array conceptual capacities. If my tiny moves in the direction of incorporating different modes of supposition provide advances in our understanding of the logic of *necessity* and *a priori knowability*, then attention to a greater range of conceptual capacities could enrich logic all the more.

So, this is why logic has a place in the humanities, not just because our thought and talk about the world is a human practice (the same could be said about accounting or Magnetic Resonance Imaging, and we are not installing lecturers in accounting or MRI machines in

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<sup>12</sup>Greg Restall, "A Cut-Free Sequent System for Two-Dimensional Modal Logic: and why it matters" *Annals of Pure and Applied Logic*, 163 (2012) 1611–1623 <<http://consequently.org/writing/cfss2dml/>>.

<sup>13</sup>Nuel Belnap, "Declaratives are not enough," *Philosophical Studies*, 59:1 (1990) 1-30 <<http://www.jstor.org/stable/4320114>>.

our departments). The connection is deeper than that: Logic is a part of the humanities because reflecting on the practice of reasoning and representing the world—and reflecting on that practice as an involved subject from the first person perspective—is an important part of doing logic. Reflecting on that practice (not only the phenomenology of it, from the inside, but also its history, its norms, its connections with other human practices) is an important part of the discipline of logic itself. It is not an optional extra, but part of what it is to understand the grounds of our logical concepts, what it is that we need to be able to *do* in order to take part in that practice.

In turn, learning how to reason well, understanding how reasoning works, reflecting on reasoning and its connection with other human practices—all of this can play a role in the humanities, too. If we all work in our own ways to better *understand* understanding, to understand ourselves and our place in the world, not only could we become good colleagues and partners to each other; I also harbour a shy hope that a shared and growing understanding forged in this way might help improve the world around us, too.<sup>14</sup>

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