Logique & Analyse **210** (2010), 185–210

PERNICIOUS LOGICAL METAPHORS

EDWIN COLEMAN

Exordium

(The titles I've used for sections are discussed later, under structure, in Confirmatio 2; they are taken from classical Rhetoric — exordium (introduction), narratio (statement of the case), divisio (outline of the parts of the text), confirmatio (positive argument for my thesis), confutatio (argument against objectors), peroratio (conclusion).)

I claim that there are pernicious logical metaphors. My primary example is 'logical construction', but I will also discuss some other, related ones. Such metaphors both derive from and foster a distorted and aggrandized conception of logic and a distorted and unhistorical conception of rhetoric. They are pernicious because they have these effects, which ramify into philosophy more generally. These metaphors distort how logic is conceived, and thus they distort conceptions of practices with logical components, particularly epistemology and mathematics. An understanding of the role of metaphor informed by classical rhetoric can make the use of such metaphors less pernicious.

Narratio

For many people the terms 'logic' and 'rhetoric' express an opposition — the aims and character of logic are thought to be diametrically opposed to those of rhetoric. This attitude generally rests on misconceptions about both logic and rhetoric, and on some ignorance of one or the other. The correct relation is this: logic is a sub-branch of rhetoric. There is a simple, general argument to this conclusion. The argument is this: rhetoric is the art of constructing persuasive texts; there are three sources of persuasive force for texts, namely logos, ethos and pathos; logic is the study of one of these; consequently logic is a branch of rhetoric. I will not defend this argument here however. For present purposes it will suffice to claim that logic and rhetoric are not disjoint. I will show this via the role of metaphor in logic.

The term 'logical construction' is a metaphor, which has been used in concert with a group of related metaphors, including certain uses of 'foundation' and 'reduction', 'Ockham's razor' and 'ontological economy'. These metaphors have had importantly pernicious effects on philosophical thinking. One of these pernicious effects is in epistemology, by deepening confusions about the reality of ordinary physical objects. A second pernicious effect, in the philosophy of mathematics, is the replacement of one insoluble pseudo-problem — locating the foundations of mathematics — by another pseudo-problem — determining the status of mathematical objects — as the main focus of attention. The use of these metaphors is pernicious, not because the use of metaphors is pernicious a such, but because such uses are thought of as mere decoration, dispensible from serious discourse. This idea is part of the trivialisation of rhetoric, a process which began in the Renaissance and needs to be undone so that such metaphors can be used less misleadingly. I outline some elements of what needs to be recovered.

Divisio

The paper has three main parts; in the first I explain why I say there are pernicious logical metaphors; in the second I defend this claim against some objections; in the third I explain how the bad effects of such metaphors in logic derive from a false and unhistorical notion of rhetoric.

The argument is divided up as follows.

Confirmatio 1

What "logical constructions" are supposed to be; that 'logical construction' is a metaphor; that such metaphors are pernicious.

Confutatio 1

That 'logic' is not just meta-mathematics, but includes using logical claims to further philosophical discussion.

Confutatio 2

That the development of varied senses comes from fading metaphors, but this does not show that the uses in question are not metaphorical.

Confutatio 3

That the dispensibility of metaphors in some circumstances does not show that these uses are not pernicious.

Confirmatio 2

That the identification of rhetoric with figurative language is a gross misrepresentation, for figures are an element in style, style is one of five offices of rhetoric, rhetoric is an integrated art of construction of good texts, and a good text is one that is persuasive for its intended audience; classically there are three main kinds of text, but they all need to make the three necessary and legitimate appeals to ethos, logos and pathos.

Confirmatio 3

That figures in philosophy have positive and negative effects, and in logical texts, too, writers aim to persuade, and to persuade of novelties; therefore they cannot rely on 'the usual' way of saying things — figures are necessary.

Peroratio

Several caveats need to be made, but there are pernicious logical metaphors.

Confirmatio 1

Logical constructions

Carnap's book *Der logische Aufbau der Welt* (Carnap 1967), mostly translated as *The logical structure of the world*, but sometimes as *The logical construction of the world*, takes as its epigraph this remarkable assertion of Russell's:

> "The supreme maxim in scientific philosophizing is this: Wherever possible, logical constructions are to be substituted for inferred entities." (Russell 1914, 155)

It seems indeed to have been Russell who made the term 'logical construction' popular; but what is a logical construction? An example he gives is this: the number 2 is the class of all couples, a couple being any class equinumerous with my hands, equinumerous being definable without mentioning numbers at all. Two classes are equinumerous if there is a bijection between

them, and 'bijection' can be defined without mentioning any numbers at all. Russell expounds this in (Russell 1919, 18) where he gives this justification:

> "there is no doubt about the class of couples: it is indubitable and not difficult to define, whereas the number 2, in any other sense, is a metaphysical entity about which we can never be sure that it exists or that we have tracked it down. It is therefore more prudent to content ourselves with the class of couples, which we are sure of, than to hunt for a problematical number 2 which must always remain elusive."

This is most unfair to the number 2, but we will come to that later. For now, we note that this construction of natural numbers from classes is merely the last step in a sequence of definitions, in which complex numbers were defined as ordered pairs of reals, reals as equivalence classes of Cauchy sequences of rationals, rationals as equivalence classes of ordered pairs of integers, and integers as equivalence classes of pairs of natural numbers. These prior constructions had not been called logical, but mathematical.

Another example was given by Whitehead, who showed that instead of postulating a point for any nested sequence of spatial regions one could just define a point to be an equivalence class of such sequences. So we can understand why Russell also says:

> "One very important heuristic maxim which Dr.Whitehead and I found, by experience, to be applicable in mathematical logic,and have since applied to various other fields, is a form of Occam's Razor. When some set of supposed entities has neat logical properties, it turns out, in a great many instances, that the supposed entities can be replaced by purely logical structures composed of entities which have not such neat properties. In that case, in interpreting a body of propositions hitherto believed to be about the supposed entities, we can substitute the logical structures without altering any of the detail of the body of propositions in question. This is an economy, because entities with neat logical properties are always inferred, and if the propositions in which they occur can be interpreted without making this inference, the ground for the inference fails, and our body of propositions is secured against the need of a doubtful step. The principle may be stated in the form: 'Whenever possible, substitute constructions out of known entities for inferences to unknown entities'." (Russell 1924, 160)

What are these "various other fields"? Russell and his followers like Carnap tried to emulate the mathematical definitions for non-mathematical concepts such as physical object. (Carnap writes "The present study is attempt to apply the theory of relations to the task of analyzing reality." (Carnap 1967, 7) Consequently we find Russell making claims like 'This table is a logical construction', while Wisdom devoted a series of articles in Mind, entitled 'Logical constructions', attempting to explain "what I mean when I say 'Pennies are logical constructions.'"

Both Carnap's and Wisdom's projects are recognised failures. Both can be seen as attempts to carry out the Russellian program of justifying our knowledge of the so-called external world via its reduction to so-called sense-data, though Carnap's aim is perhaps not so straightforward as that. No-one thinks this kind of project possible any more. But some other applications of the constructive move have longer legs. The paradigm, of course, is the Present King of France. In the flagship paper for this line of thought, "On Denoting" (Russell 1905), Russell had applied the method of logical analysis to solve the puzzle about the meaning of 'The present king of France is bald', a meaning which seemed elusive since neither its assertion nor its denial seems simply true. Relying on the new logic of Frege and Peano he paraphrased that sentence as 'one and only one thing is a present king of France, and that thing is bald' which can be labeled false without a qualm. To express precisely 'one and only one' he used the new notation of variables and quantifiers. The moral drawn from this is that 'present king of France' is an *incomplete symbol*, and the king himself is a *logical fiction* or *construction*.

Putting these various examples together, we can state the position like this. A putative entity is shown to be a logical construction when it can be defined precisely in terms of non-putative entities. In such a case, the usual means of "referring" to such things are shown to be incomplete symbols and to lack any real meaning of their own. But all those usages can be replaced by paraphrases using the definition, which dispense with such misleading expressions. In many cases the definition characterises the putative entity as an equivalence class under some relation, following the lead of the mathematicians, and of Frege, who did this with directions, for example. But the method of logical analysis is more general than that. That is the import of "On denoting".

The supposed advantages of logical construction are two-fold: security and economy. We do not need to make as many existential assumptions, of points or of numbers or of mysterious kings, or even of tables and pennies, because we can construct these things instead. Consequently we are less prone to have made a mistaken assumption.

'Logical construction' is a metaphor

Now it is clear to me that 'logical construction' is a metaphor. Stebbing puts her finger on some obvious problems with the phrase taken literally: as she says, "There is no doubt that it is an unfortunate expression, for it certainly suggests that something is *constructed*, which is not the case, and that *logic* is adequate to the construction, which is also false. Russell's habit of using "logical fictions" as a synonym for "logical constructions" makes matters worse." (Stebbing, 1931, 501). Stebbing was concerned with the more dubious cases of tables and pennies, but the point is general.

We can see that both her points hold good if we ask whether the number 2 is really *constructed* out of all two-membered sets, and if it is done with logic. Have these sets been put together? What would 'together' mean for such a gathering? In what sense are my eyes, the moons of Mars and the square roots of -1 "together"? What kind of structure do they and the rest compose ? What becomes of the structure if a couple is destroyed — or is that not possible in the realm of sets?

What may more reasonably be said to have been constructed is a definition, and the sign on the right of it, a new way of indicating the number 2. Even this is not quite literal since signs are abstract things, it is not this specific inscription on my text which is the sign, though it has the best case for being called 'constructed' since various pixels — physical items — have been put together — spatially — to form it.

It has been objected to the claim that 'logical construction' is a metaphor that we commonly talk about construction without meaning building construction or the like. We can speak of putting together a team, and so on. However this does not establish the point at issue since a great deal of our ordinary talk is metaphorical. I'll discuss this further below.

'Logical construction' is pernicious

It seems Russell confused himself with his terminology, since an incomplete symbol and what it might or not stand for — a logical construction or a logical fiction — can't possibly be the same thing. However this may be, as has been suggested, his rather sloppy usage in writing for general audiences. The main reason this metaphor is pernicious is that the supposed advantages from the technique are illusory but widely taken seriously. Disregarding the metaphorical nature of this terminology fosters exaggerated unfulfillable expectations about what can be achieved by logical analysis.

Security theatre

These expectations are particularly exaggerated and long-lived in the philosophy of mathematics. In the first half of the twentieth century, the philosophy of mathematics was dominated by the search for "foundations" for mathematics, in the second half most of the discussion concerned the so-called object problem. These two pseudo-problems correspond to the promises of security and economy held out by the metaphor 'logical construction' and a network of related terminology. The metaphor of 'logical foundations' is mutually reinforcing with that of logical constructions. Indeed, all construction requires foundations and there's not much point in foundations unless you are going to build — that is, construct — on top of them. What is it that we would like to build? In the case of mathematics, the short answer is, the whole of mathematical truth. But is anything actually wrong with mathematics as it stands (I use the word advisedly)?

The metaphors of construction and foundation impeded clear thinking about the nature of mathematics by reinforcing and exaggerating worries about certainty; by suggesting that better versions of mathematics were possible — better in the sense of stronger, more secure; and by encouraging the idea of 'foundational theories' as a kind of buttress to provide this added strength. Logicist, i.e. logical, foundations were the leading contender — Frege, Russell etc. (The other two main contenders were Intuitionism and Formalism.) Eventually it was conceded that there aren't any foundations to be found — but very reluctantly, and there are still some holdouts. Foundationalism in general is in some retreat, within epistemology and without.

(Weirdly, Shapiro has written a book (Shapiro 1991) with the title 'Foundations without foundationalism'. But the apparent self-contradiction is easily explained — foundations, he thinks, means no more than the development of attractive notations in which to do mathematical logic, indeed that's what it always meant really. But what was, or is, the point of doing mathematical logic? It was to find the foundations of mathematics!)

One cannot build without secure foundations — we all know the parable about building your house on sand. But was there any real evidence of shakiness in the plethora of beautiful and useful mathematical theories which had been developed prior to the so-called foundations crisis — Galois theory, the theory of differential equations, complex analysis, the theory of algebraic number fields etc etc? Frege invented his logic in order to be able to write a mathematics text-book which had no gaps in the reasoning. Frege's project was prior to the discovery of the contradictions we label Russell's paradox etc, not a response to it. It was not motivated by security paranoia. (This idea of a gap has both objective and subjective aspects. Wiles' original proof

of Fermat's last theorem had an objective gap , i.e. it wasn't really a proof. By contrast, the inference from Euclid's axioms to Pythagoras' theorem — A , so P — has a gap, but it is a subjective one. Mathematicians routinely compete to leave ever bigger gaps glossed with the word trivially: A, so trivially P.)

The whole project of shoring up standard mathematics with some foundational theory is absurd — it's the standard theories we use and will continue to use. They are far more secure than any philosophical theory about their "foundations".

False economy

There was long lull in philosophy of mathematics in the middle of the twentieth century as it sank in that foundations are a will o' the wisp. But Nature abhors a vacuum and eventually work resumed, now to focus on the status of mathematical objects such as numbers. Are there really and truly, numbers or any of the various other mathematica? The weak form of the answer most favoured is no, not really, really there are only sets. The stronger answer ("nominalism") is that there aren't really even sets, even they are just a façon de parler, some kind of construction out of signs. I think both these positions are absurd on the face of it, and still absurd when their attempted justifications are considered.

Much of this work is connected with the activities of Quine, Russell's intellectual heir. The leitmotif of this movement is the terminology of 'ontological commitment' and 'ontological economy'. This lingo is not commonly admitted to be metaphorical, but it gets metaphorical force by a kind of logical osmosis from 'logical construction'. The link is the continuation of the Russell technique of paraphrase into so-called 'canonical notation' (another misleading metaphor) first exhibited in "On Denoting". In *Word and Object* and other works Quine purports to cut a swathe through the undergrowth of reality, throwing out all kind of dubious entities such as possibilities, meanings — and above all sakes. Everyone apparently agrees that sakes are just a façon de parler and that there are better façons de parler in which we avoid mentioning them. But they are not shown to be imaginary by not talking about them.

Consider, for the sake of argument, the much more important real numbers — they reduce to (equivalence classes of sequences of) rationals, constructionists say. So by this construction we have effected an ontological economy. But have we really? We found out, if they are right, that reals are certain constructions out of rationals — but that shows that they do exist

(assuming rationals do), not that they don't exist. Pressed with this point, economisers may say that at least we need not as many different kinds of things, because clearly we have shown that reals are not fundamental — they are constructed out of rationals. It's like saying that wooden chairs are not fundamental because they are made out of wood. But this is also a mistake — it's not true that there are only rationals, because there are reals which are rationals and reals which are not. That's still two kinds of thing. (Ah, but they are all rationals — yes but they were all numbers anyway.) So what does it mean to call a category 'fundamental'? I'm afraid this is just another mystifying metaphor! Moreover it's not really the case that we have fewer kinds of thing. Now we have rationals and equivalence classes of sequences of them. In what way is wood more "fundamental" than chairs made out of it?

Why should we even consider the question whether there are numbers? Isn't it obvious that *17 is a prime number, therefore there are numbers*? Sometimes, though remarkably seldom, anti-realists try to show that there is a problem. The most explicit attempt is Chihara's. He writes (1990: 3–5):

> "Among the theorems of classical mathematics one finds countless existence assertions... How... are we to understand (them)?... (Literalists) maintain that the existence assertions of mathematics are not essentially different from (those) made in ordinary workaday contexts or in the empirical sciences: to say that a natural number greater than a million exists is just to say that there really exists a natural number which is greater than a million. Thus, to say that a set of such-and-such a sort exists is to say the same sort of thing one says in physics when one says that a molecule of such-and-such a sort exists: in the latter case one is saying that there is something which is a molecule and which is of such and such a sort; whereas in the former case, one is saying that there is something which is a set and which is of such and such a sort...."

So far so good, I would have thought, being a literalist myself: what's the problem? Chihara goes on:

> "Whatever the merits of such a response to the problem I have been sketching ..."

— but what problem? Only someone happy to beg the question could think that he had so far made out a problem —

> "it quickly leads us into some rather murky philosophical waters... it makes no sense to ask where [numbers are and we are admitting] a realm of entities that cannot be seen, felt, heard, smelled or tasted even with the most sophisticated instruments. But if this is so, how can the mathematician know that such things exist? We seem to be committing ourselves to the impossible situation in which a person has knowledge of the properties of some objects even though this person is completely cut off from any sort of causal interaction with these objects." (ibid)

Chihara assumes without argument that to know about X you have to causally interact with X. You can't kick numbers, so they aren't there. This is essentially the same prejudice Russell had about reference and sense-data. It would not be possible to take it even remotely seriously unless one *assumed* that my simple proof fails (*17 is a prime number, therefore there are numbers*), because the sentences therein have misleading "logical form". That's a metaphor too.

The same paraphrastic agenda underlies the rest of the anti-realists. At least Chihara offers some kind of argument for numbers being problematic. In his quixotic *Science without numbers*, Hartry Field does not even bother — he merely asserts baldly that there is only one good argument for believing in the existence of numbers, the so-called Quine-Putnam indispensibility argument, which his book aims to circumvent. Very few commentators have pointed out the massive cheek involved in this pushing of the burden of proof onto the plain realist. And of course, only a bounder like me would point out that trying to manipulate the burden of proof is a *rhetorical* device.

To sum up this somewhat tortuous point, the technique of approximate paraphrase into canonical notation is the thread which ties together these metaphors of construction and foundation and ontological economy and ontological commitment. They mislead us as to what is really happening when these paraphrases are made. Quine accepted that the claims of full equivalence for such paraphrases that had been made by Russell and Carnap were incorrect, but his substitute was the claim that they are pragmatically adequate — we can do what we need to with them. Asked to justify the economies in what we might do — why we might think to give up ordinary talk — in the end his only answer is "a taste for desert landscapes". But de gustibus non est disputandum, and even this appeal to taste is metaphorical!

How to make a table

Whatever one thinks about mathematics — and many philosophers think very little — it is even easier to see how this metaphor, or nest of metaphors, confuses thinking about material objects. Even if one felt more secure in talking about tables and pennies for having learned that they are "really" logical constructions, one cannot "really" just abandon ordinary ways of talking in favour of the epistemologically comforting ersatz. If this chair is a logical construction and I am sitting on this chair, then I am sitting on a logical construction. Stebbing pooh-poohs this inference as being as egregious a mistake as 'men are numerous, Coleman is a man so Coleman is numerous', but her reason — the claim that 'this chair is a logical construction' has a logical form quite different to what it appears — is quite misleading. What it actually means, according to her, is '"this chair" is an incomplete symbol'. But it isn't; unless we take seriously another of Russell's metaphors — "logically proper name" — which assumes that genuine reference cannot fail, so that we can only refer to whatever we are "acquainted with" (another dubious metaphor), and that is sense-data. Russell and others are fond of urging the epistemological advantages of so-called "acquaintance". Insofar as this means anything different to plain old 'know' (it comes from cognoscere indirectly), its primary meaning is personal knowledge — friends and acquaintances etc. To suppose as Russell did that a clear novel sense would be picked out by contrasting it with knowledge by description was over-optimistic to say the least. I *am* acquainted with this chair in the most straightforward sense, that's why I sat on it.

Confutatio

In this part I will deal with some objections to my main claim. This discussion will be general, taking the case of 'logical construction' as typical. First I consider objection to the description of such language as logical metaphor, second I consider the objection that it's not really pernicious because it is inessential. It's in dealing with the latter that the rhetorical context of logic becomes salient.

Before refuting some objections, I will make a few concessions. First, I do not claim that all metaphors are pernicious, or even that 'logical construction' is entirely pernicious. Actually I think that metaphors are an excellent thing; but we all know that you can have too much of a good thing, a fortiori, of an excellent thing. Nor do I think that any metaphor with pernicious effects should be extirpated from logic. My view is that it is disregarding or denying the metaphorical element, because of misunderstandings of logic

and rhetoric, which can lead to trouble. For that reason, among others, I don't wish to over-emphasis the demonic aspect of 'logical construction'; it is connected, as I have illustrated, with a number of other metaphors which have a similar ambivalence. And it is connected, though less tightly, to other logical metaphors which I did not discuss here; for example, the much older metaphor contrasting the form and the content of an argument. I do not want to exaggerate the strength of the claim I am making about the pernicious effects of certain metaphors. In every case I am happy to allow that other things are at work too in the production of the bad effects to which I point. For example, the foundations wild goose chase in philosophy of mathematics was prompted in part by the development of set theory and by the development of a more accepting attitude toward pure existence proofs in the 19th century mathematical community. My point is that it was never really *foundations* that were needed, but metaphors like 'logical construction' distorted our understanding of the problems.

Not logical metaphors?

One might admit that 'logical construction' is a metaphor, but deny its being really part of logic. What indeed is logic? For the most part in this paper I shall go along with the usage of mathematical logicians, for whom logic is, or has become, the study of "validity" in the technical sense — that is, the logical consequence relation — by means of the mathematical investigation of formal systems. I think both the object and the methods of logic are wider than this, though I will not insist on that here. But I distinguish three aspects of logic, or of logical work perhaps I should say. I am not interested here in the actual construction (!) of logical notations and systems, and the demonstration of their mathematical properties such as completeness. That's because I take that to be mathematical work. I distinguish the mathematical from the other work of formal logicians, because it it the latter but not the former that is ineluctably metaphorical. This "other" work is partly a species of applied mathematics, in which a logical system is used as a model for some range of ordinary reasoning. This is perhaps metaphorical in some sense, but I am not here considering the relationship of models and metaphors.

The third kind of logical work, and that most relevant here, is attempting to use mathematical logic in doing philosophy. A paradigm example is of course Russell's "On Denoting". Some other examples of logical work in this sense, which overlaps considerably with what is generally meant by "philosophical logic" (though that is a bad phrase) are any number of attempts to explain away vagueness, Lewis' modal realism as a means of puzzle-solving, numerous uses of Gödel's theorem to justify claims about

minds and machines, etc. In particular I take it that trying to understand and explain what we are doing when we do logic is part of logical work. It's in that work that these various metaphors have been used.

A second way of denying that 'logical construction' is a logical metaphor is to deny that it is really a metaphor. It's certainly true that 'construction' is used outside the building trade, and it also has the sense 'construe'. Most words have several different senses; one can use 'construction' literally when speaking of grammatical constructions, so why not of logical constructions? This response underestimates the prevalence of metaphor. There are at least two ways to argue for metaphorical omnipresence, even.

A good argument for metaphorical prevalence uses the phenomenon of so-called dead metaphor. What this means is that once you look for them, you find metaphors everywhere. Here's William Grey both saying it and showing it:

> "Any dictionary will quickly confirm that most of the words which we recognise as straightforward and literal are dead (or "frozen") metaphor. Moreover if one attends carefully to the sentences of any fluent speaker one finds that they contain a steady stream of metaphors. The fluid boundaries of language surround us. Typically, however, the metaphors of ordinary discourse are transparent, so we pay little or no attention to the metaphorical character of ordinary discourse and the role that metaphor serves. However, while metaphor should be a central part of any inquiry which purports to provide a general explanation of language and communication, the important puzzles about language and meaning which metaphor raises are frequently treated as a peripheral issues in semantic theory, if they are mentioned at all. A central aim of this paper is to redress this neglect and to delineate the central role which metaphor plays in semantic evolution..."

There are at least 23 metaphors in this unremarkable passage. For example, speakers are not literally fluent — flowing, that is. Metaphors it seems are indeed under every linguistic rock. Indeed, the very term 'metaphor' is a metaphor, as most philosophers point out sometime. But what is the moral here? If metaphor is this prevalent, can it really be pernicious? Or, if this is so prevalent, can it really be metaphor? It does not follow that there is no such thing as plain speaking — literal talk. One could argue that dead metaphor is no more really a metaphor, than a corpse is really a human being. As has often been pointed out, though, 'dead' is not a very good metaphor

here, because often these metaphors can be resurrected by probing their origins. That's what I did with the quote from Grey. As Nelson Goodman said, in an odd mixed metaphor (Goodman 1981, 68), "A frozen metaphor has lost the vigor of youth, but remains a metaphor." Radman (Radman 1997, passim) has quite a good discussion of this issue, pointing out that it's a matter of when a certain usage is a metaphor. It depends on the person (the German word for glove is metaphorical for me), and it depends on how much incidence a novel use has had. A 'run on the bank' is still metaphorical but a 'run in my stocking' is not. Repeated use of a term in a new way is not always enough to kill off its metaphoricity.

(Another way to argue is via the Lakoff school of metaphor, the theory of so-called "conceptual metaphors". They have it that most of our concepts are metaphorically structured. For example, they say that our ordinary understanding of argument is structured by the metaphor 'Argument is war'. Why else, they argue, is it so "natural" to say things like 'he attacked my assumption'; 'she defended her thesis'; 'your case has several strong points'; 'my position lies in ruins'. I think there is a good deal in their point of view, though not as much as I used to. As Roger White has argued (White 1996), it may be questioned whether what they are talking about is really the same topic as metaphor construed more simply. Another reason to doubt their case is that its recent application to mathematical concepts sems to me to be utterly wrong. "By their fruits ye shall know them": there must be something wrong with a theory which can have such a disastrously bad application.)

I conclude that it will not do to deny that 'logical construction' and the like are metaphorical. Can it be argued that they are not pernicious? Not everyone sees the history of the philosophy of mathematics as two fruitless wild goose chases, as I do; but to argue against the perniciousness of the metaphors need not raise that debate. The natural response of the logician to my claim is that it is vapid, because metaphors can always be dispensed with, at least in logic. So any harm they might be capable of doing can be easily avoided. To see why this response is inadequate will require us (finally) to discuss rhetoric.

Not really pernicious?

A natural response to the claim that certain logical metaphors are or may be wholly or even partly pernicious is to assert that if that's right then they should be eliminated, since they are not necessary. This raises some hard questions about metaphor in general. Can metaphor be eliminated? How

and when? What, after all, is a metaphor? Of course, it might be that although metaphors cannot be eliminated altogether, they can be from logic.

At first, it might seem obvious that any metaphor can be eliminated, being merely a compressed simile. So we can amend the pernicious 'Peter is a rock' (pernicious because false) to 'Peter is like a rock', exchanging falsity for truth and all's well. We can even replace the comparison with the supposed similarity, as in 'Peter is completely reliable.' This might not capture exactly what was meant, and anyway not every metaphor is so simple; it might be hard to carry out this operation on cases like the stock example from Stevens, 'Death is the mother of beauty'. Some kind of paraphrase is certainly possible. Obviously the literary quality may suffer, but perhaps that's beside the point.

In the seventeenth century, many writers associated with the rise of modern science advocated the rejection of all figurative language such as metaphor, and the use of the "Plain Style" (this phrase is explained below). Many philosophers will be familiar with such sentiments to be found in Hobbes and Locke. For example, Hobbes avers in *Leviathan*, chapter 5 (after listing use of metaphors as a cause of absurd conclusions):

> "To conclude, the light of humane minds is perspicuous words, but by exact definitions first snuffed, and purged from ambiguity; reason is the pace; increase of science, the way; and the benefit of mankind, the end. And, on the contrary, metaphors, and senseless and ambiguous words are like ignes fatui; and reasoning upon them is wandering amongst innumerable absurdities; and their end, contention and sedition, or contempt." (Hobbes 1651, 22)

And Locke (Essay, Book III, chapter X) likewise:

> "Seventhly, language is often abused by figurative speech. Since wit and fancy find easier entertainment in the world than dry truth and real knowledge, figurative speeches and allusion in language will hardly be admitted as an imperfection or abuse of it. I confess, in discourses where we seek rather pleasure and delight than information and improvement, such ornaments as are borrowed from them can scarce pass for faults. But yet if we would speak of things as they are, we must allow that all the art of rhetoric, besides order and clearness; all the artificial and figurative application of words eloquence hath invented, are for nothing else but to insinuate wrong

> ideas, move the passions, and thereby mislead the judgment; and so indeed are perfect cheats:. . . " (Locke 1689, 5080)

which is plain enough, though hardly devoid of metaphor, but only a few lines later we find:

> "Eloquence, like the fair sex, has too prevailing beauties in it to suffer itself ever to be spoken against. And it is in vain to find fault with those arts of deceiving, wherein men find pleasure to be deceived."

Locke's remarks are helpful because he states clearly what the charge against figures is: he says they "insinuate wrong ideas, move the passions, and thereby mislead the judgment". But do they? Must they? I'll deal with that claim in the last section. Notice, though, how replete with figures of speech are these denunciations of figures of speech. Thomas Sprat in his history of the Royal Society is salient here. To quote Richard Nate (2001) writing about Margaret Cavendish:

> "(Margaret) Cavendish wrote in a period in which the attitude towards rhetoric changed considerably. This historical development is connected to the emergence of the New Science and the cultural climate which made it possible. Whereas Humanism had celebrated the homo rhetoricus as a cultural model and had propagated the copia rerum ac verborum as a linguistic ideal, in the aftermath of the Restoration scientists would argue for a plain style that was opposed to the "rhetorical flourishes" of Humanism. Equally, the Hermeticists' understanding of metaphors as signs of cosmic correspondences, which had enjoyed a renewed interest during the Interregnum, fell into disrepute after the Restoration. Like his contemporaries Joseph Glanvill and Samuel Parker, Sprat defined the plain style ex negativo; in other words, instead of defining its positive characteristics he listed those elements a writer should avoid. Among these he numbered "amplifications, digressions, and swellings of style", phenomena which traditionally had been dealt with in rhetorical elocutio. Because the plain style was marked by the absence of rhetorical figures, it was characterised by its proponents as non-rhetorical. It may thus be described as a further instance of the "rhetoric of anti-rhetoric" that has recurred in European intellectual history time and again since Plato's rhetorically skilful criticism of the Sophists. Furthermore it has to be noted that, in spite of representing a radical departure from the traditional rhetorical paradigm, Sprat's stylistic programme conformed to the principles of classical

> rhetoric in that it argued for perspicuitas as opposed to obscuritas, and for the genus humile as opposed to the genus grande. The fact that the scientists nevertheless opposed rhetoric in general can be explained by the lasting impact of the earlier Ramistic reforms in which rhetoric had been reduced to elocutio and thereby had been equated with the use of figurative language. What the members of the Royal Society had in mind when they described the plain style as non-rhetorical was the renunciation of a deliberate use of rhetorical figures."

Sadly, like Plato, these anti-rhetoricians are like people who give up drugs, and then find it hard to keep away from the stuff: here's the said Samuel Parker's complaint:

> "All those Theories in Philosophy which are expressed only in metaphorical Termes, are not real Truths, but the meer products of Imagination, dress'd up (like Childrens babies) in a few spangled empty words .... Thus their wanton and luxuriant fancies climbing up into the Bed of Reason, do not only defile it by unchaste and illegitimate Embraces, but instead of real conceptions and notices of Things, impregnate the mind with nothing but Ayerie and Subventaneous Phantasmes." (Parker 1666, 75)

And it may be so, but this is no way to convince one to give up figurative language. There is a pragmatic self-contradiction in these various fulminations, which is at least partly due to the distorted understanding of rhetoric to which Nate is pointing. To clarify the transformation to which he refers, we need a view of Rhetoric as it was classically, before it was trashed by the plain speakers.

Confirmatio 2

Rhetoric

By Rhetoric I mean classical rhetoric — that is, the discipline described in the treatises of Aristotle, Cicero and Quintilian. Often people inclined to disparage rhetoric know little of this tradition, though it was the backbone of a good education for over a thousand years in the classical world and after. It went through strange transformations in modern times, only reaching its current general low esteem a mere two centuries ago. In order to show the place of figurative language in discourse, I will briefly sketch a few of the

leading elements of Rhetoric. More details can be found in, for example, Corbett 1971 and Barthes 1988.

Origins and nature

Like logic, rhetoric derives originally from the work of the Sophists, and its intermittent bad reputation has always been associated with negative attitudes towards those badly misrepresented intellectual pioneers. Rhetoric was originally the art of oratory, that is, of the preparation and presentation of effective speeches. Right from the beginning, this preparation assumed the use of writing, as is evident from Plato's Phaedrus, and it might really be more accurate to call it the art of persuasive writing. 'Persuasion' here should NOT be taken as the opposite of rational argument, on the contrary it includes that as one of three so-called appeals, or sources of persuasive power. The modern idea that persuasion and rational argument are disjoint is a reflection of the ideological history of modern science.

Genres

Rhetoric was first developed in Classical Greece, when there were three important arenas for the delivery of speeches: deliberative, forensic and epideictic oratory — speeches needed for the political assembly, for the court room, and for the formal occasion. The division of Rhetoric according to these three genres of speech seems to have been somewhat perfunctory and particularly in later centuries disregarded to a considerable degree. But it is always insisted on that the nature of the audience plays a role in determining whether a speech is good, and differences between kinds of audience are partly captured by this distinction.

Structure

All effective speeches require a structure which goes a bit beyond having a beginning, a middle and an end. The parts of a good text are functionally distinguished. The present text is structured as: exordium (introduction), narratio (statement of the case), divisio (outline of the parts of the text), confirmatio (positive argument for my thesis, in two parts in fact), confutatio (argument against objectors), peroratio (conclusion).

These labels reflect the different purposes of the different parts of the text. Considerable elaboration or variation of this kind of scheme is given in treatises on Rhetoric.

Appeals

As already mentioned, three sources of persuasive force are identified, called in Greek ethos, logos and pathos, which relate respectively to the authority of the speaker, the merits of the arguments, and the effects on the emotions of the audience. During the modernising period between the fifteenth and nineteenth centuries, various techniques in the first and third categories have been labelled fallacies, but this is essentially a terrible mistake, to which I return shortly.

Offices

The parts or "offices" (duties) of the art of rhetoric are five: in Greek called heuresis, taxis, lexis, mneme and hypokrisis; or in Latin inventio, dispositio, elocutio, memoria and actio. That is, finding things to say, ordering what you say, how to put it, how to remember it and how to say it. The last two — how to remember it and how to say it — relate primarily to spoken texts and were historically gradually neglected as writing became more salient in western culture. The first "office" of rhetoric, inventio, if we charitably construe it as the discovery of good arguments among other material, would then include logic.

Style

The third office, expression or style, covers all lexical aspects of the text, indeed in Greek, it is lexis. Diction, rhythm, the use of long or short sentences, etc, are all given attention. There is a distinction between the low style, the middle style and the grand style, which we have already seen lying behind the advocates of the "Playne Style". The most extensive and the most characteristic part of style in the tradition is the characterisation, classification, explanation, and exemplification of *figures*. A figure is "any deviation, either in thought or expression, from the ordinary and simple method of speaking, a change analogous to the different positions our bodies assume when we sit down, lie down, or look back.... If the name is to be applied to certain attitudes (*habitus*) or gestures (*gestus*) of language, we must interpret *schema* as that which is poetically or rhetorically (*oratoria*) altered from the simple and obvious method of expression." (Quintilian, IX.i.11–14)

Figures of thought and speech, in particular metaphor

In classical rhetoric, many devices were identified which could be put to good use in the expression of one's case. Aristotle's discussion is somewhat inchoate and he identifies few specific devices beyond metaphor and simile, though he has a lot of interesting material on other aspects of style such as rhythm. By the time of Cicero, and even more so Quintilian, there

are many names for specific devices such as irony and zeugma which we still recognise today. During the early modern period a certain mania for classification produced a veritable zoo of these figures, some authors listing hundreds. They range from simple repetition (repetititio, anaphora) to personification (conformatio or prosopopoiea) through a wide variety, almost all with names which are rather exotic to those with limited latin or greek (for example: *antonomasia* — "the Philosopher"; *litotes* — "Aristotle has no small esteem"; *tmesis* — "in fact, his work is fan-bloody-tastic!"; *zeugma* — "his work had great and mysterious substance".) Usually one distinguishes between figures of speech like repetition, often called schemes, and figures of thought, or tropes, like personification but this simple contrast is not difficult to complicate, if no other reason than that figures are often employed together in fused ways.

I mention the extensive array of figures other than metaphor only to suggest in passing that *many* of them can be found in logical discourse. The standout obvious candidate is *paradox*. Another figure much used in logic is *analogy*: despite somewhat unconvincing discussions of argument by analogy as a supposed fallacy to be found in many texts, use of logical analogy to show an argument invalid is widely practiced. My discussion is centred on metaphor for several reasons: deference to Aristotle, the fact that some writers reckon all figures as at bottom either metaphor or metonymy, and the fact that there is a considerable philosophical literature about metaphor. 'Logical construction' is a metaphor, hence it's a figure. Really I am not minutely concerned with distinguishing metaphor from other figures, the contrast mainly relevant to my thesis is literal vs figural use of language.

To sum up this brief reprise of classical Rhetoric: figural language, which is any deviation from the simple, obvious, usual way of saying something, is a main part of style, which is that one of the five offices of Rhetoric concerned with expression. These five offices together show the integrated requirements for an effective text, which is one having good prospects of persuading the intended recipients of what the author wants to establish.

The most important point from classical Rhetoric is that all three sources of persuasive powers — ethos, logos, pathos — should be employed to the end of persuasion. It is the idea that ethos and pathos are illegitimate sources of persuasive power that underlies the ripping apart of rhetoric which saw it reduced to figuration. In brief, the invention of new so-called fallacies enabled appeals to ethos and pathos to be dismissed as pernicious. But in themselves, they are not. There is no such fallacy as appealing to authority, though there are many bad such appeals (cf Coleman 1997); similarly, ad hominem is no fallacy, though often odious (cf Hitchcock 2007). Equally,

there is no fallacy of appealing to emotion, be it pity or fear or any other, nor a fallacy of appealing to tradition or popular opinion. All these are weak kinds of argument, often bad. But that does not make them fallacies. In fact, these appeals to ethos and pathos are necessary and legitimate because a text which can persuade must interest its readers, motivate them to pay attention and think, and take seriously the point and significance of what is being put. Making these appeals in ways which are acceptable to a reasonable person is not something to be done by algorithm though.

Figures in philosophy and logic

The use of figures in philosophy in general, and logic, in particular, is both necessary and dangerous. It's necessary because persuading readers of novel explanations and understandings requires more than mere reporting. It is dangerous because any persuasive use of language is capable of misleading, not least its user!

It is certainly the case that figurative language in general, and metaphor in particular, can be simply decorative. The title of Dummett's book *The seas of language* (Dummett 1993), seems at most an allusion for those in the know, and not intended to tell us something about language (though Wittgenstein might have meant to). But figures have been used for much more integral purposes in philosophy too. There have been a number of works discussing philosophical style, and a few that attend to figurative language, metaphor in particular, in philosophy. Some discuss what are patently metaphors, such as Quine's web of belief, Ockham's razor and the picture theory of meaning. Some other work is attentive to features of philosophical discourse which are not so clearly metaphors at first glance.

Plato's use of imagery, allegory and myth is well-known and much discussed. It has many times been pointed out in detail how he simultaneously disparages rhetoric and makes use of it, how he contrasts rhetoric unfavourably with philosophical discourse but also admits that the latter is a good rhetoric. Perhaps the best known image in all philosophy is Plato's allegory of the Cave and the Sun. One does not need to take a position on the political philosophy of the Republic to find this figure to have a great and significant ambivalence. Who can deny that there is something right about the cluster of images connecting enlightenment, light and sight with insight, knowledge and wisdom? Yet one may doubt all the same that there is any one source of those things, analogous to the sun — the Form of the Good in Plato's terms. Indeed one may wonder if these powerful images do not put the theory of forms into a rather more favourable light than it deserves. Plato seems to have wondered about it himself, judging from his

other works. Plato thought that myths have power, and he was not averse to using that power both in his dialogs and in the Ideal City. (But this power is over the baser part of us, the emotions not the reason, so that it is appropriate only for the lesser masses, not the philosopher-rulers — they are not expected to swallow the Noble Lie.)

Figures play a central role in much of analytic philosophy, and their effects have been ably discussed by La Caze (2002) following Le Doeuff's lead (1989). Metaphors, like more extensive figures such as analogy — like Thomson's violinist in her paper on abortion — and thought experiment — brain swap scenarios — often foster particular ways of looking at things. For example, the common use of 'point of view' in philosophy has the effect of emphasising the role of vision in perception at the expense of the other senses. This in turn encourages taking the problems of epistemology to turn on the gap between perceiver and perceived, even though there is no such gap in touch or taste. The image of the "the web of belief" — commonly associated with Quine, though he took it from Neurath along with his boat — acts as a guide toward oversimplified understandings of the variety of our beliefs and the variety of connections there are among them. A genuine web is held together by spider silk, which is a single uniform stuff (though different species have slightly different formulas). But there are *many* possible relations between beliefs, not just logical consequence. This is really obvious and ought to put the image in serious question — the links at the edges are obviously different to those in the interior and this is generally admitted but glossed over. Metaphors inevitably emphasise some things and thereby diminish others' salience.

Still, there is some positive value in that metaphor. But there is none in the often-invoked "Ockham's razor". This is an image whose effects have been only negative. The slogan generally given as gloss for it is that "entities must not be multiplied beyond necessity" — though no-one has identified a text where Ockham says quite this. It withstands about three seconds scrutiny. Just how do you go about multiplying entities, should you be so wickedly inclined? If you can, why should you not — the more the merrier, say I; and if you can't, well then you can't so you don't need to be warned off. Ought implies can, and 'must not' implies can too! Sometimes a different formulation is tried — we should be economical in making assumptions. But, again, why? Do they really cost extra? Making unmotivated assumptions would seem to be, precisely, pointless — but on what is it that we are supposed to be economising? Paper? Terminology? Neurones? If there are no unicorns they won't be "multiplied" into existence by my talking about them; and if there are, they won't go away just because I don't. Ockham's razor, or some

other principle of parsimony, would seem to dictate that we do without Ockham's razor, since it has no edge! The concern with "ontological economy" so prevalent in certain schools has no rational basis, but is given the illusion of one by this stubborn image.

Figures do have positive effects of course. Thagard and Beam have argued recently (2004) that metaphors in epistemology contribute to the formation, development, evaluation and exposition of theories in philosophy, just as they do in science. They remark "Describing knowledge as a cable both helps to expound an anti-foundationalist view and to support its credibility in making sense of human knowledge." They mention in passing a good example which Susan Haack gives to justify according a positive cognitive role to metaphors in philosophy. She reports how she herself, when developing her concept of "foundherentism" (a kind of intermediate epistemology between foundationalism and coherentism), at first she had only her new word, but she was enabled to articulate a theory by leaning on the *analogy* of the crossword puzzle. "The reasonableness of an entry in a crossword puzzle depends on three factors: how well it is supported by its clue and any already completed intersecting entries; how reasonable those intersecting entries are, independent of the support given them by the belief (sic) in question; and how much of the crossword has been completed." She goes on to transfer this three point support idea to knowledge. (Haack, 1993)

Now what about figures in general and metaphors in particular in logic? Gasser has argued recently (Gasser 1999) that there are metaphors endemic in logic, and offered an explanation of their role. He apparently thinks the role of these metaphors to be positive only. Gasser suggests the following role for the logical metaphor of 'gaplessness' which Frege put forward as an ideal for proofs. Gaplessness assists with the recognition of the expression of a deduction; the metaphor transfers the meaning of a deduction to that of an expression of deduction; but metaphors "are not to be met with in deductions themselves but in the theory of deductions ... The usefulness of metaphors becomes apparent not when it comes to deducing this or that conclusion from given premises, but when it comes to understanding the notion of deduction itself... and (sic) when it comes to recognising a deduction". (Gasser 236)

I think that Gasser and I are on the same page here — this is akin to the idea I put forward about the third kind of logical work. So let me make a parallel point about 'logical construction'. Consider Carnap's *Aufbau*. He wishes to convince the reader that it is possible to construct certain "constructional systems". He tries to do so by partly constructing one, and by discussing the consequences and value of such systems. Consider Russell's "On Denoting". He wishes to convince the reader that the technique of "logical analysis" resolves the puzzle about the present king of France, and that "the whole realm of non-entities such as 'the round square', 'the even prime other than two',

'Apollo', 'Hamlet', etc, can now be satisfactorily dealt with" (Russell 1905, 54). Consider Quine's *Word and object*. He wishes to convince the reader that by the technique of regimentation and the semantic ascent it affords "we can get on; we are no longer caught in the toils of our opposed uses" (Quine, 1960, 272). None of these persuasive projects succeeds with every reader, in fact they each evoked widespread and spirited objection. That's fine, that's philosophy; I am just pointing out that logicians are involved in persuasive activity here, not some kind of affectless scientific telemetry.

Peroratio

I do not intend to denigrate the work of mathematical logicians, only to put it in the right light. Logical work requires that they use figures to explain and advocate their work, for persuasion must engage the sympathetic attention of readers. The truth of what one says is not enough — it must be interesting too. Figures, though, are dangerous if their purpose is understood as merely dispensible decoration. We saw this in the case of 'logical construction' and its family of related metaphors — foundations, ontological economy and the rest. Exaggerated estimates abound of what has been done and what might be done by paraphrase. Only a better understanding of Logic as a part of Rhetoric will prevent the legitimate and necessary use of metaphors from being pernicious.

University of Melbourne
E-mail: coleman@unimelb.edu.au

REFERENCES

Aristotle (1991), *On rhetoric*, trans. & ed. G. Kennedy, Oxford: OUP.
Barthes, R. (1988), "The old rhetoric, an aide-mémoire", in *The semiotic challenge*, Oxford: Blackwell.
Carnap, R. (1967), *The Logical Structure of the World & Pseudo Problems in Philosophy*, trans. R. George, Berkeley: University of California Press.
Chihara, C. (1990), *Constructibility and mathematical existence*, Oxford: Clarendon Press.
Cicero (1942), *De Oratore*, trans. E. Sutton, Cambridge Mass.: Harvard Up (Loeb).
Coleman, E. (1997), "There is no fallacy of arguing from authority", *Informal Logic* 17:365–383.
Corbett, E. (1971), *Classical rhetoric*, Oxford: OUP.
Dummett, M. (1993), *The seas of language*, Oxford: Clarendon Press.

Gasser, J. (1999), "Logic and metaphor", *History and Philosophy of Logic*, 20: 227–238.
Goodman, N. (1981), *Languages of art*, Brighton: Harvester Press.
Grey, W. (2000), "Metaphor and meaning", *Minerva* 4 (online journal: `http://www.ul.ie/~philos/vol4/metaphor.html`).
Haack, S. (1993), *Evidence and inquiry*, Oxford: Blackwell.
Hitchcock, D. (2007), "Why there is no argumentum ad hominem fallacy" in *Proceedings*, 6th ISSA conference, Amsterdam: Sic Sat.
Hobbes, T. (1651), *Leviathan*, London: Dent 1914.
La Caze, M. (2002), *The analytic imaginary*, Ithaca: Cornell University Press.
Lakoff, G. and M. Johnson (1980), *Metaphors we live by*, Chicago: University of Chicago Press.
Le Doeuff, M. (1989), *The philosophical imaginary*, Stanford: Stanford University Press.
Locke, J. (1689), *An essay concerning human understanding*, ed. P. Nidditch, Oxford: Clarendon Press, 1975.
Nate, R. (2001), ""Plain and Vulgarly Express'd": Margaret Cavendish and the Discourse of the New Science", *Rhetorica* 19: 403–18.
Parker, S. (1666), *A free and impartial censure of the platonic philosophy*, Oxford: Richard Davis.
Plato (1941), *Republic*, trans. and ed. D. Lee, Oxford: Clarendon Press.
Quine, W. (1960), *Word and object*, Cambridge Mass.: MIT Press.
Quintilian (1920), *Institutio Oratorio*, trans. & ed. H. Butler, Cambridge Mass.: Harvard Up (Loeb).
Radman, Z. (1997), *Metaphors, figures of the mind*, Dordrecht: Kluwer.
Russell, B. (1905), "On Denoting", in Robert Marsh, *Logic and Knowledge: Essays 1901–1950*, London: George Allen and Unwin, 1956, 39–56.
Russell (1914), *Our Knowledge of the External World as a Field for Scientific Method in Philosophy*, Chicago and London: Open Court Publishing.
Russell, B. (1919), *Introduction to mathematical philosophy*, London: George Allen and Unwin.
Russell, B. (1914), "The Relation of Sense-Data to Physics" in *Mysticism and Logic*, London: George Allen and Unwin, 1917.
Russell, B. (1924), "Logical Atomism", in *The Philosophy of Logical Atomism*, D.F. Pears, ed., Lasalle: Open Court, 1985, 157–181.
Shapiro, S. (1991), *Foundations without foundationalism*, Oxford: Clarendon Press.
Sprat, T. (1667), *History of the Royal Society*, London: J. Martyn.
Stebbing, S. (1931), *A Modern Introduction to Logic*, London: Methuen (out of print; the passage is online at `http://www.hist-analytic.org/STEBBING.htm`).

Thagard, P. and C. Beam (2004), "Epistemological metaphors and the nature of philosophy", *Metaphilosophy* 35.4, 504–516.
White, R. (1996), *The structure of metaphor*, Oxford: Blackwell.
Wisdom, J. (1931), "Logical Constructions (I.).", *Mind*, XL, April, 188–216 (et seq).