LOGIC AS METAPHYSICS\*

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ow should logic be understood? I outline and defend the view that I call “realism” about logic. This is a thesis with two elements: first, that certain logical constants are features

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or constituents of the world; and, second, that logical constants con- cepts and words have the function of referring to these features or constituents of the world. Here I restrict my focus to an examination of just three central logical constants: *and* (∧), *or* (∨) and *not* (¬). I shall not address quantification, identity, conditionals, or other phenomena that philosophers classify as “logical.” I shall remain agnostic about

the extension of the realist thesis beyond these three logical con- stants. I shall however comment on the question of the scope of logic at the end of the paper. One common theme running through this paper is a distrust of any general notion of a “logical constant” that assumes that something interesting is shared by the items that it collects together.

This paper divides into four sections. In the first, I motivate the realist approach by underlining the difficulties for its main rival: inferentialism. In the second section, I focus on ∧ and ∨, and delineate a realist view of these two logical constants. The realist view is developed

in terms of Alexander’s Principle—showing that ∧ and ∨ have determin- ing roles and also that they have distinctive determining roles. Prob- lems with the realist interpretation of ∨ are then addressed, as well as

\* This paper had its first outing at the Hongo Metaphysics Club at the University of Tokyo in Japan. After that it was presented at the Institute of Fundamental Sciences in Iran, Beer Sheva University in Israel, Warsaw University in Poland, the Universities of Sao Paulo and UNICAMP in Brazil, and SADAF in Argentina. On all these occasions I learned much from the discussion. Many thanks for discussion, questions, or advice from Walter Carnelli, Cian Dorr, Simon Evnine, Harry Gensler, Robin Hendry, John MacFarlane, Alexander Paseau, Hili Razinsky, and Gonzalo Rodriguez-Pereyra; and for written com- ments I am especially grateful to Mark Colyvan, Dominic Gregory, Jonathan Lowe, and Dean Zimmerman. Thanks also to two referees for this journal.

the sense/reference distinction. In section iii, I say what logic is not. Although at that point we have only discussed two logical constants—∧ and ∨—these are central ones, and we will have enough to be the basis for an explanation of why we should not take logic to be essentially

about the mind, or language, or exclusively about an abstract realm, or about reasoning, truth, truth tables, truth functions, topic neutrality, or form. In the last section, section iv, I turn to consider ¬ and argue that we cannot escape negative facts, and facts conjoining and dis- joining negative facts with positive facts. I then give ¬ a distinctive role, one that contrasts with ∧ and ∨. I reflect on the notion of logic in the coda. Section i is negative, section ii is positive, section iii is negative, and section iv (on negation) is positive.

* 1. logic, inference, and direction of explanation
  2. *Against Inferentialism.* It is often claimed that we should under- stand the meaning of words for logical constants such as ∧ or ∨ in terms of their “introduction” and “elimination” rules. The idea is that to understand logical constant words or to possess logical con- stant concepts is to endorse or follow rules for the deployment of these words or concepts. The rules in question are taken to be nor-

mative in the sense that they say how we should, may, or may not proceed in revising our beliefs. The rules tell us what we should, may, or may not infer from what. For example, from A we can infer A∨B, and from A∧B we can infer A. This view is sometimes called “inferentialism.” Logic turns out to be a normative discipline on an inferentialist view.1

This view of the nature of logical constants and of the meaning of logical words or concepts is subject to the following objection. The introduction and elimination rules are supposed to be *norms* for inference. If so, then, like all norms, there must be something *in virtue of which* they hold.2 The trouble is that it is clear what these norms hold in virtue of. When we should infer in accordance with

1 Some examples: Ludwig Wittgenstein, “Philosophy,” in *Wittgenstein*’*s Lectures: Cambridge, 1932*–*1935, From the Notes of Alice Ambrose and Margaret Macdonald* (Oxford: Blackwell, 1982), section 2; Gerhard Gentzen, “Untersuchungen über das logische Schliessen” (“Investiga- tions into Logical Deduction”), *Mathematisches Zeitschrift*, xxxix (1935): 176–210, 405–31, reprinted in *The Collected Papers of Gerhard Gentzen* (Amsterdam: North Holland, 1969);

P. F. Strawson, *Introduction to Logical Theory* (London: Macmillan, 1956), p. 56; William Kneale, “The Province of Logic,” in H. D. Lewis, ed., *Contemporary British Philosophy* (London: George Allen and Unwin, 1956), pp. 237–61; Ian Hacking, “What Is Logic?,” this journal, lxxvi, 6 ( June 1979): 285–319.

2 For discussion of normative dependence see Nick Zangwill, “Moral Epistemology and the Because Constraint,” in Jamie Dreier, ed., *Contemporary Debates in Moral Theory* (Malden, MA: Blackwell, 2006), pp. 263–81; and Nick Zangwill, “Moral Dependence,” *Oxford Studies in Metaethics*, iii (2008): 109–27.

the introduction and elimination rules, it is *because* we are thinking in terms of conjunction or disjunction. We are not thinking in those terms because those rules apply. Inferentialism gets the direction of explanation the wrong way round. And it is not that there is an identity or a two-way mutual dependence. There is a one-way dependence of the inferential norms on the thoughts we have.

There is an analogy with issues besetting the divine commandment theory. In the case of God and goodness, there are necessary bicon- ditionals tying goodness to what God does or would approve; never- theless, the dependence may flow one way and not the other. They flow from God to good or from good to God, depending on which side we endorse in the debate over the divine commandment theory. The moral autonomist has a powerful case that, despite necessary biconditionals, God does or would approve things because they are good. Similarly, despite necessary biconditionals tying the occurrence of logical constants with norms of inference, it seems that we ought to make certain inferences because our thoughts have the logical con- tent that they do. In the case of inferential norms, it is obvious which way the direction of explanation flows—it flows from thoughts to norms; that is, the inferential norms are explained by thoughts with logical constant constituents in their contents. If that is the direction of explanation, it means that inferentialism, as a theory of the logical constants, is dead.

This direction of explanation argument might be challenged as follows. Sometimes, it might be said, what explains what is not uncontroversial. Perhaps it is just part of holding different theories that we take different things to be explanatorily fundamental. For example: are mental states explained by physical states? Materialists say yes and dualists say no. Do properties explain sets or do sets explain properties? Again, philosophers disagree. In many cases there is no independent fulcrum of explanatory direction from which to exert dialectical pressure. So it might be replied that it could be that even though we infer as we do because our thoughts contain logical constants, what makes thoughts have logical constant contents is their being governed by certain inferential rules.

Here again, the divine commandment theory is a helpful analogy. The issue there is over the explanatory priority between what God wills and what is good (or other normative properties). The divine commandment theorist says that acts of will have explanatory priority over goodness (or other normative properties). The problem for the divine commandment theory is that those acts of will have an inten- tional content, and norms figure in the content of those acts of will. It is this that generates trouble: since if goodness (or other norms)

figures in the content of acts of will, there is a difficult question about the reasons that God has for those acts of will. Those reasons, it seems, can only be the normative properties that figure in the acts of will. That is, God wills what He does because He thinks it is good.3 The situation runs parallel to the situation with inference and logic. As with the divine commandment theory, the problem for the inferentialist arises because one item of the dependee-depender pair is the content of the other. Inference is logical inference because it has a logical content. So the reasons for the inference must be logical reasons—we infer because of the logical contents of our thoughts. This is essential to the kind of mental act it is. Just as God wills what He does because it is good, so we undertake logical inferences because of the logical content of the thoughts from which we make our inference. When we follow the rules that are allegedly constitutive of having logical constant thoughts, those actions are done for logical constant reasons. Hence logical constants explain inferential acts rather than vice versa.4

* 1. *Comparison with Prior*’*s Objection.* This direction of explanation objection to inferentialism is in considerable sympathy with, but also at a little distance from, two well-known anti-inferentialist arguments: those of Arthur Prior and Gilbert Harman.

Prior’s objection fits well with the direction of explanation objection. Prior argued that logical constants cannot be defined by inference rules because if we stipulate rules for inference (various introduction and elimination rules) as we please, in an arbitrary way, the resulting defined terms may be useless.5 It is often replied that although *some* sets of inferential rules collapse, others do not, and in those cases the inferential norms may define the logical constants.6 But Prior’s point is (or is with a little encouragement) that some arbitrarily stipulated rules lead to absurd consequences, and these absurd consequences are logically absurd consequences. Other arbitrarily stipulated rules lead to consistent consequences—logically consistent consequences.

3 See Nick Zangwill, “A Way Out of the Euthyphro Dilemma,” *Religious Studies*, xlviii

(2012): 7–13, for discussion.

4 Inferentialism should not be confused with the view that logical constants can be defined by sets of logical *implication* relations—those expressed in “introduction” and “elimination” principles for logical constants. This is a different view—a non-normative view—which has nothing to do with a psychological process of inference. Nevertheless, that view falls to a structurally parallel objection, which is that such implication rela- tions hold in virtue of the logical constants and therefore the logical constants are not explained by those implications.

5 Arthur Prior, “The Runabout Inference-Ticket,” *Analysis*, xxi (1960): 38–39; and see especially Arthur Prior, “Conjunction and Contonktion Revisited,” *Analysis*, xxiv (1964): 191–95.

6 For example, Nuel Belnap, “Tonk, Plonk, and Plink,” *Analysis*, xxii (1962): 130–34.

Therefore the rules do not explain those crucial ideas. Logic explains which rules of inference are acceptable and which are not; hence logic does not reduce to, or is not explained by, such rules.

If inferential norms are explained by the logical constants and our grasp of the logical constants, then we are not free to stipulate any arbitrarily selected set of norms as defining a logical constant. This is what we would expect on a realist view according to which logical constant concepts and words refer, since what these refer to dictates norms for inference for thoughts with logical constant contents. Norms for logical inference cannot be invented by us; they follow from the logical facts. The logical facts explain the norms, not vice versa.

The principle of normative dependence is at work here, and it has significant consequences for norms of inference. It is the unassail- ability of normative dependence that means that the direction of explanation objection to inferentialism is not question begging. The norms that rules of inference embody must, like all norms, depend on non-normative facts. Those non-normative facts dictate certain nor- mative facts and not others. We are not free to construct or stipulate norms as we please because the non-normative facts constrain what normative facts there are. What explains norms of inference are the logical constants that figure in the thoughts in question. They explain and dictate the norms and rules. Hence the logical constants cannot be explained in terms of norms of inference.

* 1. *Comparison with Harman*’*s Objection.* Gilbert Harman made a strict distinction between logic and reasoning.7 He argued that norms for belief revision are one thing and logical facts and truths are another. Norms of belief revision concern our propositional attitudes, our psychological states, and mental actions. By contrast, logic either concerns propositional structures and relations of consistency between the propositions that are the contents of propositional attitudes, or else logic concerns the worldly correlates of such propositional structures. Either way, it does not essentially have to do with human psychological processes except in the special case of propositions about human psy- chological processes. This means that a category mistake is committed by those who appeal to inferential norms in order to explain logical constants, or our grasp of logical concepts, or the meaning of logical constant words.

However, even if Harman is right to distinguish logic from norms of inference or reasoning, there is surely some dependence relation between

7 Gilbert Harman, *Change in View: Principles of Reasoning* (Cambridge, MA: MIT Press, 1986).

them. For the norms of belief revision that apply to us—whatever they are—derive in part from the beliefs we have, from the contents of those beliefs, and their logical relations (between their contents that is, not between the beliefs themselves). To take two of Harman’s posi- tive suggestions for inferential norms: perhaps we should be conserva- tive in belief revision or we should avoid clutter in our beliefs. But the application of these norms of reasoning depends in part on the logical contents of the beliefs in question. Harman is right that the norms of reasoning that bear on our attitudes, and the logical con- tents of our attitudes, are in radically different categories. However, it remains the case that inferential norms hold partly in virtue of the logical constant contents of propositional attitudes. The logical contents of the propositional attitudes are part of that in virtue of which the norms hold, and hence cannot be explained in terms of them. Thus, although Harman’s objection is correct, the direction of explanation objection is more basic than Harman’s objection and explains its force.

* 1. *Ideological Differences?* It might be said that logic is about rules of inference because logicians sometimes disagree about rules of logi- cal inference. For example, classicists and intuitionists about logic differ over the rules of inference that bind beliefs involving negation. But this does not show that inference rules define logical constants. It is true that classicists and intuitionists disagree over the correct infer- ence rules for negation. But since the rules embody norms they must hold in virtue of something—something that explains the norms (otherwise they are not norms at all). So there must be something that classicists and intuitionist think explains their difference over the norms. Classicists and intuitionists, therefore, do not and cannot *just* have different views about required, permitted, and forbidden inferences. It would be as if there is a debate about the morality of abortion but neither side held any view about what it is about abor- tion that makes it permissible or impermissible. That would be an odd debate. Similarly the classicist/intuitionist debate cannot just be about which inference rules are correct; they must have a view about why they are correct. If the logical realist is right, different logical systems characterize different metaphysics—different views of the structure of the world.
  2. logical realism
  3. *Fear of Realism.* The direction of explanation objection to infer- entialism seems to me to be powerful, and so I find it surprising that inferentialism is so popular. I suspect that the explanation is that people worry that anti-inferentialism has its own difficulties, and so

inferentialism is the only acceptable theory of logical constants and our understanding of them. In particular, a prominent worry is likely to be that rejecting inferentialism invites too robust a realism about logical constants. In a relatively simple case where a logically complex thought represents a logically complex fact—for example, a disjunc- tive or conjunctive fact—a robust realist view would be that logical constant concepts or words refer to constituents of logically complex

facts. The logical constants in question here at least include ∧ and ∨. Thus, for a robust logical realist, ∧ and ∨ are (non-semantic) constitu- ents of reality.8 Many philosophers find this robust realism about logi-

cal constants hard to stomach. Such weak-stomached philosophers might hope for a more moderate form of realism, one that would be restricted to asserting the explanatory priority of logical constants over inference rules. But it is one thing to assert such an explanatory priority and another to explain it. Explanatory priority needs to be explained by appeal to what logical constant concepts or words mean. But then what are these non-inferential meanings, if not their references? The idea of logical constituents of reality seems repug- nant to many.9 This, I believe, is the main factor encouraging inferen- tialism. The attraction to it is explained by fear of the alternative. Therefore I think that it would be a good thing if philosophers of logic sympathetically explored realist options to see whether they are really as unpalatable as they seem. This I do in the rest of this paper.

* 1. *Realism and Determination.* I begin with ∧ and ∨, putting ¬ to one side until later. The realist view is that ∧ and ∨ are part of, or constituents of, or features of the world. How so?

Many facts in the world are logically complex. For example, one complex fact is the fact that grass is green and snow is white. Another is the fact that grass is green or snow is blue. In these logically com- plex facts, logical constants such as ∧ or ∨ are constituents of logically complex facts.

Logical constants may also bind objects and properties. There are conjunctive and disjunctive objects and conjunctive and disjunc- tive properties. But here I focus for the most part on facts. I take facts to be worldly entities, otherwise known as “states of affairs” or

8 Statements of such a logical realism can be found in Morris Cohen, *A Preface to Logic* (London: Dover, 1944), p. x; Arthur Prior, “A Statement of Temporal Realism,” in *Logic and Reality: Essays on the Legacy of Arthur Prior*, ed. B. J. Copeland (Oxford: Clarendon Press, 1996), p. 45; Willard Van Orman Quine, *Philosophy of Logic* (Engelwood Cliffs, NJ: Prentice-Hall, 1970), pp. 97–102; earlier writers with realist inclinations may include Leibniz, Wolff, and Bolzano.

9 See for example Ludwig Wittgenstein, *Remarks on the Foundations of Mathematics*

(Oxford: Blackwell, 1978), section 8.

“situations.” A simple fact would be something, such as an object or an event possessing a property. (There are truths because there are facts, not facts because there are truths. I take facts for granted in this paper and also that facts are relata of causal and metaphysical determination relations.10)

Not only do logical constants exist, since they are the constituents of complex facts, they also have essences, and different logical con- stants differ in their essences. One important respect in which they differ is in their contribution to the causal or metaphysical powers of the facts they partly constitute. Here I extend an idea from Samuel Alexander11 and Sydney Shoemaker12—sometimes called “Alexander’s principle”—which is roughly the idea that reality generates powers. For example, being round is a genuine property because possess- ing it affects a thing’s rolling behavior on flat surfaces; and being triangular differs from being round in that respect. Similarly with

∧ and ∨. How does the complex fact A∧B differ from the complex fact A∨B? They differ in their metaphysical determination relations with respect to A, for example. A∧B determines A, whereas A∨B does not. And A∨B is determined by A whereas A∧B is not. They also differ with respect to each other. A∧B determines A∨B, not vice versa. They also differ in their determination relations with

respect to other facts. Since these two complex facts do not differ in their non-logical constituents, the different powers of the whole complex facts depend on the different contribution to their powers made by their logical constituents.

Since the idea is that ∧ and ∨ differ in the contribution that they make to the powers of the logically complex facts in which they

figure, this is therefore an *indirect* account of what these different logical constants are. However, they differ in this indirect way *because* they are the logical constants that they are. On Shoemaker’s version of Alexander’s principle, something is real if it makes a contribution to the powers of the things with which it combines. ∧ and ∨ pass this test. There are also conjunctive and disjunctive objects. Most familiar objects are composite, such as London; they are conjunctive objects.

One might visit London by visiting either north or south London. There are also disjunctive objects. For example, some people have had an Oxbridge education, which means that they went either to Oxford University or Cambridge University. But my focus is on facts

10 D. H. Mellor, *The Facts of Causation* (New York: Routledge, 1995).

11 Samuel Alexander, *Space, Time, and Deity* (London: Macmillan, 1920).

12 Sydney Shoemaker, “Causality and Properties,” in *Identity, Cause, and Mind* (Cambridge, UK: Cambridge University Press, 1984).

and their constituents, not on objects, except insofar as objects are constituents of facts.

* 1. *The Structure of the World.* Logical concepts and words refer. But to what? To constituents of complex facts. But what are they? Perhaps they are not *objects*—but objects are not the only worldly objects of reference. The world (objects, events, properties, facts…) has a logi- cal structure (“*aufbau*”). And that structure is nothing to do with us. Logical concepts and words represent the structure of the world. Even if there were no human beings or other thinkers, it would have that structure. Take a complex fact such as either grass is green or snow is white. Such a complex fact has nothing to do with thinkers or even abstract objects. Logic pervades the world.13

Someone might find something queer about the idea that logical words refer, and they might articulate this by saying that there is a sense in which logical words are *abstract* in meaning. This is true, but only in the sense in which “motion” or “space” are very abstract words, even though they refer to the physical world and not to a realm of abstract objects, such as numbers or sets. Logical words refer to the structure of the world. Compare the striped pattern of a tie. We may describe that pattern, which is an “abstract” description, in a sense. Still, what we describe is a feature of the tie. Similarly, in this sense, logic describes the “abstract” quite general structure or pattern of the world. The logic of the world is like a pattern on a tie.14

It might be said that logic is not just about the structure of the world but about the structure of all possible worlds. If we allow talk in terms of “possible worlds,” someone might say that there could not be pos- sible worlds in which the laws of logic differ, in the way that there can be possible worlds in which the laws of physics differ. But this is not because logic is somehow about possibilities and necessities. It is essen-

tial to what it is to be ∧ that for any X and Y, X∧Y determines X; and the essence of ∧ explains why it is not possible that X∧Y obtains with- out X. The essence explains the modal facts.

What about the deployment of logical constant concepts and words in fiction? Surely, it might be argued, there are no fictional facts, so the logical constant components of fictional thoughts and sentences do not refer. One response would be to say that fictions are artifacts, like paintings. If so, there are facts about fictions, and logical constant

13 Rudolf Carnap’s book *The Logical Structure of the World: Pseudoproblems in Philosophy* (English translation by Rolf A. George (Berkeley: University of California Press, 1967)), had an excellent title until the colon, but the book went downhill from then on, since the whole point of the book was to reject the idea that logical structure lay in the world. 14 Contrast Ludwig Wittgenstein, *Tractatus Logico-Philosophicus* (London: Routledge,

1922), 4.0312.

concepts or words can refer in thoughts about, or descriptions of, those facts. An alternative response would be to say that in fictional thought and talk, we pretend or imagine. In that case there is no reason why we cannot pretend or imagine reference to logical con- stants just as much as we pretend or imagine the non-logical constant contents of fictions. Similarly, we may deploy logical constants con- cepts and words in *reductio ad absurdum* arguments where we do not believe a logically complex assumed premise.

Many of the examples of logical determination that I have given are drawn from classical logic. But I do not want to be dogmatic. Given realism, the correct logic of the world is an open question. The true logic of the world might be classical, intuitionist, quantum, dialethic… and there are many other options. Furthermore the true logic is not necessarily common sense. The true logical structure of the world may differ from what we take to be the logical structure of the world. There is folk logic and there is true logic. Folk logic can be in error. For example, Hilary Putnam explores the idea that we should embrace quantum logic, which would be a departure from folk logic.15

What about “monism” and “pluralism” about logic? On the realist view, logic is the structure of the world. There is only one world so there is only one logical structure of the world. Logical theories cor- respond more or less accurately to that structure. It is, I suppose, a substantive assumption that there is one common structure to the world transcending the specific kinds of fact, such as mental facts, physical facts, mathematical facts, and so on. But it is plausible that some logical structure is shared across these domains. For example, basic principles of conjunction and disjunction are shared. We might, however, be justified in accepting a variety of different logics depend- ing on what the epistemology of logic looks like.16 Since the view I develop here is a realist one, I leave the epistemology of logic to one side.

* 1. *Boring Complex Facts?* An objection to the realist view is this. If ∧ and ∨ are ingredients in complex facts, then A, A∧A, and A∨A turn out to be different facts because they differ in their logical ingredients. If A∧B and A∨B differ due to the difference in their logical ingredients, how can we deny that A∧A and A∨A differ in

15 Hilary Putnam, “The Logic of Quantum Mechanics,” in *Mathematics, Matter, and Method: Philosophical Papers, Volume 1*, 2nd ed. (Cambridge, UK: Cambridge University Press, 1979), pp. 174–97.

16 Thomas Kuhn, “Objectivity, Value Judgment, and Theory Choice,” in *The Essential Tension* (Chicago: University of Chicago Press, 1974), pp. 320–39.

the same way? One reply would be that ‘A∧A’ and ‘A∨A’ are not properly formed, for it is the nature of ∧ and ∨ to relate two distinct facts and to make a new fact from them. ‘∧’ and ‘∨’ thus do not refer in ‘A∧A’ and ‘A∨A’. We might think of ∧ and ∨ as being like chemical bonds. Some chemical bonds relate one oxygen atom to another,

that is, another atom of the same kind. But a chemical bond cannot relate an atom of oxygen to itself. Similarly with logical bonds. If so, it may be said that ‘A’, ‘A∧A’, and ‘A∨A’ are three ways of referring to the same fact—which is logically simple. It could also be argued that

since A, A∧A, and A∨A all determine and are determined by the same facts, they do not really differ. If they were different facts, there would

be a difference in the facts that they determine or that determine them. But there is not. They do not differ in their causes and effects, for example. A different reply to the objection would be to say that A, A∧A, and A∨A *do* differ in their powers. A∧A determines but is not determined by A, which determines but is not determined by A∨A—even though these are all mutually necessitated. So these are three different facts, and the conclusion of the proposed reductio of the objection is embraced. Furthermore, what could be motivating people to identify A∨A, A, and A∧A? Surely only the error of thinking that necessary biconditionals amount to identity. But identity is not the same as a necessary biconditional. (Consider sets and their mem- bers, which necessitate each other even though sets and their mem- bers are not identical.17) So distinguishing these three facts is not objectionable. Either way, the realist view survives this challenge.

* 1. *Disjunctions, Ingredients, and Relations.* Thus far it might seem that I am suggesting that ∧ and ∨ are both *relations* between facts— relations that differ in their determining role because they are the relations that they are. The different logical constant notions denote different relations. This is a tempting idea. But in fact, ∨ is not

well thought of as a relation. I now want to drive ∧ and ∨ apart. It is not that I do not believe in ∨. The world is full of ∨. (The world is “or-some”!) But the role of ∨ in the world is different from the role of ∧.

The tempting model to be avoided is this. Logical constants bind

facts together, which in simple cases are non-logically complex facts, to make new complex facts. Different logical constants combine with the same facts to make different new complex facts. Logical constants seem to be ways of constructing new facts given two non-logical facts.

∧ and ∨ both combine with facts A and B, but they make two different

17 Kit Fine, “Ontological Dependence,” *Proceedings of the Aristotelian Society*, xcv (1995): 269–90.

complex facts: A∧B and A∨B. This model can be illuminated by a cooking analogy. We may have the ingredients, chicken and mush- rooms. To these we may add soy sauce or olive oil, to make a new dish.

Similarly, we may have the facts A and B, to which we may add ∧ or ∨ to make a new fact. Or perhaps a better analogy would be that the logical constants are like cooking methods, say boiling or frying, which take

the ingredients and produce a new complex reality.

The problem for the ingredient view is that if ∨ combines two facts to make a new fact then not only is ∨ an ingredient in A∨B, but so are both A and B. But this generates problems. For A∨B can obtain without A. So how can A be an ingredient in A∨B? A seems not necessarily a constituent of A∨B in the way it is in A∧B. For A∨B can hold even though ¬A, so long as B holds. The same point holds in terms of relations. What does ∨ relate when only one of A and B obtains? Relations need relata. Whether we put the problem in terms of ingredients or relations, the idea that ∨ always combines two facts to make a new fact looks questionable. Sometimes it seems

not. (Metaphysicians sometimes have an unjustified favoritism towards

∧ when compared with ∨, but the present consideration does sup- port such favoritism.)

Of course it might be that ¬A is a negative fact, and ∨ and ∧ may combine positive with negative facts to make new facts. I discuss this in section iv. But this does not help with the problem that a disjunctive

fact can obtain with only one of its disjuncts—positive or negative—in which case it does not always function to combine two facts to make a new complex fact.

Two initial responses are these.

We could say that although A∨B can obtain when ¬A, that does not show that A is not an ingredient in the disjunctive fact; for A is an ingredient in ¬A, which is an ingredient in the disjunctive fact A∨B. However, the idea of A as an ingredient in ¬A is surely bizarre (see further section iv below). And anyway, it does not address the worry

of A∨B without A.

A second response would be to say that it depends on the disjunc-

tion. Some disjunctions do and some do not have both disjuncts as ingredients. In many cases, both A and B are ingredients of the fact that A∨B. But in many other cases, only one disjunct obtains. So some disjunctions do combine facts to make new facts and some do not. The idea would be that those that do not are somehow to be explained in terms of those that do. But this response is ad hoc and dissatisfying. A unitary theory of ∨ has been lost. Does ‘∨’ really mean and refer to something different in disjunctions in which both dis- juncts obtain from those in which only one disjunct obtains?

* 1. *Constituents Not Relations.* The relational and ingredient view cannot be salvaged. The view has some appeal as a picture or image. But its implications should be resisted. It cannot be denied that there *are* complex disjunctive facts. For they stand in determination relations to conjunctive and atomic facts. How then could there not be such facts? We talk about them all the time, and we appeal to them in explanations. Consider being red (that is, having the dis- junctive property of being some shade of red). A cloak’s having that property may partly explain why a bull charged at it. Or consider being over six feet tall: the fact that I have the disjunctive property of being over six feet tall may partly explain why I knocked my

head on a low door frame. If there are disjunctive facts, then what is ∨ doing in them if it is not an ingredient of the complex fact, relating the disjuncts? But the problem remains that ∨ in A∨B does not necessarily relate A and B.

Consider the fact that snow is white or grass is red. What does ∨ relate? It cannot relate two facts, for grass is not red. But if ∨ does not relate two facts—snow is white and grass is red—then, it might

be argued, it cannot be a feature or ingredient of the world, as I say it is. Perhaps ∧ is, but it is hard to see how ∨ is. How can ∨ be real if it is not a relation between facts or objects, or an ingredient in a complex, all the elements of which exist?

We must jettison the idea of ∨ as an ingredient or a relation, and retreat to saying modestly that the disjunctive fact is one that is deter- mined entirely by any of its (non-logical) elements, and in this it is

unlike a complex conjunctive fact. There is not much more that we can say besides locating ∨ by its powers in this way. Ingredients no, relations no, powers yes.

It might be replied that the idea that ∨ is a *constituent* of disjunctive facts, contributing in a distinctive way to the powers of the com- plexes of which it is a constituent, is just as worrying as the idea

of ∨ as an ingredient or a relation. But I do not see why the idea of ∨ as a constituent in a complex fact loses sense when only one disjunct obtains. ∨ can be a constituent of the complex fact A∨B even without B. The constitution relation is not the mereological/ part-whole relation. If ∨ was part of the whole A∨B then, somehow, both A and B would have to exist. But if ∨ is a constituent of the complex fact A∨B, it does not mean that the complex can be decom- posed such that we find both A and B as elements. That would be to confuse ∧ and ∨. Nonetheless ∨ is essential to A∨B. It would not be the complex fact that it is without ∨. No ∨, no disjunctive fact.

One source of resistance to the reality of ∨ remains. Disjunctive

facts are determined by simpler facts about ordinary things. They

pop into existence given any non-disjunctive fact! Every fact deter- mines disjunctive facts in which the disjunct itself is a constituent. Consider also that ∨ is a constituent of the very general fact p∨¬p.

But all facts determine this fact, which contains ∨. So every fact

generates the reality that is disjunction. I think that this must be embraced. Yes, there is a lot of ∨ about. ∨ is everywhere, or at least ∨ is determined by everything everywhere. Every property instantiation determines a disjunctive property instantiation, and every object deter-

mines a disjunctive object, which contains ∨ as a constituent. That is what it is for ∨ to be part of the structure of being. But ∨ occupies a distinctive place in that structure, one that is not basic but is deter-

mined by other facts and objects.18

* 1. *Logical Sense and Reference?* According to logical realism, the function of logical constant concepts and words is to refer. This raises the question: what about the sense/reference distinction? Gottlob Frege argued that there is a distinction between the sense and refer- ence of a proper name.19 If we believe in senses as well as references, then these senses are *ways* of thinking about things. Could there be different ways of thinking of one logical referent? That is: could there be alternative ways of referring to the same logical constant?

One common view in the twentieth century, which a realist about logic firmly rejects, is that there is logical sense without logical refer- ence. But is the realist view the reverse—that there is logical reference but no logical sense? The realist could hold something analogous to a “direct reference” view of the meaning of logical constant words or concepts, so that they have references without distinct senses.20 How- ever, there is some plausibility to the idea that logical structures can be picked out in different ways. If logic is a matter of the structure of the world, then it seems that there might be cognitively different ways of referring to the same structure, in the way that Frege had in mind for proper names. For example, what are sometimes called “logically equivalent” complex sentences describe the same logically structured facts, in different ways, such that someone could think of

18 Does the realist view commit us to believing that there are some non-complex facts? I do not see why it should. Infinite mereological complexity is possible, and I do not see why infinite logical complexity is not also possible. On the other hand, at the deepest level, I believe that the world cannot have disjunctive complexity.

19 Gottlob Frege, “On Sense and Reference,” in *Translations from the Philosophical Writings of Gottlob Frege*, trans. Peter Geach and Max Black (Oxford: Blackwell, 1960), pp. 56–78.

20 Keith Donnellan, “Reference and Definite Descriptions,” *Philosophical Review*, lxxvii (1966): 281–304; David Kaplan, “Demonstratives,” in Joseph Almog, John Perry, and Howard Wettstein, eds., *Themes from Kaplan* (New York: Oxford University Press, 1989), pp. 481–563.

the logically complex fact in one way but not in another. One pair of examples (at least for classicists) is ‘P ∧ (Q ∨ R)’ and ‘(P ∧ Q) ∨ (P ∧ R)’; another is ‘¬(P ∨ Q )’ and ‘¬P and ¬Q’. In this sense, then, it seems that there might be logical senses. We can compare logic with arithmetic.

An arithmetical realist claims that many arithmetical words and con- cepts function to refer to numbers. Nevertheless there are numerical equations, such as ‘715512’, which are informative because there are different ways of referring to the same numbers. Similarly a logi- cal equation is informative because there are different ways of think- ing of one and the same logically structured fact of the world.

What about the logical constants themselves, rather than logically complex facts? Well ‘∨’ might refer to the same thing as ‘Søren Kierkegaard’s favorite logical constant’. But are there alternative non- relational ways of referring to ∨, in the way that one person may have two names? Of course there can be different *words* for logical con-

stants, in different languages. But it seems possible and indeed not implausible that concepts of some logical constants are primitive, with references but no distinct senses. Thus, at a certain level, and “Kierkegaard’s favorite logical constant” cases apart, a direct reference account of concepts of logical constants is not implausible.21

* 1. what logic is not

Having given a positive statement of logical realism, in the case of ∧

and ∨, I want to say what logic is not.

* 1. *Logic, Not Essentially Mind-dependent.* The view I have in mind

can be said to be “realist” about logic in a number of senses. It is “realist” in the sense not only that there are logical facts about the world, but also that in many cases logical facts have nothing to do with mental or semantic facts. We should not think of ∧ and ∨ as features exclusively of us or our thought or our language, and we should not think that ‘∧’ and ‘∨’ exclusively refer to features of us or our thought or language. So the view is “realist” about the logical constants in the sense not only that they are real but also in the sense that they are mind- and language-independent.

The fact thata ball is red and round is a conjunctive fact. The logical constant ∧ is a constituent of that fact. It is no more mind-dependent than is the ball, or its having the property of being red. The fact that the

21 One interpretation of Prior’s ‘tonk’ operator is that although its function is to refer, just like ‘∧’ or ‘∨’, in fact it fails to perform its function. Functional things can malfunction. So there is tonk-sense without tonk-reference. We live in a tonkless world. The tonk operator would contrast with the Sheffer stroke, which does refer, albeit to something that metaphysically depends on more familiar logical constants. The Sheffer stroke has a sense as well as reference, whereas, on a direct reference view, ‘and’ has no sense in addition to its reference.

ball is red and round is determined by its being red together with its being round. How could two mind-independent facts determine a mind-dependent fact or a fact with a mind-dependent constituent? The fact is that neither the two facts, nor the conjunctive facts, nor their logical constituents, are mind-dependent. Disjunction is similar.

The fact that a tree is over 20 feet tall is a disjunctive fact. The logical constant ∨ is a constituent of the disjunctive property that the tree has. That property is no more mind-dependent than the tree or the prop- erty of being exactly 28 feet tall. The fact that the tree is over 20 feet tall is determined by its being 28 feet tall. How could a mind-independent fact determine a mind-dependent fact or a fact with a mind-dependent

constituent? The fact is that neither fact is mind-dependent, and if the disjunctive fact is mind-independent so are its logical constituents.

* 1. *Logic, Not Essentially Abstract.* The view I have in mind may also be said to be “realist” about logic, in the sense that logical facts have nothing essentially to do with abstract objects such as sets or proposi- tions. Logical words and thoughts refer to the world quite generally, not to some special abstract part of that world. (Some scholars say that Frege and Russell sometimes held this realist view.) Perhaps

people cannot hurt their toes on ∨, but they can bang their heads on low door frames because they are over six feet tall, that is, because

they have that disjunctive property. A rabbit can die because all the remaining holes were blocked, so there was no way out—this hole was blocked and that hole was blocked and there were no others. And: either X or Y can cause a fire. Furthermore, being both X and Y can cause a fire when neither X nor Y would cause it by themselves.

So ∧ and ∨ must be worldly, not just matters of us and our thought or talk. And ∧ and ∨ must be often be *this*-worldly, in the sense of being a constituent of the material world, not confined to the world of

abstract objects, properties, and facts. They make a difference, a dif- ference to the material world. Therefore they are real and constitu- ents of the physical world, as well as constituents of any other kinds of realm that there might be (mathematical, theological, and so on). Where A and B are physical facts, A∧B and A∨B have different causal roles, even though they are the same in non-logical respects. There- fore they differ in causal roles because of their logical constituents. In many cases, therefore, ∧ and ∨ make a contribution to the causal powers of the complex facts in which they figure.

Suppose that materialism is true and that the world is entirely material (there is nothing non-material). Then the world has a material logical structure. If someone asks: in such a world, what distinguishes the fact A∧B from the fact A∨B? Could it be something non-material, such as something semantic or abstract? No. They differ

in their determination and dependency relations. The disjunctive fact is determined by A whereas the conjunctive fact is not. And it takes both A and B to determine the conjunctive fact, and that is not the case of the disjunctive fact. These facts can differ without differing in semantic or abstract respects. The logical structure of the world is the structure of everything. So the logical structure of complex *material* facts shares in the quite general logical structure of anything—what would at one time have been called the structure of “being.”

* 1. *Logic, Not about Reasoning.* The view I have in mind may be said to be “realist,” in the sense that logic is not essentially about reasoning. Many philosophers say that logic tells us how we should reason so that if we start from true beliefs, and reason in accor- dance with logical principles, then we can be sure to preserve truth in our beliefs. (It may have been noticed that truth has not made an appearance thus far.) Suppose we start with a belief that p, which is true. And suppose that we then reason in accordance with

the rule [If you believe that p then believe p∨q]. Then we can indeed be assured that the belief that p∨q is true too. Is that what logic is about, somehow? No. It is true that the reasoning of this sort preserves truth in our beliefs. But that is because p determines p∨q. That is, the logical fact explains truth preservation in reasoning, not

vice versa. To confirm this direction of explanation point, imagine that there is an anxious evil demon. He generates false beliefs in his vic- tims. But he worries that they may reason from false beliefs to true beliefs. For example, he may succeed in getting his victims to believe falsely that they are sitting in front of the fire. But from that they may infer that either they are sitting front of the fire or they are the victim of an evil demon, which is true. This would be disappointing if you happen to be an evil demon! Hence he devises certain norms of rea- soning and promulgates them among his victims. We may call these norms of *flogic*. In flogic, reasoning always preserves falsity. If you start

with false beliefs, it guarantees that you will end up with false beliefs. One principle would be [If you believe p, then believe p∧q]. Or [If you believe p∨q then believe p]. These principles ensure that if you start with false beliefs then you will end up with false beliefs. But *why* is

this? In the first case, it is because of a fact of logic, that ¬p determines

¬(p∧q) (or perhaps that p∧q determines p). And in the second case it is because ¬(p∨q) determines ¬p (or perhaps that p determines p∨q). In *both* the cases of logical and flogical rules of reasoning, the logical

facts explain why the rules preserve truth or preserve falsity. But this shows that logic is about the world, not directly about reasoning.

* 1. *Logic, Not Essentially about Truth.* On the realist view, there is no essential connection between logical constants and truth. It is

often said that we need the notion of truth to state quite general logical facts.22 This is one of the main arguments for connecting logic with truth. We can say that snow is white entails that either snow is white or that grass is green. But we want also to make general claims of that form. It is then claimed that we need to semantically ascend if we are to make those general claims. This is incorrect. Before I say why not, it is worth remarking that it would be extraordinary if to form such generalizations we had to start talking about entities and proper- ties of a quite different sort—truth-bearers—by semantic ascent. It is as if in order to make general claims about rabbits we must makes claims about rabbit-hutches! I propose that we can have generaliza- tions of the sort we want by quantifying over facts or states of affairs. However, it is not so obvious how to state the relevant generalizations. We had better not say something like: for all facts X and for all facts Y,

if X then X∨Y. For this claim is not well formed. Instead let us say that facts may “obtain” or “not obtain.” Is this just a sneaky way of

making facts into something semantic, like propositions, and then using “obtaining” to mean something near “true”? I do not think so. There is no need to think of obtaining in semantic terms any more than we should think of existence as a semantic notion. Obtaining is for facts what existence is for objects. To say that something exists is not to say anything semantic. For example, it is not to say of some- thing quite different, a concept, that it is instantiated. Rather if the concept is instantiated it is because the thing exists. We can quantify over objects, and make existence into a predicate, and say “If an object exists, then…” Similarly, we can quantify over facts and say “If a fact obtains, then…” So we may put general logical claims by saying things

like: “For all facts X and all facts Y, if X obtains then X∨Y obtains.” Thus we can make general logical claims without semantic ascent.

* 1. *Logic, Not Explained by Truth Tables.* It might be said that logic is connected with truth because truth tables give the meaning of logical concepts and words. This is incorrect. How, exactly, do logical con- cepts and words figure in truth tables? What facts do truth tables represent? Here is the usual truth table for ∨ that we are given in logic textbooks. Call this table “VTT”:

p q p∨q

T T T

T F T

F T T

F F F

22 For instance Paul Horwich, *Truth* (Indianapolis: Hackett, 1998).

This is familiar, but deceptively so. It is actually rather puzzling. The ‘p’, ‘q’, and ‘p∨q’ at the top of the table must represent truth-bearers of some kind, such as beliefs or sentences. If the symbols ‘p’ and ‘q’ did not refer to truth-bearers but to non-semantic facts, such as snow’s being white, then the whole “truth table” would be absurd. ‘p’ really should read “the sentence ‘p’,” or just “‘p’.”

Suppose, then, that ‘p’ and ‘q’ refer to truth-bearers. Then we can see that the truth facts that the truth table records are not funda- mental: they are dependent facts. We may assume the following three reference-semantic facts:

p refers to P q refers to Q ‘∨’ refers to ∨

We can now see that the truth-semantic facts recorded in VTT hold because of and only because of the following four conditional facts, which correspond to the four lines of VTT:

If P and Q, then P∨Q If P and ¬Q, then P∨Q If ¬P and Q, then P∨Q

If ¬P and ¬Q, then ¬(P∨Q)

And these four conditional facts hold, in turn, because of these four metaphysical facts:

P and Q determine P∨Q P and ¬Q determine P∨Q

¬P and Q determine P∨Q

¬P and ¬Q determine ¬(P∨Q)

If we add either the four conditional facts or the four determination facts to the three reference-semantic facts, that yields VTT.

Thus the truth table facts are explained by the metaphysical facts plus the reference facts. I am not saying that the metaphysical deter- mination facts explain what logical constants are. For statements of the metaphysical determination facts deploy logical constant words. Nevertheless, what we do not need is truth.23

Suppose that we enshrine the determination relations that accom- pany ∧ or ∨ in a “determination table”—a table that records determi- nation facts. Does that table give the meaning of logical constant

23 The argument applies just the same if there are more than two truth-values. In that case, the reference and determination facts would have to be such that they explain the full range of truth-values, whatever they are.

words or concepts? One problem is that each line of the determina- tion table records an asymmetrical determination relation. What of the conjunction of all of its lines? The conjunction of the lines of a determination table, plus the totality fact that those lines are all the lines, is perhaps necessarily correlated with the logical constant. But they do not give the essence of the logical constant. The logical con- stant itself explains what the determination table records. Hence the idea that the logical constants are to be explained in terms of either truth tables or determination tables is implausible.

The tableau and natural deduction methods seem to me to be a better way of thinking about logic than truth tables since the pro- cedures and principles that tell us how to proceed in proofs can be stated without semantic ascent.

When logic is said to be essentially about truth it is sometimes said that it is the “It is true that p” phrase that it is being deployed. How- ever, I think it is hard to understand what that phrase means if no reference to a truth-bearer is made. My own view is that this con- struction should be interpreted by means of a Davidsonian “para- tactic” analysis, whereby the ‘that’ in such sentences refers to a truth-bearer.24 Otherwise, the idea of truth without a truth-bearer is simply obscure, like the idea of goodness or beauty with no bearer of goodness or beauty. Goodness must attach to something, the thing which is good. It is the same with truth. We can quantify over goods (health, intelligence, and so on) or truths (the truth that grass is green, the truth that snow is white, and so on), but only because we assume the existence of bearers of goodness or truth. No bearers, no goodness and no truth.

* 1. *Logic, Not Explained as Truth Functions.* Truth tables are some- times supposed to show that logical constants are *functions*, or at least that they are in many respects analogous to arithmetical functions, such as addition or multiplication, where in a table for an addition or multiplication function, numerical values for x and y figure in two columns, and the numerical value of the sum or product of x and y figure in a third column.25

There are a number of differences between arithmetical functions and truth tables that might make us cautious about trying to under- stand logical constants as truth functions. One difference is that tables

24 See Donald Davidson, “On Saying That,” in *Essays on Truth and Interpretation*

(Oxford: Clarendon Press, 1984).

25 See Wittgenstein, *Tractatus Logico-Philosophicus*, *op. cit.*, 5.1–5.441; see also Wesley Salmon, *Logic* (Engelwood Cliffs, NJ: Prentice-Hall, 1984), pp. 37–50; and see Georg Von Wright, “Form and Content in Logic,” reprinted in his *Logical Studies* (London: Routledge and Kegan Paul, 1957), pp. 6–7, on the definition of truth functions.

for mathematical functions describe relations among mathematical *objects*. But it is difficult to construe truth tables in this way. Again, we can ask: what are ‘p’ and ‘q’ supposed to represent at the top of truth tables? They cannot be variables ranging over facts. They must be variables ranging over truth-bearers, such as sentences, beliefs, or propositions. If so, what occupies the boxes of a truth table are *semantic facts*—a truth-bearer’s being true or false—not objects. And a line

of a truth table for ∧ or ∨ records determination relations linking two semantic facts with a complex semantic fact. A second difference

is that in the arithmetical case, ‘x’ and ‘y’ at the top of the table for arithmetic functions, such as addition or multiplication, represent variables ranging over numbers, and the boxes of the table contain numerals, which *also* represent numbers. By contrast, at the top of a truth table there are variables ranging over truth-bearers, and what occupies the boxes are complex semantic facts—a truth-bearer’s having a truth-value. Hence, unlike the arithmetical case, what is represented in the boxes is different in kind from what the variables range over at the top of the table. A third difference is that arithmetic functions involve identities, unlike logical functions, which involve determination relations but not identities.

How important are these differences? A harsh point of view would be that the idea that what occupies a box in a truth table is a truth- value, conceived as an object, is unintelligible because objects and facts (including semantic facts) fall into different metaphysical cate- gories. But that flagrant metaphysical category mistake seems to have been exactly Frege’s view—that truth and falsity are two abstract objects to which sentences refer.26 This is certainly an extraordinary and perplexing idea. The more plausible view is that truth and falsity are *properties* of truth-bearers, where truth-bearers, such as sentences, propositions, or beliefs, refer to facts, or at least represent them. Never- theless, many philosophers think that although Frege’s objectual con- ception of truth has the drawback that it is metaphysically unintuitive, it also has virtues; in particular, it reduces the distance between arith- metic and logic. If so, there might be a trade-off with the three differ- ences above. Frege’s view is eccentric, but perhaps it is not unmotivated if he can supply an understanding of logical constants so that they are in some respects illuminatingly analogous to arithmetic functions.

Furthermore, it might be said that whether or not we go along with Frege in thinking of truth-values as objects, we can still understand logical constants as functions in the modest sense that truth tables

26 Frege, “On Sense and Reference,” *op. cit*.

describe how the truth-value of complex sentences is determined by the truth-values of their parts. Perhaps such a modest understanding of logical constants as functions can be retained without the metaphysical excesses of truth-values as objects and without worrying about the lack of identities.

Truth tables are unobjectionable if we take them simply to *record* determination relations among truths. In the previous section, I noted the way truth tables derive from the determination of complex facts by their logical and non-logical constituents, together with semantic facts. We *could* describe these determination relations by saying that there are “functions” from simple semantic facts to complex semantic facts. As we saw, we can write out determination tables, which record deter- mination facts. However, the determination facts recorded in determi- nation tables do not “give the meaning” of logical constants. Instead the logical constants explain the determination facts recorded in determination tables. And as we also saw, one problem is that any line of such a table, and indeed the conjunction of all its lines, involves logical constants; so even if there are such functions, they hold because of logical constants, rather than being identical with them. Furthermore, together with reference facts, determination tables explain truth tables. So while there may be a sense in which we can say that there are “functions” from the truth-values of parts of sentences to the truth-value of complex sentences, those functions hold in virtue of the logical constants and do not explain them. Thus truth tables are superficial; they merely record the determinative power of logical con- stants when harnessed to semantic facts, and we could not understand truth tables unless we already understood logical constants.

* 1. *Logic, Not Topic Neutral or Formal.* Logic is sometimes said to be “topic neutral.” The realist rejects this. It is true that logical prin- ciples apply whatever are the *non*-logical elements of sentences or thoughts, so long as the non-logical elements are of a type that recurs in the right places with respect to the logical elements. But since logical constant words or concepts refer to logical reality, they are far from being “topic neutral.” Their topic is logic! Logic concerns the structure of the world. Logic is a metaphysically committed dis- cipline, like mathematics, chemistry, or geography.

It is sometimes said that logical truths follow from the null set of premises. If this is taken to mean that logic is not existentially com- mitted, then logical realism denies this. For logical facts transcend nothingness. A more plausible view would be that logical truths follow from the truth of any arbitrary positive premise. And perhaps they follow from the existence of the null set. But that is because logic is built into every fact or existing thing, including sets, such as the null

set. Even an arbitrary negative premise is itself a thing, whether true or false, and so that thing contains logic, since the structure of the world is manifest in every part of it.

Logic is often said to concern the “form” of thoughts or sentences.27 The notion of form is supposed to help explain why sentences like “If X is heavier than Y then Y is lighter than X” are not logically true even though they are necessary, analytic, and knowable a priori. The explanation is supposed to be that such conditionals are not true in virtue of the “form” of the sentence, unlike the truths of logic. While a conception of logic as form has some advantages, especially over a purely modal conception of logic (since many necessary truths are not logical truths), the appeal to form must be treated with caution.

If “form” is taken to imply a contrast of form with *content*, such that the logical constant words are supposed to have form *without* content, then, as with the idea of topic neutrality, this is very far from being a notion of form that uncontroversially characterizes logical constants. For the realist’s view is precisely that there is logical content.28

The appeal to form would be acceptable if “form” were a matter of a certain structure of elements, where types of non-logical elements reoccur in a complex whole, which includes logical elements, and the determinative power of the complex whole depends on the recur- rence of types of non-logical elements and on the place they reoccur with respect to the logical elements. But such a conception of form presupposes a separation of logical constants and non-logical ele- ments of thoughts or sentences, and so does not explain it.

There are some parallel issues over notions of form that arise in aesthetics, for example in the theory of music and literature, where a contrast between form and content is unsustainable.29 Eduard Hanslick embraced the idea that form is of central importance in music. He sometimes seems to be asserting that there is form without content, but he may be better interpreted as denying that content is separate from form or perhaps content reduces to form.30 A different case is that of form in literary works, where, again, there is no contrast

27 Examples are Bertrand Russell, *Introduction to Mathematical Philosophy* (London: George Allen and Unwin, 1920); Alfred Tarski, “On the Concept of Logical Conse- quence,” in *Logic, Semantics, Metamathematics*, 2nd ed. (Indianapolis: Hackett, 1983), pp. 409–20; Von Wright, “Form and Content in Logic,” *op. cit.*; and Mark Sainsbury, *Logical Forms* (Oxford: Blackwell, 1991).

28 For discussion, see John MacFarlane, “Frege, Kant, and the Logic in Logicism,”

*Philosophical Review*, cxi (2002): 25–65, at pp. 44–46.

29 See Suzanne Langer, *Introduction to Symbolic Logic* (London: Dover, 1937), for dis- cussion of the parallels between logic and aesthetics.

30 See Eduard Hanslick, *On the Musically Beautiful* (Indianapolis: Hackett, 1986), especially chapter 3 and p. 80.

between form and content, but this time not because there is no content or because content is form, as with music, but because form is a structural property *of* content. (I gather that thinking this may make one a “post-structuralist”!)

* 1. negation and non-being
  2. *Negation as a Logical Constant.* Thus far—it may have been noticed—I have stayed away from negation. (I am afraid of the dark!) Negation may even have been conspicuous by its absence. Twentieth-century logicians treated ¬ as a “logical constant” on a par with ∧ and ∨, as a matter of course. In my view this is a large mis- take; indeed it might be said to be the foundational error of twentieth- century philosophy of logic.

Although I have focused on ∧ and ∨, I have said nothing to rule out other logical constants, even if we do not include ¬. But I am inclined to believe that there is something fundamental about ∧ and ∨.

What about the Sheffer stroke (5 “not both p and q”)? Of course, once we accept ¬ as a “logical constant” on a par with ∧ and ∨, then the Sheffer stroke is bound to make us think that focusing on ∧ and

∨ is parochial given the sixteen non-equivalent ways of combining

two non-logical facts with ¬, ∧, and ∨. (This point is usually put in terms of sixteen possible “truth functions” given two “propositional

variables.”31) But it is questionable whether ¬ should be treated like

∧ and ∨. So the Sheffer stroke is not obviously a logical constant with the same status as ∧ and ∨.

What about the “truth table” for negation? The “truth table” of

standard logic textbooks is what we may call “NTT”:

p ¬p

T F

F T

However, there is the same problem with the reference of ‘p’ and ‘¬p’ that we encountered with VTT. We must suppose that they refer to sentences or other truth-bearers if NTT is to make sense. Suppose so. If we add the semantic fact that p refers to P and ‘¬’ refers to ¬, we seem to run into an embarrassment when we try to state the non- semantic logical facts in virtue of which NTT holds. Are they perhaps: if P then ¬¬P; and if ¬P then ¬P? And are the facts underlying these conditional facts: P determines ¬¬P; and ¬P determines ¬P? The trou- ble is that these determination facts do not seem very interesting. But

31 Wittgenstein, *Tractatus Logico-Philosophicus*, *op. cit.*, 5.101.

perhaps they are. For the first of these seems informative and perhaps holds in virtue of the nature of ¬. Indeed, it is not implausible that P determines ¬¬P even though ¬¬P does not determine p. This coincides with an “intuitionistic” view, but from a different direction of thought. I shall not commit myself on this issue. The present point is that the truth table for ¬ has little to teach us.

* 1. *Hybrid Facts and Negative Facts.* I assume that there are posi- tive facts and there are negative facts. The notions of positive and negative, like that of presence and absence, are primitive,32 although they have marks, and there are differences that are consequential on this distinction.33 Negative facts are not to be characterized in terms of sentences with a linguistic negation sign. For example, a glass’s being empty is a negative fact, despite the lack of sentential negation in many linguistic descriptions of that fact. Whether there are linguistically negative ways of referring to positive facts is more controversial. At any rate, not all positive sentences refer to positive facts. Nevertheless I shall here assume that it is their primary func- tion to do so and that we are dealing with standard cases in which they do. I assume that ‘A’ refers to a positive fact and ‘¬A’ refers to a negative fact.

Now ∧ and ∨ bind negative facts as well as positive facts. They can combine a positive fact and a negative fact to make what I shall call a “hybrid” fact, such as [A∧¬B] or [A∨¬B]. And they may even combine with two negative facts to make a complex negative fact, such as [¬A∧¬B] or [¬A∨¬B]. But—it may be asked—how can we combine something with nothing? Or nothing with nothing?

A possible reply would be to say that it is the *primary* role of ∧ and ∨ to combine positive facts, although they may also combine positive facts with negative facts and negative facts with negative

facts. But it is difficult to see what might motivate such a claim, and it is also problematic.

In order to solve this difficulty, we have no choice but to accept negative facts as a kind of fact. If so, ∧ and ∨ are constituents of the facts [A∧¬B], [A∨¬B], [¬A∧¬B], and [¬A∨¬B]. That we must embrace hybrid facts does not by itself mean that we must also embrace

conjunctions or disjunctions *only* of negative facts. If some facts are constituted wholly out of negative facts then, to speak loosely, some non-facts are facts. Nevertheless, we should also embrace these complex

32 See D. M. Armstrong, *Truth and Truthmakers* (Oxford: Oxford University Press, 2004), p. 55.

33 See Nick Zangwill, “Negative Properties,” *Noûs*, xlv (2011): 528–56.

purely negative facts once we have embraced hybrid facts. I will return to this issue.

Whether or not we must embrace complex facts that are entirely constituted by negative facts, I think we must embrace hybrid facts that include some negative facts. The acceptability of at least hybrid facts (which are constituted at least by one positive fact and one negative fact) can be seen by returning to the cooking analogy. What is mushroom risotto? Or chicken Kiev? These dishes have essential ingredients. Mushroom risotto must contain mushrooms and rice. Could we make chicken Kiev without chicken? It seems not. There has to be chicken, it seems. Or perhaps duck might do as a substi- tute. It is not clear. But it must have something like chicken. Never- theless a dish or its recipe does not just consist of ingredients plus instructions for cooking or combining them. There is the question of stopping. A recipe says what is included but also tacitly or explicitly includes a “that’s all” clause. Perhaps many things could be added to mushroom risotto while it remains mushroom risotto. We could add herbs like oregano, for example. But there are limits. We should not add a lot of chocolate to mushroom risotto or to chicken Kiev! That shows that *non*-ingredients are part of what “makes up” a dish. Chicken Kiev has essential ingredients as well as essential or necessary non-ingredients! Perhaps we should not say that there is the totality fact that the essential ingredients are all the ingredients. For there are a variety of optional seasonings. Nevertheless, a recipe tacitly or explicitly includes non-ingredients. This shows that facts about mush- room risotto or chicken Kiev are hybrid facts—the ingredients plus the lack of other ingredients. So hybrid facts should be accepted.

What goes for mushroom risotto and chicken Kiev goes for the whole world. The world consists of the facts *and* the fact that there are no other facts.34 Thus the world consists of both positive facts and negative facts—being and non-being. The world is not just all that is the case but also all that is not the case. The negative fact that we need to complete the world is not some singular negative fact (or some conjunction or disjunction of such facts), but is a gen- eral negative existential fact. The world includes a limit fact. Neither listing all the positive facts, nor adding all the singular negative facts to the list, tells us everything about the world. We need to add that there is nothing else.

David Armstrong restricts himself to admitting just one “limit” or

“totality” fact, and thus he hopes to dispense with a plurality of negative

34 This is a theme in Wittgenstein, *Tractatus Logico-Philosophicus*, *op. cit*.

facts.35 But this is questionable because limit facts depend in part on particular negative existential facts, not vice versa. When we list the planets and say that they are all the planets, that is because there are no other planets, rather than there being no others because the ones listed are all of them. It would be an absurdity or a joke to say that there are no others because these are all of them. (This direction of dependence may fail for the special case of teleological kinds. Consider “That’s all folks,” said when a show or performance is over. There is some inclination to say that there is nothing more because the show is complete. But that is because someone intended that there is nothing more.)

Hybrid disjunctive facts should also be embraced. For one thing, they are determined by hybrid conjunctive facts. For another, they have intuitive appeal. For example, they play causal roles. A boat is likely to sink if either its hull is not repaired or if it hits a rock. Anemia is caused either by not eating properly or by taking drugs.

What of the special case of the conjunctive hybrid fact p∧¬p? I seem to be committed to granting that this is a fact. But it is not a fact that p∧¬p even though it may be a fact that p∨¬p. What this shows, I sus- pect, is that facts cannot be arbitrarily constructed from other facts

and logical constants. (There are similar constraints on construction in set theory, which is shown by Russell’s paradox.) ∧ and ∨ do not need to be policed by principles of fact construction. One thousand conjunctive and disjunctive flowers can bloom. But ¬ does need to be policed, and that may just be something that is distinctive of ¬ by con- trast with ∧ and ∨.

* 1. *Combinations and the Satanic Role of Negation.* Having said this,

the role of ¬ is still puzzling. ¬ does not seem to be constitutive of complex facts as ∧ and ∨ are.

It might be insisted that ¬ contributes to the powers of the facts

that it partly constitutes. ¬ does not bind *two* facts to make a new fact, but perhaps it does combine with *one* fact to make a new complex fact.

Is this right? Instead of combining with a fact to make a new fact, rather ¬ seems to take us from a fact to a non-fact. ¬ seems to be a fact destroyer! Perhaps we could call this the “Satanic” role of negation.

In reply, the following might be said: while ¬ may combine with a fact to make a non-fact, ¬ may also combine with a non-fact to make a fact. So ¬ may play a role in fact creation after all. But this is not

35 Armstrong, *Truth and Truthmakers*, *op. cit.*, pp. 53–60.

obviously correct, and it seems strange. How can we make a non-fact into a fact? Returning to the conditional and determination facts that underlie the truth table for negation, we may say that although if p then ¬¬P, and P metaphysically determines ¬¬P, it is not the case that if ¬¬P then P, and it is not the case that ¬¬P metaphysically determines P. Thus ¬ does combine with facts, but not to make new facts, but only to annihilate facts. So ¬ cannot combine with a non-fact to make a fact. Can we revive the dead? If you shoot a dead person, they remain dead. Negation, like Satan, is only destructive and cannot create.

It might be replied, in a Manichean vein, that ¬ need not work alone. ¬ may make a contribution to fact-making when it is combined with conjunctive or disjunctive facts. For example, ¬P and P∨Q together determine Q. It is tempting to say that in these cases ¬ com- bines with complex facts to make new facts. Certainly, it must be accepted that negative facts may combine with complex facts to make new positive facts.

Nevertheless, it is not clear how ¬ is functioning in such cases. Yes, a negative fact may combine with one or more complex facts to gen- erate another positive fact. What remains unclear is whether ¬ is a constituent of facts such that it combines with those facts to form new complex facts. Is ¬ a constituent of facts, as ∧ and ∨ are? The contrary view is that ¬ is not something that combines with facts to transform those facts into other facts; ¬ does not transform facts,

rather ¬ is the angel of death for facts.

In support of this, consider that the idea of ¬A as a complex fact is unintuitive. Typographic representation apart, ¬A is surely just as simple or complex as A. The presence of A and the absence of A are equally complex or simple. This is unlike ∧ and ∨. Existence and non-existence are similar: the existence of a thing and its non- existence are equally complex.36

So the idea that ¬ is a constituent of the complex fact ¬A is objec- tionable. The important point is that it is clear that ¬ differs from

∧ and ∨ in important ways. This partly explains why it is no accident that there is something intuitive about ∧ and ∨. It is not arbitrary that human beings tend to think in these terms, as it would be on the standard view according to which all that recommends ∧ and ∨ over the Sheffer stroke is mere familiarity or ease of use or some-

thing like that, and that we can easily imagine other creatures for whom the Sheffer stroke seemed natural, and for whom our ∧ and ∨

36 Compare Ludwig Wittgenstein, *Wittgenstein and the Vienna Circle: Conversations Recorded by Friedrich Waismann* (Oxford: Blackwell, 1979), pp. 84–87.

seem contrived and unnatural. I say that ∧ and ∨ are natural and the Sheffer stroke is unnatural and perverse.

¬ has much in common with ∧ and ∨. But it also has much not in common with them. We must reject the assumption that ∧, ∨, and ¬ are all to be labeled “logical constants,” as if that category is

straightforward, uncontroversial, and uncontested.

* 1. *Logic and Non-being.* Let us end by confronting the funda- mental issue over what ¬ is, and how it is related to ∧ and ∨. Is ¬ part of the structure of being in the way that ∧ and ∨ are?

We need to think about the world as a whole. The subject matter

of the discipline of logic is the structure of the world; but not all concepts or words that are classified as “logical constants” refer to similar structural features of the world.

The realist view of ∧, ∨, and ¬ is the following. The world consists of positive facts plus negative facts—or in other words, the world of

being and the world of non-being. Being is the sum of positive facts and non-being is the sum of negative facts. The world of being can be described without ‘¬’; ‘∧’ and ‘∨’ will do. But the world has plenty of non-being as well as being. For example: there is Pierre’s absence from the café; there is the stolen bicycle that is not chained where it was left; there is no absolute space-time; and there are holes in the road. Moreover, without reference to non-being we will not be able

to talk about everything—the whole world—since we need to say what there is and also that there is nothing else. Even when we con- sider parts of the world, the world contains hybrid facts. Without non-being, there would be no mushroom risotto and no Chicken Kiev, since both partake of non-being as well as being. So without referring to non-being, we will not be able to think about mushroom risotto or Chicken Kiev.

Similarly with objects: we might refer to an absence, such as a hole, and say that it exists. But this is possible only given that the primary application of the notion of existence is to positive enti-

ties. We might have a name for a thing that might, for all we know, turn out to be either a presence or an absence. Stars, for example, might turn out to be holes in the sky. The same is true of properties—we might use a predicate which could, for all we know, turn out to refer to a positive or negative property. Neverthe- less, the standard function of positive language is to refer to existing things and their positive properties. And the standard function of linguistic negation is to refer to negative facts (something not existing or an existing thing possessing a negative property). The distinction between positive and negative facts, objects, events, or properties is fundamental for us.

We are led to a dualist view of the world—a world that divides into being and non-being. But these two realities are locked together in an inextricable embrace—they are tied together with various dependencies.37 The one world combines these two realities— that of being and that of non-being. Logic reflects this duality. There is light and there is dark—presence and absence. And the function of ‘¬’ is to enable us to describe non-being—the dark side of the world.

This is quite different from the function of ‘∧’ and ‘∨’. They enable us to talk of the structure of being and also the structure of non-

being—of the structure of the world. ‘¬’ does not enable us to do that. It enables us to talk and think about non-being. ‘∧’ and ‘∨’, by themselves, do not enable us to do that. Yet again, it is essential to abandon the idea that ¬ is similar to ∧ and ∨, something that the notion of a “logical constant” invites. Yes, ‘∧’, ‘∨’, and ‘¬’ all refer. But they refer to different features of reality. We need all three to

describe the world.

Do we need all three? Perhaps we only need either ‘∧’ or ‘∨’ together with ‘¬’ to describe the world. Was that the point of the Sheffer stroke? It might be argued that ∧ and ∨ are convertible into each other: A∧B5¬(¬A∨¬B); and A∨B5¬(¬A∧¬B); so we only need one of them. But these conversion principles are controver-

sial. Earlier I expressed sympathy for abandoning the double nega-

tion principle of classical logic, that A5¬¬A: because, although A determines ¬¬A, ¬¬A does not determine A. So there is no identity. Similarly, although A∧B determines ¬(¬A∨¬B), and A∨B deter-

mines ¬(¬A∧¬B), ¬(¬A∨¬B) does not determine A∧B, and ¬(¬A∧¬B)

doesnotdetermineA∨B.Sotheyarenotidentical.Ifso,todescribe the basic logical structure of the world, we need both ‘∧’ and ‘∨’ to add to ‘¬’.

Despite their differences, ∧ and ∨ have much in common with each other; together they comprise the structure of the world, the whole world, of being and non-being.

coda: defining “logic”?

I have not engaged in a project of trying to *define* “logic,” or of trying to give a theory of what is distinctive of all so-called “logical constants.” I have focused on three paradigm cases of logical constants without worrying about what connects them with each other or with other logical constants. Whatever definition of “logical constant” we pursue, or indeed whether or not we pursue a definition, it should not be

37 I explore these in Zangwill, “Negative Properties,” *op. cit*.

assumed that the items identified as “logical constants” have much in common. ∧ and ∨ are similar in many respects. And ¬ has many similarities to ∧ and ∨, but it also differs from ∧ and ∨ in significant ways. It is an entirely open question whether or not identity, quantifi- cation, and conditionals should be treated similarly to ∧, ∨, or ¬. Each so-called “logical constant” should be considered for what it is, and

not automatically treated like other items classified as “logical con- stants.” If a systematic treatment can be achieved, and there is unity to a number of items that are often classified as “logical constants,” then we should recognize that. But it should not be something we strive for overzealously. If it is there, good; if not, also good.

It is true that despite the differences between ∧, ∨, and ¬ they do share a high degree of generality. But the question of whether their

distinctive generality is *due* to their being an instance of the kind “logical constant” should disappear. We can be content to say: this is what ∧, ∨, and ¬ are, and they have these determining powers irre-

spective of the kind of facts with which they are combined. The gen- erality of such claims springs directly from the natures of ∧, ∨, and ¬. Why think that ∧, ∨, or ¬ have their distinctive generality because they have the property of being logical constants? Even if there is a

property of being a logical constant (which is far from obvious), why think that possessing such a property explains the generality of some constant? Since the generality of any particular constant is explained by that constant, there is not much for the supposed prop- erty of being a logical constant to do.

A useful comparison is with theories of the nature of art, where there has been some reflection on the point of seeking definitions of art. In my view, what matters both in logic and the theory of art is what we say about various items, rather than articulating some gen- eral category under which some philosophers collect items together. There is a somewhat uninspiring project of saying what is common to the items collected in the eighteenth-century “system of the arts,”38 which included and was limited to painting, sculpture, architecture, music, and poetry. There are papers, textbooks, and anthologies dedi- cated to trying to find something in common between these. This is an odd pastime! Perhaps *some* people have a notion of “fine art” or “*Kunst* ” that collects all and only these items.39 My view is that there

38 Paul Kristeller, “The Modern System of the Arts: A Study in the History of Aesthetics (I),” *Journal of the History of Ideas*, xxii (1951): 496–527.

39 It does seem, however, that this notion needs first to be inculcated in university aesthetics classes; compare Gilbert Harman on analyticity at Gilbert Harman, *Reasoning, Meaning, and Mind* (Oxford: Clarendon Press, 1999), p. 142.

is no need to be bound by such a notion of art, one that may turn out to be culturally parochial. Renaissance and traditional Japanese cul- tures, for example, collected together activities and things into kinds very different from those of the eighteenth-century system of the arts, which they thought exhibited interesting explanatory uniformities. Aestheticians seek to understand particular items or kinds of items; they want to understand paintings, for example—what they are and why we are interested in them. It is not likely that anything of signifi- cance is explained by the painting having the alleged property of being an artwork. If we can make high-level generalizations about various so-called “arts,” that is good. If not, it is nothing to cry about; it just means we need a more variegated theory.40 It is similar with the so-called “logical constants,” whichever they are. Quantification is typi- cally thought to be in the category of “logic,” but how about set- membership, or modal operators? Music is definitely in the cate- gory of the “arts,” but how about photography or cake decorating? If it turns out that there is something in common to many of the items that a concept collects together, that is nice. It means that the concept is tracking an interesting explanatory uniformity. If not, it is no disaster. We are not engaging in conceptual analysis—gazing at our conceptual navels—but seeking to understand the world. Aesthetic functions are characteristic of many items that are stan- dardly collected together under the label “art.” And generality is char- acteristic of many of the items that are standardly collectedly together under the label “logic.” Nevertheless, among the items with that common characteristic there are also significant differences. In think- ing both about logic and art, asking the “What is…?” question is not a good idea because it assumes a unitary range of phenomena, which is not only controversial but also implausible.

The definitional question is sometimes connected with concern over the boundaries of logic. Perhaps we can use a definition to police its borders. For example, it might be asked: are temporal, deontic, or epistemic logics really *logic*? That is: are ‘before’, ‘is obligatory that’, or ‘is known that’ *logical* constants? I agree with Prior that these questions are not pressing ones.41 If we can formulate general principles within a domain, where there are symbols for variables or operators, and it looks like there is a specific temporal, deontic, or epistemic logic, one that is revealing in casting light on intuitive implication relations,42 then why not call that “logic”? There is no interesting border to

40 See further Nick Zangwill, *Aesthetic Creation* (Oxford: Oxford University Press, 2007). 41 Arthur Prior, “What is Logic?,” in *Papers in Logic and Ethics* (London: Duckworth, 1976). 42 Donald Davidson, “The Logical Form of Action Sentences,” reprinted in *Essays on*

*Actions and Events* (Oxford: Clarendon, 1980).

police. So we do not need the notion of a logical constant in order to have a criterion of what it is to be a logical constant, in order to decide controversial cases or police the borders.

However, it is natural to think that the specific logics are less gen- eral than what we might call “plain” logic (∧, ∨, and ¬, and perhaps also identity, quantification, and conditionals). The specific logics apply only within specific domains—domains that are relatively restricted, to temporal, deontic, or epistemic facts. By contrast, the plain logical constants apply more generally, to reality that is non-temporal, non- deontic, and non-epistemic. For example, mathematical objects and

facts seem not to be subject to the strictures of temporal, deontic, or epistemic logics, but they are subject to the strictures of plain logic. It might be objected, however, that this is not true because we may say that the number 2 has never not existed, or that if the number 2 were morally obligated to do something then it would be permitted to do it, or that if the number 2 were to know that it knows something then it would also know it. Moreover, it is not implausible that arith- metic or set theory are as general as plain logic since anything can be counted or gathered together into sets; so the distinction between plain logic, on the one hand, and arithmetic or set theory, on the

other hand, will be hard to establish on the basis of generality.

The specific logics describe relations among certain kinds of *prop- erties* and *relations*. This allows that any *thing* can possess them, in which case the specific logics apply to all things. Nevertheless, the subject matter of plain logic is more fundamental than that of the specific logics. In particular, to formalize principles of deontic logic, for example, we must draw on principles of plain logic; whereas to formalize principles of plain logic we need not draw on principles of deontic logic. This is because deontic logic holds partly in virtue of plain logic, but plain logic does not hold partly in virtue of deontic logic. So plain logic is more explanatory comprehensive than deon-

tic logic. In this sense ‘∧’, ‘∨’, and ‘¬’ have a distinctive fundamentality, by contrast with the terms and symbols of temporal, deontic, epi-

stemic logics, and other specific logics. That remains true even if a case can be made for thinking that specific logics apply to every- thing. This fundamentality may also be distinctive of identity, quan- tification, and conditionals. There is a sense, then, in which plain logic is more fundamental than the specific logics: it is more explana- tory basic. If so, this fundamentality marks a difference between the phenomena that philosophers group together as what I am calling “plain logic” from specific logics, such as deontic logic, tense logic, and epistemic logic. But we can say that without thinking that the specific logics are somehow less truly logic than plain logic.

So long as we can describe systematic structural aspects of the world by means of notions like conjunction, disjunction, negation, identity, quantification, or conditionals, together with temporal, deontic, episte- mic, or other operators, what does it matter whether we classify only some of these phenomena as truly “logical” in some narrower sense? It is enough to describe the structure of the world.

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