From Logic to Philosophies

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FROM LOGIC TO PHILOSOPHIES *

Susan Haack has undertaken the long overdue task of introducing students to the main topics in the philosophy of logics.

I have tried to produce a book which will be useful as an introduction to the philosophical problems which logic raises, which will be intelligible to students with a grasp of elementary formal logic and some acquaintance with philosophical issues, but no previous knowledge of the philosophy of logic (p. xiii).

It is a competent work, perhaps too wide in scope and too shallow in its treatment of individual topics to bear the creative individual stamp of other little books of roughly similar titles. Nevertheless it is a solid introduction for students to material that does after all have an historical and conceptual connectedness, which they cannot discern in the usual farraginous reading lists of anthologies and journal articles.

   To give some indication of the scope of the book, the chapter headings are: 1. 'Philosophy of logics'; 2. Validity; 3. Sentence connectives; 4. Quantifiers; 5. Singular terms; 6. Sentences, statements, propositions; 7. Theories of truth; 8. Paradoxes; 9. Logic and logics; 10. Modal logic; 11. Many-valued logic; 12. Some metaphysical and epistemological questions about logic. Anyone familiar with the literature will realise how much controversy has to be condensed under each heading. The impressive bibliography alone, if blended in the way one can expect from Haack's fair and even hand, would result in only the most anodyne discussion. Haack can serve as background reading at the very best. One must, as she herself does, point the student firmly in the direction of the classical sources. Otherwise Haack's tentativeness, and way of abruptly ending a discussion just when it starts to bear the fruits of deeper disagreement, might be taken as a model of philosophical style; and the student, in learning the price of every idea, will appreciate the value of none. At several points Haack's survey style renders her discussion too superficial:

Tarski proposes . . . Wallace fears . . . But Kripke has argued . . . So I shall assume . . . (p. 51).

or

The objectual interpretation is championed by . . . Quine and Davidson; the substitutional interpretation by . . . Mates and Marcus. . . . Russell's explanations . . . are sometimes of the one and sometimes of the other character. . . . I, in the company of e.g. Belnap and Dunn 1968, Linsky 1972, Kripke 1976, shall etc. etc. (p. 42).

   One reflection on the state of the art prompted by Haack's present publication is that we need a book on the logics themselves, upon which hers would be a philosophical commentary. The time is ripe for their

presentation in some uniform fashion, enabling comparison of grammar, proof systems, semantics, translations from and into natural language, and scope of application. In a sense, therefore, Haack's work is somewhat premature. Students do need the raw materials of the logical systems in some detail before benefiting from her discussion of points of philosophical interest. For example, the only fact a student will find about quantum logic is that it lacks the distributive law. He will not find out why. Quantum logic anyway is about as indeterminate as the behaviour of the physical systems whose descriptions it deals with. It has come a long way since Reichenbach's Model *T* version based on three truth values, and is now a very complicated mathematical discipline. One could not begin to tell the student at this level what quantum logic is, unless he be a mathematician who knows about Hilbert spaces and lattice theory. We should not encourage students of philosophy to whistle in the dark in such esoteric domains.

Haack's plural title may pretend to more than is on offer. On page xiii of her Preface she concedes that much of the first eight chapters is concerned with 'problems raised by the *standard* logical apparatus' (my emphasis). The broad and confident brushstrokes in the Preface, deftly sketching the lines we expect to follow later in more satisfying detail, have a sense of urgency and excitement that the text does not live up to. Haack distinguishes (p. vi) four major areas of development since the *Begriffschrift*. Two of these are formal:

 (i) the development of the standard logical apparatus (syntax and semantics)
 (ii) the development of non-standard calculi;
and two are philosophical:
(iii) philosophical study of the application of logical systems to informal argument
(iv) study of the aims and capacities of formalization.

Notably absent, however, is any consideration under (i) of proof theory since Gentzen; of higher order type- and categorial theory; and of game theoretic semantics. The criticism here is not that the book is too short, but that these topics could have displaced some other chestnuts. Modern proof theory is vital to one's understanding of the powerful arguments of Dummett and Prawitz for anti-realism, and her own discussion of intuitionism in *Deviant Logic* had been very inadequate. The other two topics are likewise central to the formal study of natural language. Haack says only

... it is, to my mind, doubtful whether one is entitled to expect that linguists will eventually discover a sufficiently rich, universal, grammatical structure ... (p. 26).

by way of justifying her neglect of this link between logic and language, surely of great importance for (iii) and (iv).

In Chapter 1, Haack begins with the expected list of questions but the student will be relieved to find that there is no difficulty over the question of 'what it is to be a formal system'. The interesting question is which of these are logics. Distinguishing between interpreted and uninterpreted formal systems, she writes (p. 3), 'uninterpreted, a formal system is just a collection of marks . . .'. But this appears to disregard the other features, such as definitions of formation and transformation rules, that can and should be added before the question of interpretation arises at all. This is surely reasonable, if only to make sense of 'the claim of a formal system to be a logic' which depends 'upon its having an interpretation according to which it can be seen as aspiring to embody canons of valid argument'. As formal logics she includes (p. 4),

'traditional' logic — Aristotelian syllogistic
'classical' logic — 2-valued sentence calculus
predicate calculus
'extended' logics — modal logics
tense logics
deontic logics
epistemic logics
preference logics
imperative logics
erotetic (interrogative) logics
'deviant' logics — many-valued logics
Intuitionist logics
quantum logics
free logics
'inductive' logics

Here we have a catalogue of the areas of omitted detail mentioned above. And it is precisely here that Hack's bibliographical generosity falters. There is no comprehensive guide to the various best or most important treatments of the logics in this list. Following up the entries in the index for these logics, one gleans only the most inconsequential details about them. It is as though a *cordon sanitaire* has been thrown around standard logic, in order that Haack might complete her pluralist programme of philosophical inoculation before exposing the student to unknown strains.

Even given the concentration on issues arising from standard logic, it is disappointing to see that she does not treat the important topic of identity and relative identity. The writings of Frege, Russell, Wittgenstein, Quine, Geach, Wiggins and Noonan on this theme provide a sustained route that could do with some of the clearance and signposting of which Haack is so capable.

She adopts an 'hospitable policy' in listing systems as potential logics, criticizing Quine for over-hasty dismissal of second order logic. But she

does not discuss the latter at all. Even a reference to Boolos' article 'On second order logic', [1975], would have been better than silence here. Given its importance for the philosophy of mathematics, in considerations of 'trade-off' between expressive and deductive power, Haack has missed here an opportunity to present the student with a major problem for the choice of a logic. There is no mention likewise of the results of Lindström and Tharp on extensions of first order logic. She is silent also on branching quantification, presently of considerable interest to logicians and linguists, the seminal works on which appeared as early as 1974. I do not wish to be taken as carping from the vantage point of a specialist who might be accused of being too occupied with the most recent developments in the area. I think rather that the topics I have mentioned are, with the benefit of only limited hindsight, of great importance for Haack's project. Even if there is no discussion of them, she should have provided the student with a way in to the topics himself.

Haack gives rough and ready criteria for a system's being a logic:
(i) reasonable analogy to classical logic in the case of an extension or deviation, and
(ii) applicability to reasoning irrespective of subject matter.
The second criterion does not sit easily with the locution 'logic of'. Haack admits to vagueness in both criteria, and simply doubts that 'logic has a precisely specifiable "essential character"'. Obviously the traditional question 'What is a logical constant?' should loom large here, and the two recent interesting suggestions of Peacocke and Hacking would be the starting point for an up to date discussion of this problem within truth theory and proof theory respectively. They might allay Haack's 'feeling . . . that the prospects for a well-motivated formal criterion are not very promising' (p. 7).

In her discussion in Chapter 2 of appraisal of arguments, Haack presents a reasonable corrective to the view that there are two kinds of arguments, deductive or inductive:

it is not that there are two kinds of argument, but that arguments may be logically assessed by different, deductive or inductive, standards . . .

The inductive standards, however, are never elaborated. (For the deductive standards, the student is assumed to have had his squeeze of Lemmon.) Haack advances directly to the question 'What is an argument?' and answers that it is a stretch of discourse suitably punctuated or annotated. She does not discuss the interesting difficulties in attributing at least tree form, and perhaps even graph form to the logical connections among sentences in a linear sequence. These problems are likely to assume fresh importance if multiple conclusion logic were ever practised seriously.

Having defined syntactic validity and semantic validity of arguments with finitely many premises Haack says we naturally aspire to soundness

and completeness results. That this would require compactness of semantical consequences is not noted. Nor does she emphasise that syntactic validity should be defined with respect to axioms and rules applications of which are effectively checkable. The slogan for validity of arguments—'its premises couldn't be true and its conclusion false'—invites the beginners' misinterpretation according to which valid arguments would be like the Lewis paradoxes. Sloppier still is the explanation of tautologies as statements that 'say the same thing twice', as if repetition erased contingency.

Haack does, however, draw attention to the shortcomings of the standard definition of consequence—which is precisely that if the premises are collectively impossible, or the conclusion necessary, then the argument will be valid, even if the premises are quite irrelevant to the conclusion.

Proponents of 'relevance logic' therefore challenge this conception of validity; and because of this challenge they urge the adoption of a non-classical formal logic which requires relevance of premises to conclusion . . . so their dissatisfaction with the usual informal conception of validity is intimately connected with their challenge to classical logic (p. 16).

What Haack fails to highlight, however, is relevance logic's obsession with an *implication connective* rather than a relation of 'relevant consequence' or 'relevant deducibility'. In the fuller discussion of relevance logic on pp. 198–203 the lurch from considerations of deducibility and the Rule of No Funny Business, to an axiomatic presentation using a *connective* for relevant implication is particularly conspicuous. There is a large gap between the motivating ideas and their final systematic form which is likely to puzzle any student—and justifiably so. In these non-standard contexts he is continually being cautioned against assuming classical canons too readily (such as disjunctive syllogism). He is therefore quite justified in his reluctance to assume a deduction theorem to mediate between axiomatic and inferential treatments.

Haack defines a broader and a narrower sense of 'same system' in terms, respectively, of inferences' or primitive rules' matching under translation.

Since, except in some unconventional systems, anything whatever follows from a contradiction, . . . all inconsistent systems will count as the same system in the broader sense (p. 22).

Except for her brief mention of relevance logic, Haack does not say what these unconventional systems are, which is surprising in a connoisseur of deviance. If anything is likely to fire the imagination of her intended readers, it is an Hegelian hint that contraditions do not turn turnstiles into floodgates. But perhaps she is wise to avoid such catholicity of logical taste. The student bitten by the paraconsistency bug will have to rely on Arruda's comprehensive survey in his [1979] and the latest Rescherches by Brandom [1980].

Haack is at her lucid best over a train of ideas dealt with in brisk succession—the maxim of shallow analysis, the matrices for the connectives, their informal readings, the aims of formalisation. As ever, the tone is one of balance and moderation:

> it is preferable to think of the optimal formal representation as the one which reveals the least structure consistently with supplying a formal argument which is valid in the system if the informal argument is judged extra-systematically valid . . . (p. 26).

> Prior has not shown that acceptable rules of inference could not give the meaning of connectives occurring in them . . . (p. 32).

> one should neither expect nor desire a direct formal representation of all the informal arguments, extra-systematically, to be valid. Rather, pre-systematic judgments of validity will supply data for the construction of a formal logic, but considerations of simplicity, precision and rigour may be expected to lead to discrepancies between informal arguments and their formal representations, and even in some cases perhaps to a reassessment of intuitive judgments. One uses intuitive judgments of some arguments to construct a formal theory which gives verdicts, perhaps quite unexpected verdicts, on other arguments; and one might eventually sacrifice some of the original judgments to considerations of simplicity and generality (p. 33).

This last account is a curious conflation of the descriptive and normative. Laws of logic are not justified from general considerations of meaning or possible method, and accepted as normative. Nor are they straightforwardly descriptive of all the quirks of everyday reasoning. Rather, according to the view presented here, they derive their normative status by virtue of being simple and neat descriptions of intuitively acceptable practice. There is much to untangle and amplify here, and Haack would have done well to pursue it in more detail.

In Chapter 3 a survey of Strawsonian points over the faithfulness of truth-functional connectives to their several English counterparts is of obvious value to the student. But Haack appears to lose sight of the fact that Frege's original purpose was to design a language to analyse expressions and reasoning in mathematics. (She does, however, note this on page 156.) As an afterthought she says

> If one is concerned only to represent formally the valid arguments which are used in mathematics, for example, it might be that a truth-functional implication would be adequate . . . (p. 38).

I think it is a fair demand on the relevance logician, in this connection, that he provide canons of translation according to which all mathematical reasoning can plausibly be re-constructed using relevance logic.

In Chapter 4 on quantifiers, Haack mentions that Montague treated names and quantified phrases as expressions belonging to the same logical category. No explanation is offered of *how* this is so. Nor does she press against Montague any criticism in the same spirit as that levelled against Quine's elimination of singular terms:

The fact that Quine can supply an appropriate definite description to replace a name only by the use of predicates which, though officially unanalyzable, are unofficially explained with the help of names ('A' means ' = a') scarcely reassures one that the eliminability of singular terms really shows them to be ontologically irrelevant (p. 47).

On Montague's treatment the category of names is that of quantifiers— they are saturated by predicates to yield sentences. And then, one asks, what is the category of predicates?—and cannot, on pain of circularity, give the usual answer that they are saturated by names to yield sentences.

Haack provides some forceful insights into the difficulties confronting any attempt at an extensional formulation of Quine's criterion of ontological commitment. She ends by suggesting (p. 49).

Perhaps I may rewrite Quine's slogan: to be is to be the value of a variable bound by an objectural quantifier; it's less memorable, but truer, that way! Notice, though, that Quine's criterion now begins to look oddly oblique: as if one discovered that a theory which says there are so-and-so's is ontologically committed to so-and-so's by first translating it into predicate calculus notation, and then appealing to the objectural interpretation of the quantifiers to show that its existential theorems say that there are so-and-so's.

But the matter is not really that straightforward. In any reasonably interesting case it is only after proper formalisations that we are able to locate the various theoretical sayings that there are so-and-so's. Does Newtonian mechanics, for example, *say that* there are forces? First order formulation here brings considerable insights. One realises to what extent ordinary language versions of the laws contain unnecessary nominalisations, illusory reifications. Austerely, Newton's laws are not about actions and reactions, in the Quinean quantificational sense of 'about'. Rather, they are about particles and real numbers. As Haack then goes on to say,

The serious work has to be done in deciding which *ostensibly* existential assertions of a theory need remain in primitive notation, and which are eliminable by suitable paraphrase (p. 49).

Haack seems to be under the misapprehension that standard logic's commitment to there being at least one object (*via* theorems such as $(\exists x)Fxv - Fx$) can be avoided only by giving up the objectual interpretation of the quantifiers in favour of a substitutional one, with non-denoting terms allowed as substituends. But of course universally free logic can be devised on the objectual interpretation, combining naturalness of reading with neutrality on ontic questions. (For a detailed account of just such a system, see Chapter 7 of my [1978].) Note also that Haack is wrong in explaining 'free logics' as systems the languages of which require a domain of fictional entities (p. 71), and the terms of which are 'represented' as 'denoting unreal objects' (pp. 71–2). Moreover, modal logic on the objectual interpretation, with proper attention to scope distinctions, can

cope with those problems that led Marcus to suggest the substitutional interpretation.

The central question addressed in Chapter 5 is 'whether proper names have meaning ("sense", "connotation") as well as denotation, and if so, what meaning they have.' Following her two earlier flow-charts clarifying the issues surrounding Quine's criterion of ontological commitment, and the two interpretations of the quantifiers, a convenient table now summarizes the view of Frege, Russell, Wittgenstein, Quine, Searle, Burge, Davidson, Mill, Ziff and Kripke on proper names. This meeting of minds is dutifully minuted, and the student is left with a useful crib-sheet, graphically summarising the sentiment.

Drawing attention to the variety of kinds of proper names may induce some caution about assuming that there is such a thing as *the* way in which proper names work (pp. 57–8).

Haack pays particular attention to Kripke's account.

. . . his criteria for correct use of a name make no appeal to the speaker's knowledge of or beliefs about the individual designated, but require only that his use of the name be appropriately connected, causally, with that individual. However, . . . a gap could open between the semantic and the pragmatic accounts; for if I fix the reference of a proper name by means of a definite description which, in fact, though I don't know it, designates nothing . . . there can't be an appropriate causal chain to the bearer of the name, since there is no bearer (p. 60).

Is there really a gap here between the semantic and pragmatic accounts? In Haack's envisaged case, the reference has, *ex hypothesi*, been fixed. Isn't it reasonable then to suppose that this was by a *referential use* of the definite description, in Donnellan's sense? (Donnellan's views, sketched on page 69, could easily have been applied here.)

After discussing those accounts of proper names that invoke descriptions or clusters of descriptions, Haack passes on to the theory of descriptions itself. Her discussion of Russell, Frege and Strawson is excellent, ending with the author sitting on the fence:

I am doubtful whether the question, whether 'The present King of France is bald' should be accounted false or truth-valueless could, or even should, be settled by appeal to 'what we would ordinarily say'. The issue turns, rather, on whether one is prepared to tolerate some artificiality (either, in the case of Russell's theory of descriptions, in the translation from natural languages into the formalism, or, in the case of Frege's preferred theory, in the choice of referent for otherwise non-denoting expressions) in order to conserve bivalence . . . (pp. 68–9).

But the choice of alternatives is not so stark. One can conserve bivalence without Russell's artificial translations or Frege's arbitrary referents. This is the virtue of the free logic referred to above, in which the descriptive operator forms terms directly, and is not defined contextually. This consideration could tip the balance in favour of Russell's analysis of the truth-

conditions of sentences with non-denoting descriptions. The problem of non-denoting terms from fiction ends with the 'hunch' that

the most significant difference between telling a story and making a report, so to speak, is not the difference between the story and the report, but in the difference between the telling and the making (p. 73).

In Chapter 6, following Gochet, Haack distinguishes three approaches to the question 'what in informal arguments corresponds to the well-formed formulae of formal languages?'

(i) syntactic: what, in natural languages, is the analogue of the '*p*', '*q*' of formal logic?
(ii) semantic: what kind of item is capable of truth and falsity?
(iii) pragmatic: what kinds of item should one suppose to be 'objects' of belief, knowledge, supposition, etc.?

By a *sentence* I shall mean any grammatically correct and complete string of expressions of a natural language . . .
By a *statement* I shall mean what is said when a declarative sentence is uttered or or inscribed . . .
By a *proposition* I shall understand what is common to a set of synonymous declarative sentences . . . (pp. 75–6).

The usual caveats, distinctions and options follow with the expected number of references. The

debate about which items are the, or the primary, truth-bearers, however, has been, to my mind, neither very conclusive nor very fruitful (p. 79).

One might hope, then, to my mind, to be spared it all; but

You will shortly see what I mean (p. 79).

She suggests two desiderata:
(i) truth-bearers should be relied upon not to change their truth value, and
(ii) all items of the relevant kind should have a truth value.
This second one is simply the classical principle of bivalence, and apparently in no special need of justification.

Haack wonders what the point would be of introducing statements as distinct from sentences if one

(guaranteed) against statements changing their truth-values by tightening up the criteria for statement identity so far that no non-simultaneous utterances count as making the same statement (p. 80)

But is not the answer the usual one, namely in order to distinguish what was stated from what was said?—for there can still be utterances of sentences that are not, or fail to make, statements. I also find curious her claim

Sentences, of course, have grammatical structure; statements and propositions, however, being extra-linguistic, do not (p. 82).

Fregean thoughts, for example, must be credited with structure isomorphic so that of the sentences expressing them. The claim that

it will be hard for statements or propositions to 'borrow' a structure from the sentences which make or express them

ignores the intuitive Fregean account of the compounding of senses, and Russell's account of the internal structure of a proposition.

The first section of Chapter 7, on theories of truth, is a bibliography written in prose. Haack then spends three and a half pages on the difference between definitions and criteria of truth, and the close connection between them. In considering the question 'whether the correspondence can be divorced from logical atomism, and, if it can, what account could then be given of the correspondence relation' she judges that Austin, with his descriptive and demonstrative conventions, makes an

improvement on Russell's account of 'the facts'. The point is hard to put clearly, but it is significant enough to be worth putting even somewhat vaguely. Russell is apt to speak as if the truth of p consists *in its correspondence to the fact that p*; but the trouble is that the relation between 'p' (*sic*) and the fact that p is just *too* close, that 'p' (*sic*) couldn't fail to correspond to *that* fact . . . Austin's version, however, locates the truth of the statement that p not in its correspondence to the fact that p, but rather in *the facts*' being as 'p' says . . . (pp. 93–4).

Haack here seems to be making it hard for herself to put the point clearly. If we unquote for her, as in interpreting Russell's account of *propositional* truth we surely must, then the point she is making contradicts what she said earlier about propositions not having structure.

The level of philosophical commentary is disappointing in what follows.

A persistent difficulty with the correspondence theory . . . has been the difficulty of supplying a precise account of 'corresponds'. A similar problem digs the coherence theory; it needs to be specified exactly what the appropriate relations between beliefs must be for them to be 'coherent' in the required sense (pp. 95–6).

Rescher is said to have 'contributed significantly to the detailed workingout of a coherentist epistemology'.

The problem facing the coherentist, as Rescher sees it, is to supply a *procedure for selecting*, from incoherent and possibly inconsistent data ('truth-candidates', not necessarily truths) a privileged set, the warranted beliefs . . . (p. 96, my emphasis).

So one defines the notion of a 'maximal consistent subset' of the data set. And because there will in general be more than one, one proposes a 'plausibility index' to filter out those whose 'disjunction' will be adopted. Quite apart from the problem of what a disjunction of sets is, it is incomprehensible how Haack can conclude that 'the recommended procedure . . . tells one how to select a privileged, "warranted", subset from an initial set of data.' Haack appears here to be doing something worse than confusing

definitions with criteria. She is confusing the definition of maximal con-
sistent subsets with search procedures for them. In the absence of meta-
data about the data, we can assume that Church's theorem (that the con-
sistency of a set of sentences is not in general decidable) poses limits to the
search procedure, and indeed even to our being able to tell if a one-step
search has succeeded.

By far the least satisfactory section is the one on the semantic theory of
truth. Haack's gloss on the truth schema $(T)S$ is true iff p, is

where 'p' can be replaced by any sentence of the language for which truth is being
defined and 'S' is to be replaced by a name of the sentence which replaces 'p' (p. 100).

This allows in only homophonic theories. But then comes a most remark-
able passage. Haack invites us to consider the 'definitely bizarre' (I agree!)
truth definition D_B:

A sentence is true iff it is asserted in the Bible.

She then claims 'a proponent of D_B could perfectly well maintain that his
definition *does* entail all instances of (T)'. This is simply false. Haack's
argument is as follows:

he may allow that 'Warsaw was bombed in World War II' is true, but insist that it *is*
asserted in the Bible . . . , or if he agrees that 'Warsaw was bombed in World War II'
is not asserted in the Bible, he will . . . maintain the falsity of ('Warsaw was bombed
in World War II'). So rather surprisingly, Tarski's material adequacy condition
cannot be relied upon to be especially effective in ruling out bizarre truth-definitions
(p. 101).

Haack clearly thinks that in order to show that D_B entails (logically implies)
a given T-sentence, it suffices simply to maintain the truth of the latter
(as she describes her proponent of D_B as doing—albeit only for the 'only
if' half). It is unfortunate that this was intended to support one of the
original philosophical contentions in the book. Note that the mistake
does not depend on any stricter, 'relevant' notion of entailment than
classical consequence. The very next claim, also a substantive one, is
likewise false:

The material adequacy condition *does*, however, apparently rule out . . . truth
theories . . . according to which some sentences are neither true nor false.

But all T-sentences are in the *minimal* logical closure of the truth-defini-
tion. In the metalanguage one need use only the introduction and elimina-
tion rules in deriving instances of the T-schema. It is only in proofs of
other theorems of (classical) truth theory, such as the law of bivalence, that
we use strictly classical reasoning in the metalanguage. It is only because
Tarski did assume the 'usual logical laws' in the metalanguage that he
could show 'that it follows from his definition of truth that of each pair
consisting of a closed sentence and its negation one, and only one, is true'

(pp. 109–10). But, for the reasons just given, this was *not* 'to be expected in view of the fact (*sic*), already observed (*sic*), that the material adequacy condition rules out non-bivalent theories of truth' (p. 110).

Haack gives no very good reasons for seeing Popper's theory of verisimilitude as an 'extension of Tarski's ideas' (p. 116); but she does inform the student that 'Popper's definition of verisimilitude does not apply to comparisons between theories both of which are false' (p. 117) and quite rightly regards this as supporting Tarski's more modest assessment of the epistemological significance of the semantic theory of truth.

No modern discussion of the semantic theory of truth, of course, could be complete without including an account of Davidson's programme, the aim of which is to provide a theory of meaning for natural language via a theory of truth-conditions for its regimented sentences. She makes a fair and nice point against Davidson:

There is some difficulty in squaring Davidson's attitude to the paradoxes (don't worry too much about them, concentrate on the rest of the job) with his holism, the insistence that an adequate theory of meaning must be a theory for a whole language (p. 121).

On the whole her discussion of the difficulties and innovations in Davidson's programme is clear and balanced, but does not address the thorniest problem, that of modality. She is unclear, however, as to whether it is the original English sentence or its canonical paraphrase to which the indexical theory of truth assigns truth conditions. Thus she suggests (p. 125)

The application of Tarski's methods, as extended by Weinstein to cope with indexicals, gives a result along the lines of:

'Galileo said that the earth moves' (s, t) means that $\left.\begin{array}{l} \\ \text{is true iff} \end{array}\right\}$

Galileo uttered at t' (t' earlier than t) a sentence which meant in his mouth what the utterance demonstrated by s at t'' (t'' just after t) meant in s's mouth, where the demonstrated utterance is of 'The earth moves'.

Now presumably the utterance demonstrated by s at t'' is the subordinate clause of the original sentence utterance. This proposal will cope with English sentences if we ignore such matters as pronominal back-reference from the subordinate to the main clause. But in a language such as German, where '*daß*' sends the verb to the end, it is arguable that utterance of the subordinate clause in isolation will fail to say anything, for lack of grammaticality. This problem, however, might be avoided if we consider, instead of the original sentence, its Davidsonian paraphrase as two separate sentences. But this shifts the problem to the canons of paraphrase, and it becomes one of justifying one's choice of paratactics.

Moreover, Haack's misgiving that the appeal to 'samesaying' as a 'semantical primitive' is objectionable, is not argued for very intelligibly, and can probably be allayed by noting that recursion is at work. As

Stephen Read has also pointed out, her rejection on page 131 of the re-
dundancy theory with a substitutional interpretation of the quantifier, on
the charge of circularity of definition, results likewise from a failure to see
that recursion winds matters down.

Haack's closing account of the redundancy theory and Grover's pro-
sentential theory of truth is one of the most striking examples in the book
of questions being raised, insights glimmering, and discussion tailing off
without either consolidating one's understanding or indicating how to
pursue the questions further.

In Chapter 8 on the paradoxes, Haack opens with the usual list of
'logical' and 'semantical' paradoxes, but plays down the Ramseyan
distinction. Curry's paradox, however, is missing (as noted by Stephen
Read); although it is important for discussion of self-referentiality, since
it shows that negation is not the villain of the piece. I applaud Haack's
broad requirements on a solution to the paradoxes: It should give a con-
sistent formal theory in place of the one beset by paradox. 'It should, in
addition, supply some explanation of *why*' the culprit premises or principles
of inference are exceptionable. Moreover, there should be *independent*
grounds for taking exception to them. But we must not cripple reasoning
we want to keep, while yet blocking all paradoxical arguments.

This of course overlooks one line of solution—that of tolerating the
premises and inferential principles, but justifying a way of ignoring or
rejecting the force of 'paradoxical' arguments on the grounds that there
is something *globally* wrong with them, something not detectable in
individual premises or principles. Such a decidable feature of the para-
doxical proofs might turn out to be a necessary and sufficient condition
for paradoxicality as defined in general by Kripke for sets of sentences. It
would provide an axiomatization of Kripke's semantical notion, which in
turn might turn out to be compact and undecidable. The reviewer intends
to present such a proof-theoretic approach to the paradoxes elsewhere.

Let us now turn to some of Haack's mistakes about logic. I think she is
simply wrong, in objecting against a ban on self-reference, to say that

some mathematical argument, including Gödel's proof of the incompleteness of
arithmetic, makes essential use of self-referential sentences . . . ; so that the con-
sequences of a ban on self-reference would be very serious (p. 139).

The use made of Gödel numbering of expressions is commonly mis-
understood as making the language of first order arithmetic semantically
closed. This results from the sloppy yet helpful analogy drawn between
the structure of argument in the Liar paradox and in Gödel's proof.
Gödel *numerals*, however, are *not* used in the language as singular terms
referring to expressions (such as sentences). Rather, they denote as usual
the appropriate *numbers*—*code* numbers of the expressions, to be sure, but
numbers just the same. The theorem on representability of recursive

functions in suitably strong arithmetical theories, from which the incompleteness result flows, establishes a correspondence between, on the one hand, functional relations among numbers, and, on the other, arithmetical theorems of a uniform form involving the corresponding numerals. It is a mere *façon de parler* to speak of self-referential sentences in this context. The mathematical results still stand, regardless of whether we interpret the cleverly constructed diagonal sentence to ourselves with the misleading semantical gloss that it 'says of itself that it is unprovable'.

Also mistaken is Haack's claim (p. 140)

The argument to a contradiction from the Liar sentence uses the assumption that 'This sentence is false' is either true or false.

It does not, or at least *need* not. She is in good company here, however, for Frege also thought that the law of excluded middle might have been the source of Russell's paradox. But the reasoning in the case of the Liar, as in Russell's paradox, is straightforwardly intuitionistic.

Haack is agreeably lucid about the vicious circle principle, Tarski's language levels, and Kripke's recent theory of truth and the paradoxes. Kripke's theory she introduces as designed to allow that paradox may arise with respect to any truth ascription if the facts turn out badly, and as not relying on there being any syntactic or semantic features by which recalcitrant sentences might be distinguished. The notion of groundedness of truth-ascriptions is well explained, and a table summarizes clearly the points of comparison between Russell's, Tarski's and Kripke's solutions to the paradoxes.

In Chapter 9 Haack distinguishes between seven kinds of reaction to apparent inadequacies of standard logic:

1. Conservative delimitation of the scope of logic
2. The novel paraphrase strategy (*e.g.* Russell on descriptions)
3. The semantic innovation strategy (*e.g.* substitutional quantification)
4. Extended logic (*e.g.* modal and tense logics)
5. Restricted or deviant logic (*e.g.* intuitionist or quantum logic)
6. Challenge to classical metaconcepts (*e.g.* by intuitionist or relevance logicians)
7. Revision of the scope of logic

'Roughly speaking, I suppose, it would be right to think of these response as increasingly radical' (p. 155). The various strategies provide a background to a useful and informative comparison of Quine's and Prior's treatments of temporal discourse. 'Quine appeals to the character of current physical theories to support his approach; Geach, on Prior's behalf, urges that it is quite improper to adjust logic to suit science.' This would have been the point at which to refer to Mellor's lively paper on this topic in *Analysis* 1974. The second case study, of Zadeh's 'fuzzy logic' and the problem of vagueness, I shall pass over in silence.

Balanced surveys follow, in Chapters 10 and 11, of modal and many-valued logics. Chapter 10 is especially good on the circle of intensional notions and the various kinds of 'depraved semantics', or 'patter' on the formal semantics, which possible worlds theorists have offered.

The final chapter, on metaphysical and epistemological questions, finds Haack favouring

a global pluralist position: there can be several logical systems which are correct. . . . However, I stress first that this does not mean that one *never* has to choose between a deviant and the classical logic, only that one *sometimes* need not (so my pluralism is, so to speak, piecemeal although global); and second that, even in those cases where a deviant and the classical logic may be both correct, there may nevertheless be competition between them at the metalogical level . . . (p. 231).

The book closes with sections on fallibilism and the revision of logic, and on strong, weak and anti-psychologism; and pictures of smiling faces and balloons to facilitate one's grasp of Fregean mysteries.

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