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This volume collects the text of a lecture by Michael Dummett, held in Siena (Italy) in September 1997, followed by eleven papers from a symposium on *Language, Logic and Formalization of Knowledge: 100 years after Frege and Peano,* held immediately thereafter. It is a volume of proceedings and suffers from certain usual limits of such books (e.g., some lack of uniformity). Overall, however, the volume contains more than enough interesting material.

Dummett's lecture ('Meaning and Justification') is a short but crisp presentation of his views on the theory of meaning. The first part reviews Dummett's criticisms of truth-conditional theories and outlines the motivations for a justificationist account: to understand a sentence is not to know *that* something must be the case in order for an utterance of that sentence to be true; it is to know *how* to use the sentence, how to recognize evidence for it, how to act on the truth of it. Dummett's lecture is designed as a proem to the symposium, so the emphasis is on Frege's version of truth-conditionalism rather than on Davidson's. And Dummett insists on one thesis in particular, namely, that what blocked Frege from coming up with a justificationist theory of meaning of the right sort was "his unshakable commitment to the principle of bivalence as governing a scientific language" (21). Bivalence implies that there may be true statements whose truth we cannot (even in principle) recognize, so a justificationist theory cannot sustain it. In the second part, Dummett draws some consequences of this view for logic and for metaphysics. These include, respectively, (i) the abandonment of classical logic in favor of intuitionistic logic, and (ii) the view that reality is not completely determined, though not so indeterminate as to have the catastrophic effect of turning truth into an evanescent property. (Concerning sentences in the past tense, for example, Dummett insists that "a justificationist semantics must allow truth to attach to some of the propositions we could have decided but did not decide: it must acknowledge that it still attaches to them even though we can no longer decide them" (30).)

Of the other papers in the collection, Gabriele Usberti's 'On the Intuitive Notion of Justification' is the one that harmonizes best with Dummett's.

Usberti's main point is that a justificationist theory of meaning calls for *ex ante* justifications: the question whether something qualifies as a justification to believe a sentence is one that must be answered before the belief can be adopted. For a justificationist, therefore, the notion of *ex ante* justifiedness must be secured a central, unreplaceable role, and the main contribution of Usberti's paper lies precisely in an argument to resist putative reductions of *ex ante* to *ex post* justifiedness. Usberti offers also a second argument, to the effect that outside mathematics there is room for *non-factive* justifications, i.e., justifications for statements that are in fact false. Here the main reason lies in the observation that something may qualify as a justification for a belief even if it impossible for it to be judged to be so for the ideal knowing subject (e.g., because it is impossible for a subject to acquire new relevant information). This seems right, but Usberti's illustrative examples leave me unconvinced. A subject who looks at a stick half-dipped into a glass of water may form the belief that the stick is crooked when in fact it is not. Is that a justified belief? Usberti says so. Yet one may doubt that it is, on the grounds that the subject knows (or ought to know) that perception may in such cases be deceptive. This may be a higher-order constraint, but it does not seem to be incompatible with Usberti's above-mentioned general observation.

The remaining ten papers deal with a broad range of topics, mostly related to the works of Frege. In 'Frege and Peano on the Assertion Sign' [in Italian], Eva Picardi offers a thorough reconstruction of a classic controversy that has often been cited—but rarely examined—as containing *in nuce* many issues debated in present-day philosophy of language. Picardi's main point is that Peano did not appreciate the importance of Frege's assertion sign, and that that prevented Peano from seeing the original conception of a semantics for a formalized language that was implicit in the *Grundgesetze*. Peano was right in pointing out the dispensability of the assertion *sign* from the notation of logic—concludes Picardi—but that does not mean that the *notion* of assertion should be excluded from the "primitive ideas" of a theory of meaning (if not of logic).

Frege and Peano are also the focus of Gottfried Gabriel's 'The Birth of Modern Logic from the Spirit of Mathematics? Frege and Peano Compared' [in German]. This paper is concerned with the contrast between Peano's conception of logic as a kind of auxiliary discipline of mathematics (his "arithmetization of logic") and Frege's conception of logic as a foundation for mathematics (his "logification of arithmetic"). The main difference, for

Gabriel, boils down to this: for Peano it is the extension of a concept (the class) that plays a primary role; for Frege it is the concept itself.

Three other papers deal with Frege. One is Wolfgang Kienzler's 'Frege's and Wittgenstein's Use Theory of Language' [in German], which ends with the somewhat provocative slogan that "Frege's elaboration of his theory of language (based on the difference between sense and reference) is one of his most fruitful mistakes" (183). A second paper is Mirella Capozzo's 'Kant Read Through Frege' [in Italian], which explores the hypothesis that a Fregean reading may shed light on some obscure aspects of Kant's philosophy of logic and mathematics (in particular the synteticity of mathematics, and the related question of whether Kant's logic has room for singular terms). And the third paper is Gerhard Lischke's 'Frege's Principle of Compositionality and Measures of Computational Complexity' which, however, is only indirectly related to Frege. In fact the paper is not about the compositionality principle at all but about a different principle, according to which the complexity of a composed function is a function of the complexities of its parts and of the effective operation by which they are combined. Lischke is interested in the suggestion that this principle can serve as a tool to define complexity measures, and he illustrates this idea with reference to some recent work by F. W. Kroon. As it turns out, Lischke's conclusion is pessimistic: "it is never possible completely to describe by a set of axioms the comprehensive notion of naturalness for complexity measures or (if you will) such a notion does not exist in objective reality" (197). But the link between this philosophical moral and the technical results presented in the paper is somewhat left in the dark.

The remaining papers deal with miscellaneous issues. Klaus Ambos-Spies's 'Algorithmic Randomness Revisited' is a useful survey of recent works on algorithmic randomness from the point of view of computability theory, including novel results on the relationships among the leading accounts. Josef Bayer's 'How Does Logical Information Enter Grammar?' is about the syntax-semantics interface, the main point being that a better grasp of the formal side of grammar (as provided by Chomsky's Minimalist Program) "will enhance our understanding of the mapping from syntax to semantics so that we can ultimately dispense with constructional alternatives to natural language" (53). Gabriele Bersani Berselli's 'Reference, Specificity, Ambiguity' [in Italian] is a detailed study of the ambiguity between specific and non-specific interpretations of complex noun phrases (such as 'a fox-

terrier' in 'Gabriele wants to buy a fox-terrier'). And Gualtiero Calboli's 'Linguistics Today: Between Logic and Biological Models' [also in Italian] is a brief revisitation of the debate between Chomsky and H. Schelle on the relationship between logico-linguistic models and biological systems, with some forays into related arguments by Putnam, Lakoff, Jackendoff, and Abbott. Finally, Fabio Bellissima's 'Consistency and Formalization' is a case study of the rule of *Consequentia mirabilis*, i.e., the inference rule that allows one to assert any sentence which is implied by its negation, corresponding to the tautology $(\neg A \rightarrow A) \rightarrow A$. (This is a strongly classical rule, in the sense that it suffices to effect the jump from intuitionistic logic to classical logic). Bellissima does a great job at reconstructing the history of the rule through the works of Cardano, Huygens, Bernoulli, Wolff, and other early logicians, up to Bolzano's (mistaken) argument to the effect that every proof by *Consequentia mirabilis* can be converted into a direct proof. But the best part comes at the end of the paper, where Bellissima reconstructs an argument by Girolamo Saccheri in which *Consequentia mirabilis* is used to prove, in a most elegant way, that every syllogism of type AE-E in the first figure is not valid.

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