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REVIEWS

The Association for Symbolic Logic publishes analytical reviews of selected books and articles in the field of symbolic logic. The reviews were published in ***The Journal of Symbolic Logic*** from the founding of the JOURNAL in 1936 until the end of 1999. The Association moved the reviews to this BULLETIN, beginning in 2000.

In a review, a reference "JSL XLIII 148," for example, refers either to the publication reviewed on page 148 of volume 43 of the JOURNAL, or to the review itself (which contains full bibliographical information for the reviewed publication). Analogously, a reference "BSL VII 376" refers to the review beginning on page 376 in volume 7 of this BULLETIN, or to the publication there reviewed. "JSL LV 347" refers to one of the reviews or one of the publications reviewed or listed on page 347 of volume 55 of the JOURNAL, with reliance on the context to show which one is meant. The reference "JSL LIII 318(3)" is to the third item on page 318 of volume 53 of the JOURNAL, that is, to van Heijenoort's *Frege and vagueness*, and "JSL LX 684(8)" refers to the eighth item on page 684 of volume 60 of the JOURNAL, that is, to Tarski's *Truth and proof*.

References such as 49***5*** or 280***1*** are to entries so numbered in *A bibliography of symbolic logic* (the JOURNAL, vol. 1, pp. 121–218).

DOMINIC HYDE. ***Vagueness, logic and ontology.*** Ashgate, Aldershot, 2008, xii + 226 pp.

Vagueness, logic and ontology is an important addition to the vagueness literature. Anyone working in the area needs to read it and will learn much from doing so. One of the most interesting aspects of the book is the way it combines discussions of two topics that have generally been treated more or less separately in the literature—vagueness (comprising issues to do with the proper treatment of vague language and the resolution of the sorites paradox) and ontological vagueness (comprising issues to do with vague objects: vagueness of composition, existence, identity and so on)—into a unified argument.

Chapter 1 introduces the notion of vagueness. Chapter 2 discusses Russell's theory, on which vagueness is a purely representational phenomenon, not associated with any underlying ontological indeterminacy. Furthermore, vagueness is seen as a feature of natural language, not of 'Ideal Language' (p. 35), which—like the world—is precise. Hence classical logic can be retained, provided we restrict logic to ideal language.

Subsequent chapters seek a view which allows logic to be applied to natural language. Chapter 13 discusses approaches according to which classical logic may be retained by regimenting natural language into a precise language, without (serious) loss of expressive power. Hyde rejects three strategies for reaching such a language, concluding that we have no good reason to think that the world can be completely described in language free of vagueness.

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Given that we are stuck with the vagueness of natural language but wish to apply logic to it, two options are open: adopt a non-classical logic, or argue that classical logic is compatible with vagueness. Unfortunately, Hyde does not fully explore the latter route: epistemicism is not discussed, on the grounds that the text is already too long (p. 3); pragmatism is similarly set aside; and contextualism is not mentioned at all. (Those interested in paraconsistent approaches to vagueness—who will be familiar with Hyde's important earlier work in this area—will also be disappointed: a full discussion of such views is "left for another day" (p. 104).)

Turning to non-classical approaches, Chapter 4 discusses supervaluationism and subvaluationism. Hyde identifies two ways of defending supervaluationism against standard objections: the first appeals to the claim that there is no vagueness in the world in order to argue that the phenomena in question are desirable features of supervaluationism; the second admits them as costs but defends supervaluationism via cost/benefit analysis. In this chapter Hyde argues forcefully against the second kind of defence, and argues that subvaluationism is neither worse nor better off than supervaluationism when it comes to its own, dual problems.

The next two chapters turn to the claim—underlying the first sort of defence of supervaluationism—that there is no vagueness in the world. A significant part of Chapter 5 is devoted to a rebuttal of Evans's argument against ontological vagueness. Hyde sees Evans as arguing first that where there is ontological vagueness there is vague identity and second that there can be no vague identity. Hyde defends a qualified version of the first step but rejects the second step outright, claiming—following Keefe—that the flaw in Evans's reductio of vague identity is this: the result ($\lambda x[\nabla a = x]b$) of applying lambda-abstraction to a sentence ($\nabla a = b$) containing the indeterminacy operator (∇) does not attribute a *property* (i.e., $\lambda x[\nabla a = x]$) to b in the sense of 'property' that features in Leibniz's Law. Hyde never explains what he means by saying that an abstract "does not denote a property" (p. 126). Various possible interpretations come to mind, but I suspect (for reasons given in my *Why sense cannot be made of vague identity*, ***Noûs***, vol. 42 (2008), pp. 1–16) that any attempt to make the idea precise will lead to the realisation that whenever $\nabla a = b$ holds but $\nabla a = a$ does not, a and b *do* differ in a way in which a proper formulation of Leibniz's Law says that a and b do *not* differ when $a = b$. Of course the issue cannot be judged effectively in the absence of a precise elaboration of Hyde's position; it is a pity that he does not provide one. Chapter 6 counters another class of arguments against ontological vagueness: arguments which centre on problems of individuating, designating and counting vague objects.

In light of the rejection of supervaluationism and the setting-aside of paraconsistent views, Chapter 7 turns to Hyde's favoured logic of vagueness: a truth-functional system involving two truth values but three possible truth statuses (being true, being false, taking neither value), modelled by the three-valued Łukasiewicz logic. A number of well-known objections are considered, the most powerful being the objection from higher-order vagueness. If the lack of a sharp boundary between the tall and the non-tall requires positing a third truth status ($\frac{1}{2}$) between true (1) and false (0), it seems that the apparent lack of a sharp boundary between the clearly tall and the borderline tall should require positing an additional value between $\frac{1}{2}$ and 1; extending this line of reasoning pushes us to an infinite-valued logic. Hyde rejects this move, arguing that higher-order vagueness can be accommodated by positing metalinguistic vagueness, which can itself be accommodated using only the original three truth statuses. Nevertheless, he holds that the resulting complexity of assignments of truth statuses to sentences describing assignments of truth statuses (and so on) can be *modelled* usefully by the infinite-valued Łukasiewicz logic whose values are the rational numbers between 0 and 1 inclusive. (He does not discuss standard reasons for favouring a complete lattice of values and hence moving to the *real* interval [0, 1]: fuzzy logics are not considered.) The move to an infinite-valued logic raises the familiar objection that such views involve excessive precision. Hyde's response is that only the *ordering* of the values matters: "The choice of a specific value from among the infinitely many possible ... is arbitrary except in so far as it preserves ordering requirements imposed by the structure of higher-order vagueness" (p. 207). It seems that this response will not work, however: as Keefe notes (*Vagueness by numbers*, ***Mind***, vol. 107 (1998), pp. 565–579), the definitions of Łukasiewicz negation and conditional presuppose that the set of truth values has more structure than simply an ordering. Hyde could avoid this problem by moving from Łukasiewicz to Gödel logic, where the negation and conditional are defined thus:

$$x \to y = \begin{cases} 1 & \text{if } x \leq y, \\ y & \text{if } x > y, \end{cases} \qquad \neg x = \begin{cases} 1 & \text{if } x = 0, \\ 0 & \text{otherwise.} \end{cases}$$

This, however, would undercut his response to the sorites paradox: "The paradox is more and more compelling as the difference between adjacent items in the series with respect to F becomes less and less ... because the relevant conditionals more and more closely approximate true conditionals" (p. 209).

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NICHOLAS J. J. SMITH. ***Vagueness and degrees of truth.*** Oxford University Press, Oxford, 2008, viii + 341 pp.

A number of book length treatments of natural language vagueness and the associated puzzle of the sorites paradox have been published in the last 15 years, but Smith's is unique in its defence of a particular fuzzy logic approach. Clear, closely argued and technically adept, the book defends what Smith calls a "fuzzy plurivaluationist" account of vagueness—one that proposes degrees of truth to model the gradual transitions from truth to falsity said to be characteristic of the nature of vagueness, and which also identifies the distinct phenomenon of semantic indeterminacy more typically confused for so-called "higher-order vagueness" which requires what Smith calls "plurivaluationism".

Smith's book is divided into three parts. Part I (chapter one and two) gives an overview of the range of possible theories of vagueness—epistemicism, many-valued and truth-value gap accounts, supervaluationism, "plurivaluationism", contextualism, intuitionism—and an analysis that seeks to understand their differences "at a more fundamental and illuminating level".

Part II (chapter three and four) seeks to give a definition of vagueness against which the various competing theories are assessed. Smith describes and defends a definition in terms of what he calls "closeness", a weakened form of tolerance. The claim is that a vague predicate is such that if a and b are very similar in respect of F then Fa and Fb are *very similar* in respect of truth (as opposed to *identical* as tolerance demands). (Some subsequent modifications are offered to deal with special cases.) This definition is offered to unify the disparate phenomena that vague predicates are taken to exhibit: borderlines cases; blurred boundaries; and Sorites-susceptibility. It is admittedly not a "theory neutral" definition and is, in fact, used to rule out certain candidate theories and rule in a degree of truth account but Smith defends his seemingly question-begging methodology here. He is seeking to give a "fundamental definition" that correctly describes the essential features of vagueness and such a definition cannot be theory-neutral. With a definition in place (chapter three), theories can be be assessed as regards their compatibility with the definition and the general form of the correct theory of vagueness can be shown to be one invoking degrees of truth (chapter four).

Part III (chapter five and six) describes and defends the specific theory proposed by Smith. A fuzzy logic is described that is claimed to involve no violation of classical logic—though classical semantics is abandoned, classical consequence is nonetheless regained through a novel definition of logical consequence. Arguments for the retention of classical consequence though are less than convincing. Its supposed prima facie plausibility (p. 223) will be contested, especially in the face of vagueness where despite cases of $A \vee \neg A$ and $A \;\&\; \neg A$ taking the same degree of truth, one is declared a logical truth and the other a logical falsehood. Moreover, Smith's ultimate treatment of the Sorites paradox is of a kind with explanations employed by advocates of a (non-classical) Łukasiewicz fuzzy logic: in Sorites conditionals like 'If *Fa* then *Fb*' we confuse the *closeness* of degree of truth of antecedent and consequent for *sameness* (pp. 269–271). However, to preserve classical consequence Smith eschews any appeal to the Łukasiewicz conditional to make this point (explicitly rejecting the claim that there is a corresponding Łukasiewicz conditional whose very high degree of truth is mistaken for the highest). Recognizing that extending the logical vocabulary to include such a conditional will undermine the supposed virtue of preserving classical consequence (p. 265), Smith insists that to the extent we find Sorites conditional premises compelling they are in fact not conditionals at all. Their true logical form is something other than a conditional. But, contra Smith, we can simply *define* a conditional (the Łukasiewicz conditional) whose form the Sorites premises may be then said to have and in terms of which the paradox can be similarly explained. More work is needed to bar the introduction of such a non-classically behaved connective and defend a classical logic of vagueness.

Truth-functionality is also defended and other standard objections to degrees of truth are discussed and defended against, including the claim that Tarski's T-schema precludes failures of bivalence. Smith rejects the idea that the truth predicate used to deny bivalence satisfies the schema. Of special note is Smith's handling of a cluster of objections that are frequently seen as arising from the so-called "problem of higher-order vagueness", typically emphasised in respect of fuzzy logics by pointing to the apparent indeterminacy that should attend any mapping of sentences onto the real numbers—e.g., why 0.98 and not 0.97? Smith's view here is distinctive in arguing that this problem is quite separate from problems of vagueness and requires a different response. We cannot, Smith thinks, "locate" the precisely correct value of a sentence among the infinity of fuzzy values for reasons more closely connected with Quinean indeterminacy of meaning. Vagueness is to be accounted for by a gradualist semantics that employs degrees of truth, but the apparently higher-order issue is to be dealt with by acknowledging indeterminacy of meaning and modelling this distinctive kind of indeterminacy through a plurivaluationist framework. Higher-order vagueness has been misunderstood and the associated drives to a vague metalanguage are also misguided. Vagueness is to be modelled in a precise, classical metalanguage that admits of a distinctive species of semantic indeterminacy. In fact, Smith thinks that to employ a vague as opposed to a classical set-theoretic metalanguage is to "abandon the project of attaining a clear theoretical understanding of the semantics of vague discourse" (p. 307). This seems to conflate clarity with classical precision and to also advocate a standard of explanation that is simply not attainable. Sorensen's 1985 presentation of a Sorites argument involving the predicate 'is vague' (***Analysis***, vol. 45, pp. 134–137) suggests that whatever account of vagueness one gives, it must itself admit of vagueness so the hope for a precise account seems doomed anyway. And Smith's discussion of higher-order boundaries involving the predicate '1-bald' (p. 308f) fails to undermine this conviction.

Smith also proposes his account of vagueness as committed to "worldly vagueness". The higher-order phenomenon of semantic indeterminacy is taken to be merely semantic, yet the model-theoretic framework Smith employs to model vagueness, if taken literally, presents a picture of an extra-linguistic reality that is vague in itself. Since we should take our model-theory literally (§2.1.3) "worldly vagueness" follows. Some will doubt such a conclusion can be drawn so swiftly. Supervaluationists, for example, would be so charged with being similarly ontologically committed since the model-theory employed builds vagueness into the model (e.g., vague extensions) rather than the relation between language and its supervaluationist model (p. 96f) but many such theorists will argue that this puts the cart before the horse. For them there are substantive and independent metaphysical issues that they take to preclude an ontological reading, yet according to Smith it follows from a "literal" reading of the model-theory. They will argue that whether or not the model-theory should be taken literally is to be settled once the metaphysical issues are settled, not the other way around (as Smith does). However, despite reservations in some places, the book is a very significant and important contribution to the debate.

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WOLFGANG KIENZLER. ***Begriff und Gegenstand. Eine historische und systematische Studie zur Entwicklung von Gottlob Freges Denken.*** Vittorio Klostermann, Frankfurt am Main, 2009, 403 pp.

The book under review consists in a comprehensive reconstruction of Gottlob Frege's intellectual development from the very beginnings in the 1870s up to the publication of ***The Fundamental Laws of Arithmetic. I*** in 1893. In Kienzler's opinion (cf. p. 19 and pp. 36f) even the most promising candidates among Frege biographies (Hans Sluga's ***Gottlob Frege*** and Lothar Kreiser's ***Gottlob Frege. Leben—Werk—Zeit***) do not achieve this aim. And the same is said to hold for Michael Dummett, who is in the author's evaluation neither a Frege-scholar in the traditional meaning nor a genuine "Fregean" (cf. p. 21). In contrast to almost all comparable investigations on the subject, Kienzler's analysis is framed by an overall systematic concern as the golden thread of his enterprise as well as by methodological maxims for carrying out the systematic matters. It is the genesis of the categorical distinction between concept and object in Frege's philosophy that lies at the heart of Kienzler's philosophico-historiographic investigation. This leads especially to the punch line that Frege's antinomy is not a consequence of a surprising accident but the inevitable outcome of an insufficient clarification of the notion 'extension of a concept' (cf. p. 18, pp. 352ff.). For this, the evolution of the concept-object-distinction takes place only under a thorough consideration of Frege's own texts written over two decades complemented by only those publications verifiably known by Frege. Kienzler calls this last methodical maxim the "principle of contemporariness" ("Prinzip der Zeitgenossenschaft", pp. 14f), and it is used not only to avoid an anachronistic treatment of the subject but also to secure a most authentic Fregean view on it. Since the research on Frege still lacks a comprehensive study on Frege's whole work, it is the self-set task of the book under review to fill this gap, or at least to try. In Kienzler's opinion, the content of such a book is a necessary precondition for an adequate and well-balanced interpretation and evaluation of Frege's contributions to philosophy (cf. p. 37). In his "Introduction" (pp. 13–37), Kienzler justifies these claims by giving a cursory survey of Frege-literature in which he shows with regard to cases that treatments of Frege as a logician, mathematician, philosopher of language, Proto–Wittgenstein, epistemologist, Neo-Kantian etc. have warrants of their own, but do not fulfill the requirements of an encompassing picture. Unfortunately, within this review we can deal only selectively with Kienzler's insights and have to omit a lot of noteworthy details.

Kienzler partitioned the period of Frege's intellectual development up to 1893 into five stages: the early period of dissertation and habilitation (1873–1877), the time of the *Concept Script* and its reception (1879–1881/84), the years between the *Concept Script* and *The Foundations of Arithmetic* (esp. 1880–1882), the period of the *Foundations* and its reviews (1884–1887), and finally the time up to the publication of the first volume of ***The Fundamental Laws of Arithmetic*** (1887–1893). The book is organized respectively into five chapters, whereas the first, "The mathematical beginnings" (pp. 39–47), is by far the shortest one, dealing with the content of both theses as well as with Frege's early reviews on mathematical publications. But already the listed theses for his habilitation talk (p. 42) bring Frege's interest on the foundations of mathematics into the fore. Chapter two, entitled "The *Concept Script* and its reception," is dedicated to Frege's revolution in formal logic (pp. 49–142). Kienzler is more than careful in introducing the major lines of Frege's conception of the *Concept Script*, since introduces the detailed discussion of the "Preface" and §§1–13 (pp. 71ff.) with a general section dealing with the fundamental notions of the *Concept Script* (pp. 49ff.), starting with the aims and characteristics of Frege's calculus. Of special interest here is the logical grammar of judgments for the simple reason that Frege's function/argument-differentiation already carries the fundamental difference of concept and object without expressing the scope of it. But it is already obvious that the original logical point of departure for Frege is not a doctrine of concepts but the logical analysis of judgments. For this, the title *Judgment Script* would be more appropriate—as Kienzler remarks (p. 71). The last main section of this chapter (pp. 112ff.) is dedicated to the reception of Frege's first book. Here Kienzler not only documents the misunderstandings and shortcomings of the reviewers, but also their sympathy for minor points, their suggestions for further improvements as well as the partial accordance between Fregean notions and some of the others. This part also contains some observations on the (for the reviewer hitherto unknown) review by Wilhelm Schloetel, which is reprinted in the "Appendix"(pp. 373–378).

In chapter three, entitled "After the *Concept Script*" (pp. 144–208), Kienzler's main systematic concern, the evolution of the concept-object-distinction, becomes more explicit, since Frege's development in these years is closely connected to his critical demarcation against the works of Schroeder and Boole. Kienzler thoroughly investigates Frege's reading of both (pp. 144–171) and concludes in particular that Frege probably never read Boole's ***Laws of Thought*** (cf. p. 146). Equally important for this period is Frege's successive turn towards more philosophical questions. Kienzler respectively focuses (pp. 178ff.) on the potential influence of Lotze, Wundt, and Sigwart on Frege. Especially from this chapter on Kienzler demonstrates his outstanding competences in historiography. He presents in detail the circumstances of the genesis of the relevant texts by Frege while reconstructing the partially hidden lines of the adopted works as well as the contemporary intellectual and social influences. Of the approximately ten published and posthumous writings Kienzler uses for his analysis, we mention only "Boole's Logical Calculus and the Concept Script" and "Dialogue with Puenjer on Existence." Both manuscripts were not published by Frege but despite this fact they nevertheless play a key role in Frege's development, since the first (of which an early version is dated back to 1879/80) contains the very first occurrence of the fundamental notion of "concept" and "individual"/"object" (cf. pp. 155f), whereas in the latter this differentiation plays the central role for the first time (cf. pp. 191ff.).

The following two chapters "The *Foundations of Arithmetic*" (pp. 209–285) and "The road to the *Fundamental Laws*" (pp. 287–372) tell in detail the well-known story about Frege's conception of numbers as objects. But this is not only a re-narration of already known facts. Kienzler meticulously explores the several theses concerning the nature of numbers in the *Foundations* (a mathematical, a logico-semantic, and an epistemological account; cf. pp. 233ff.) and shows why Frege was forced to introduce the extension of concepts for mediating between numbers and concepts. Since this introduction was both crucial and unsettled for Frege himself (cf. also pp. 307ff.), Kienzler treats the following publications—especially the prominent articles on semantics from 1891/92—as the Fregean search for clarifying the status of extensions of concepts. It becomes obvious that Frege is—despite all novelties and brilliant insights—aware of the fact that descriptive notions like 'the concept' are indispensable but equally inadequate for semantic analysis. In the end, the tension in the formal, semantic, and ontological use of the notion 'the extension of a concept' remains unsettled and represents the source for Frege's antinomy. The depth of Kienzler's investigation—especially in these chapters—is unprecedented. To give only some hints: He analyzes on the basis of the immanent structure of references and the grammar of some sentences that the three fundamental principles of the *Foundations*—perhaps even the whole "Introduction"—are probably added resp. written afterwards (cf. pp. 218ff.). With respect to the organization of the book Kienzler, in addition, observes some irregularities of the whole conception and draws helpful advices for an adequate treatment of the paragraph-numbering (pp. 226ff.). And even in his later analysis of the triad "On Concept and Object", "On Sense and Meaning", and "Function and Object" (pp. 294–351, cf. pp. 287f) Kienzler summarizes that these essays, in contrast to the "Logical Investigations," are not conceptualized as an article-sequence. Kienzler's book is a valuable contribution to the philosophical theme "Gottlob Frege," since it combines systematic accuracy with historiographic efficiency for realizing an ambitious project. The only "deficiency" the reviewer has to criticize (but not earnestly) is the investigations breakup in 1893. With pleasure the reader would go on in his Kienzler-style readings to look for the further evolution in Frege's intellectual development up to 1918 (or some later year). But this would require another book.

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ANDRÉS BOBENRIETH M. *The origins of the use of the argument of trivialization in the twentieth century*. ***History and Philosophy of Logic***, vol. 31 (2010), no. 2, pp. 111–121.

By the 1930s, the rule *ex falso quodlibet* (*EFQ*; Bobenrieth named it *ex contradictione sequitur quodlibet*) has become the main reason for the unfeasibility of allowing contradictions in a deductive system. Despite its medieval origins and its long time role within philosophical discussions about contradictions and the principle of non-contradiction, Bobenrieth is mainly interested in the more technical use of *EFQ*. Hence he investigates in his article the first three decades of the 20^{th} century, concentrating on the probably first explicit uses of *EFQ* as the main argument for supporting the necessity of excluding any contradiction: If two contradictory statements can be proved within a calculus any other statement can be deduced too. But this would condemn the entire calculus as meaningless ("the argument of trivialization"). As a side-effect, Bobenrieth's investigations also make a contribution to the (pre)history of paraconsistent logic, since the latter explicitly rejects *EFQ* and has in the paper *Über den Satz des Widerspruchs bei Aristoteles* as well as in the eponymous monograph (both 1910) by Jan Łukasiewicz a forerunner for the program of paraconsistency.

Departing from considerations about ***Principia Mathematica*** and a contribution by Emil Post (pp. 112f), Bobenrieth detects (cf. p. 114) the first occurrence of the argument of trivialization in David Hilbert's and Wilhelm Ackermann's ***Grundzüge der theoretischen Logik*** (1928). In the second part of the paper (pp. 115ff.), the author takes a closer look on the treatment of *EFQ* within Łukasiewicz's works between 1910 and 1929. Whereas in the early period Łukasiewicz rejects *EFQ*, at the end of the 1920s he used that rule explicitly for proving a certain axiom for the logical calculus as well as for presenting the argument of trivialization. Concerning the question (cf. p. 119), whether Łukasiewicz changed his opinion concerning the status of *EFQ* during that time, Bobenrieth comes to the conclusion that "he did not sustain a unique straightforward position about the problems involved; rather, what he said changed depending on the context" (p. 120). In the case of the authorship of the argument of trivialization, Łukasiewicz was in the author's assessment not influenced by Hilbert and his disciples (cf. p. 119) and presented it "apparently independently" (p. 120).

The question as to what has to count as an occurrence of the argument of trivialization, is partially dependent on an—at least modest—interpretation of respective passages—even in the case of clear-cut arguments presented by logicians or mathematicians. Thus, I do not deny the priority ascribed to Hilbert and Ackermann, and I also agree with the diagnosis (pp. 113f) that we do not find the argument of trivialization already in such programmatic foundational essays as *Die logischen Grundlagen der Mathematik* (1923), *Über das Unendliche*

(1926) or *Die Grundlagen der Mathematik* (1928) by Hilbert. But on the other hand I do not really see whether, e.g., John von Neumann's definition of consistency via *EFQ* in his *Zur Hilbertschen Beweistheorie* (***Mathematische Zeitschrift*** vol. 26 (1927), pp. 1–46, cf. p. 14f) does not carry the argument of trivialization. This paper was not only published already one year before Hilbert/Ackermann, but it also contains the explicit annotation that 'if two contradictory statements can be proved within a calculus any other statement can be proved too via *EFQ*. Thus consistency of the calculus has the same meaning as the stipulation that not every arbitrary formula can be proved.' Does this clause not grasp the content of the argument of trivialization? I would say 'yes', but since Bobenrieth does not mention von Neumann's paper, I am not sure whether he would also interpret this passage in the aforesaid manner.

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