

INHALTSVERZEICHNIS

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Dagfin FØLLESDAL: Bolzano's Legacy 1

Bernard Bolzano (1781-1848) was an original and independent thinker, who left a lasting legacy in several areas of philosophy. Four such areas are singled for special attention: political philosophy, ethics and theology, logics and semantics, and mathematics. In all these areas he was far ahead of his time. He had pioneering ideas in political philosophy and in ethics and philosophy of religion, and he argued for them in a brilliantly clear way. In logic and semantics he anticipated Frege, Carnap and Quine on important points, and he had intriguing, yet to be explored, ideas on intuition and other fundamental philosophical notions. In the foundations of mathematical analysis and the theory of infinite sets he anticipated Weierstrass and Cantor.

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In his *Wissenschaftslehre* Bernard Bolzano tried to lay down a logically satisfactory foundation of mathematics and theory of probability. Thereby he became aware of the distinction between the actual thoughts and judgments of human beings, their linguistic expressions and the abstract propositions (*Sätze an sich*) and their components (*Vorstellungen an sich*). This ontological distinction is fundamental in Bolzano's thinking paired with a universal world view in the sense that philosophy, mathematics, physics and metaphysics should be build upon the same logical foundations. Bolzano's enterprise is sketched in the light of examples from his logical semantics, proof theory, number theory, theory of truth and his variation logic.

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Analytical philosophy begins with the first mathematical and philosophical works of Bolzano published between 1804 and 1817. There, Bolzano set out a project for the global reform of mathematics by means of the axiomatic method. Having completed the *Wissenschaftslehre*, Bolzano wrote a summary of his logic for the *Größenlehre*, which he sent to Exner in 1833. The correspondence between Bolzano and Exner covered some of the main subjects treated by ana-

lytical philosophy: the status of abstract objects (propositions and objective ideas), intuitions, objectless ideas, the concept of object and many others. While Bolzano argued in favor of abstract entities independent of mind and of language, Exner considered them as abstractions obtained from the subjective judgments and representations. During the XIXth century, Bolzano's philosophy spread over Bohemia and Austria through manuscripts and through the first edition of Zimmermann's textbook of philosophy. The most important Brentanians, Kerry, Twardowski, Meinong and Husserl, discussed his doctrines which may also have influenced Wittgenstein and the Polish school.

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Russell, in his *History of Western Philosophy*, wrote that modern analytical philosophy had its origins in the construction of modern functional analysis by Weierstrass and others. As it turns out, Bolzano, in the first four decades of the nineteenth century, had already made important contributions to the creation of "Weierstrassian" analysis, some of which were well known to Weierstrass and his circle. In addition, his mathematical research was guided by a methodology which articulated many of the central principles of modern philosophical analysis. That Russell was able to discover philosophical content within mathematical analysis was thus not surprising, for it had been carefully put there in the first place. Bolzano can and should, accordingly, be viewed as a founder of modern analytical philosophy, and not necessarily as an unimportant one. This paper considers his work in mathematical and philosophical analysis against some of the relevant historical background.

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Bolzano's theory of collections (*Inbegriffe*) has usually been taken as a rudimentary set theory. More recently, Frank Krickel has claimed it is a mereology. I find both interpretations wanting. Bolzano's theory is, as I show, extremely broad in scope; it is in fact a general theory of collective entities, including the concrete wholes of mereology, classes-as-many, and many empirical collections. By extending Bolzano's ideas to embrace the three factors of kind, components and mode of combination, one may develop a coherent general account of collections. But it is most difficult to take Bolzano's view to fit modern set theory. So while Krickel's positive thesis is rejected, his negative thesis is confirmed.

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In Bolzano's view, a proposition is necessarily true iff it is derivable from true propositions that include no intuition (*Anschauung*). This analysis is historically important because it displays close similarities to Quine's and Kripke's ideas. Its systematic significance, however, is reduced by the fact that derivability is defined with recourse to the method of variation, which we are allowed to apply even to propositions containing none of the respective variables. This liberality leads to the result that, according to Bolzano's analysis, every truth is necessarily true. Even by introducing his condition of relevance (shared variables), Bolzano cannot avoid that some propositions come out as necessarily true which are merely contingently true.

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Bernard Bolzano's most fruitful invention was his method of variation. He used it in defining such fundamental logical concepts as logical consequence, analyticity and probability. The following three puzzles concerning this method of variation seem particularly worth considering. (i) How can we define the range of variation of an idea or the categorial conformity of two ideas without already using the concept of variation? This question was raised by Mark Siebel in his M.A. thesis. (ii) Why must we define analyticity by means of (simultaneous or successive) variation of several ideas rather than by means of replacing a single idea? This problem is suggested by an example due to W.V.O. Quine, John R. Myhill and Benson Mates. (iii) Must every 'there is ...' sentence be synthetic for Bolzano, as his pupil Franz Příhonský claims in his booklet *Neuer Anti-Kant*, or can a 'there is...' sentence be logically analytic?

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Most of the Bolzano literature is exegetical, neglecting, unfortunately, the great potential of his logic as the beginning of a PROGRAMME. Specifically, his unorthodox construal of the consequence relation as triadic, and his account of logical form are promising beginnings which even as they stand shed light on question of relevance, the ancient problems of enthymemes and others. Instead of developing these suggestions, Bolzano scholars have been occupied with elucidating the ontology of sentences in themselves, and related topics. I argue, and believe to be in agreement with Bolzano, that the nature of sentences is fully explained by the relations that hold between them, just as money has no nature or essence beyond the transactions it makes possible. It follows that the development of

his logic would contribute at least as much to the understanding of sentences than any exegesis.

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Bolzano holds that every sentence can be paraphrased into a sentence of the form "A has b". Bolzano's arguments for this claim are reconstructed and discussed. Since they crucially rely on Bolzano's notion of paraphrase, this notion is investigated in detail. Bolzano has usually been taken to require that in a correct paraphrase the sentence to be paraphrased and the paraphrasing sentence express the same proposition. In view of Bolzano's texts and systematical considerations this interpretation is rejected: Bolzano only holds that the sentence to be paraphrased and the paraphrasing sentence must be equipollent ("gleichgeltend"). It is shown that even this modest view of paraphrase does not help Bolzano in sustaining his claim that all sentences have the form "A has b".

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Bolzano's Sätze an sich and Frege's Gedanken are obviously close relatives. The paper underlines both similarities and dissimilarities between the psychological and semantical roles assigned to structured truth-evaluable contents in Bolzano's and Frege's theories. In particular, their different accounts of propositional identity are compared, and it is argued that Dummett's recent criticism of Frege's account is grist to Bolzano's mill.

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The notion of testifying (or testimony) is the central notion of Bolzano's theory of communication. In his *Wissenschaftslehre (Theory of Science)* Bolzano gives an analysis of this notion. It shows surprising parallels to Paul Grice's attempt to define "*A* meant_{NN} something by *x*". I will begin with an explanation of some parts of the analysis and continue with an investigation of the relationship between Bolzano's analysis and that of Grice. In conclusion I would like to present some evidence supporting the hypothesis that several of the virtues of Grice's theory had already been developed by Bolzano, whose approach even has the advantage of a better definition than Grice's, as Bolzano's analysis provides a better basis for defining a notion of successful communication of information.