

## REFLECTIONS ON KURT GÖDEL

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Except for a few minor corrections this second printing is identical to the first ([Wang 1987]). The book is meant to be a first attempt to consider G's life and work as a whole within an inclusive context that, except maybe for chapters 6, 10, and 11, is accessible to most thoughtful people. The many personal contacts that W had with G during the later years of G's life makes him an important source of information about G, particularly when one realizes that G was a rather private person, was reluctant to publish, and left a wide range of unfinished projects. W decided, for reasons of organization, to separate the private sayings for inclusion in a later book entitled *Conversations with Kurt Gödel*. The current volume, less dependent upon unpublished material, is subdivided into three parts.

Part I, consisting of chapters 1 through 4, presents facts about Gödel's life and work.

Chapter 1 contains a discussion of G's life from the perspective of his dedication to fundamental theoretical work. W quotes and discusses three documents relevant to G's life and work. These documents are a letter from G's brother Dr. Rudolf Gödel in 1985, in response to an inquiry of W; the Grandjean questionnaire of 1974, a specially designed questionnaire that was answered by G, but never sent; and an evaluation of G's work, compiled by W and approved by G, on the occasion of G's receiving an honorary degree from The Rockefeller University in 1972. W makes a preliminary

attempt to compare G with Einstein, and reports on their relation.

Chapter 2 contains a brief account of G's life and work, as told to W in 1976. W also examines G's relation to the Vienna Circle using a reply of G to a letter from Karl Menger in 1972, and using some notes by Carnap. W mentions Hilbert's programme and G's response, and makes a comparison between G and Wittgenstein. G distanced himself from the ideas of the Vienna circle, as he did not consider himself a positivist, and never accepted more than a few of their theses. G knew Wittgenstein and his work only superficially, but believed that his later work was a step backwards compared to his earlier work.

Chapters 3 and 4 contain a chronological account of G's life, divided into the Vienna period (through 1939) and the Princeton period (from 1940).

Part II, consisting of chapters 5 through 9, is about G's thoughts, and W's preliminary attempts to sort out his agreements and disagreements with G.

In Chapter 5 W compares Albert Einstein's thoughts with G's, so as to locate a few distinctive features of G. Einstein and G met in 1933, and were intimate friends since 1942. Despite their friendship, both had very different personalities and working habits. Einstein often pursued his problems in public, while G worked on them in private. Einstein's thoughts are better known, and W feels more comfortable with these. Einstein's views were more 'realistic,' more engaged in current affairs, less optimistic with regard to the power of reason to capture the eternal, and fitted in better with the 'spirit of the time.' G questions such 'established' ideas as: "Is mind more than a machine?" "How exhaustible and conclusive is our knowledge in mathematics?" "How real are time and change?" "Is Darwinism adequate to giving an account of the origins of life and mind?" "How precise can physics become?" and "Is there a 'next world'?" Einstein shifted from mathematics to physics, from decreased precision to increased meaning, while G moved from theoretical physics to mathematical logic in quest for precision.

Chapter 6, entitled *Concepts in science and technology*, discusses G's influence on the development of computer science, on mathematical practice, mathematical logic, and the nature of mathematics, and on relativity theory and the concept of time.

Chapter 7, entitled *Gödel and philosophy*, discusses G's

conceptual realism and his objectivism centered on number theory.

In Chapter 8 W sets forth mutual points of agreement and disagreement between G and himself by commenting on (religious) metaphysics, rational optimism, and rationality.

Chapter 9, called *To fit all the parts together*, discusses the problem of *how* to fit together ideas and philosophies, and incorporates more of the views of W than of G.

Part III, about G's texts, contains chapters 10 and 11. Chapter 10 discusses two mathematical papers: *Completeness of elementary logic*; and *Incompleteness of mathematics*. Chapter 11 discusses three philosophical papers: *The problem of evidence*; *Cantor and set theory*; and *Russell and mathematical logic*.

The enduring value of this book will be in the material that will not ultimately appear in the *Collected Works* ([Gödel 1986], [Gödel 1990], and future volumes). The focus on published materials limits the number of relevant sources at W's disposal. G displayed a dislike towards controversies, so we see him suppress documents like the letter to Kenneth Blackwell about Russell (p. 112.); G also wanted W's 1976 account to appear after his death; and it explains why G didn't submit materials for publication unless the evidence was beyond debate, which explains the small number of G's publications, and the relatively large amount of unpublished material. W found only limited occasion to delve into G's unpublished work. There is mention of an undated summary by G, compiled probably around 1970, listing unpublished work from 1940 on:

- About one thousand  $6 \times 8$  inch stenographic pages of clearly written philosophical notes (= philosophical assertions).
- Two philosophical papers almost ready for print. [G's paper on relativity and Kant's philosophy, and G's paper on syntax and mathematics.]
- Several thousand pages of philosophical excerpts and [notes on the] literature.
- The clearly written *proofs* of my [G's] cosmological results.
- About six hundred clearly written pages of set theoretical and logical results, questions, and conjectures (to some extent *outstripped* by recent developments).
- Many notes on intuitionism and other foundational questions.

See also the extensive list in [Gödel 1986, pp. 26 ff]. The first item is probably the most relevant source to G's philosophical views, but they are written in Gabelsberger shorthand and therefore not easily accessible until they appear in the next volume of the Collected Works. This shorthand, nowadays only known by a few, may have been an additional hurdle for W, preventing him from investigating these notes more extensively. This makes the discussions in the book under review at least preliminary, and probably incomplete and even somewhat premature, where it concerns G's philosophy.

This book is about W's ideas as well as about G's. Below we discuss G's views as presented by W, and additionally some of the ideas of W. From the text it was not always easily seen where G's views stopped and W's views began.

G believed in the overwhelming centrality of the mathematical experience, while W pays more attention to the specificity of different fundamental areas of our cumulative experience. G's belief, and his faith in reason, are partly justified by his impressive results in foundations, but also by his recollection of a passage that Karl Menger showed him, in the early 30's, [in a book of Hegel] which appeared to completely anticipate general relativity theory. The philosophers G most liked were Plato, Leibniz, and Husserl, and G considered his ideas a continuation of those of Descartes and, particularly, Leibniz. The best known aspects of G's philosophy are his objectivism, and his conceptual realism. G believed in the objective conception of mathematical proof and conclusion, and, given objectivity, believed that there must be mathematical objects. G allowed for different levels of certainty between our intuitions of, say, small numbers and the totality of all numbers. It seems that, according to G, the biggest leap of faith is made when going from the finite to the infinite; so from accepting the infinity of the natural numbers one may as well go on to set theory. Accepting the infinity of the natural numbers is further justified by number theory and G's interpretation of it in intuitionistic number theory. G believed, contrary to W, that for each vague concept there exists a sharp concept all along that isn't perceived clearly at first. G anticipates an exact theory of philosophy that, maybe in the next hundred years, 'should do to metaphysics as much as Newton did to physics.' The extent of what is meant here by metaphysics is not clear, but may include the concept of God. The exact

theory may be found by determining the primitive concepts of metaphysics, and finding the axioms for them. G's 'rationalistic optimism' is along the lines of Leibniz and Husserl, and is partly motivated by his belief that there exist no 'number theoretical questions undecidable for the human mind', hence 'the human mind surpasses all machines.'

In relation to relativity theory, G considered the denial of the objectivity of change, and considered change as an illusion or a result of our special mode of perception. G considered his new solution to the field equations (rotating universes) to support that idea, but the model need not reflect reality.

G clearly had unusual ideas about biology and health, including his own health. Although it was known since 1950 that Einstein's health was precarious, the death in 1955 of Einstein came as a complete surprise to the health-conscious G. G also feared being poisoned; according to his death certificate, he died of 'malnutrition and inanition' caused by 'personality disturbance.' G believed that "mechanism in biology ... will be disproved." One disproof, he thought, may be a mathematical theorem to the effect that the probability of forming a human body within geological times is vanishingly small. The reviewer considers these claims with some amazement, and finds it hard to take them seriously. It is my impression that biological evolution and medicine don't reduce to fundamental principles in the way current mathematics does, and G may not thrive well on 'chaos.' G's views on biology and the human mind are related to his religious views. He considered himself religious; theistic à la Leibniz, rather than pantheistic à la Spinoza. His wife reported that G read the bible in bed on Sundays. As mentioned before, G also concluded that "The human mind surpasses all machines". He also gave an ontological proof of the existence of God.

As to the spirit of the time, G considered the twentieth century to be a bad time for doing philosophy, a time for merely gathering data. W agrees, but feels more appreciation for the necessity of gathering data. According to G, the meaning of the world is (the process of continually trying to overcome) the separation of wish from fact. G sometimes said that if you know everything about yourself, then you know everything; once you understand yourself, you understand human nature, and then the rest follows (whatever that means).

G seems to have rationalized his life to a greater extent than most people, concentrating on the issues that were relevant to his current or planned work, and reducing involvement in anything else. This explains why G's behaviour showed him to be 'weltfremd,' as exemplified by his Citizenship interview. Being unworldly may stimulate originality but, in my view, it can cut one off from experiences that improve one's insights and intuitions. We may consider G's ideas about nature in that light. G initially tried to vindicate Hilbert before discovering, to his own surprise, the incompleteness results. G wavered on the Continuum Hypothesis, sometimes believing it true, later believing the opposite.

W's ideas, particularly as expressed in Chapter 9, are hard to follow, and I do not pretend to do justice to W in the following observations. W extensively discusses the problem of fitting different ideas together to form a comprehensive view, applies his observations in trying to understand Chinese and Western philosophy and their interactions, and discusses social and socialist issues. It is not clear whether G was much interested in these topics.

W shows us many interesting sides to G, most of them probably surprising to many logicians. The text, however, is often hard to follow because of many less relevant digressions, and W's style is in sharp contrast to G's own clear and concise presentations. The discussions of G's views may need significant revisions when G's unpublished notes appear in the Collected Works. W's book will not be the last reflection on Kurt Gödel.

#### REFERENCES

- [[Gödel 1986]] ■ K. Gödel, *Kurt Gödel, Collected Works, Volume I, Publications 1929–1936*, S. Feferman, J. W. Dawson, S. C. Kleene, G. H. Moore, R. M. Solovay, J. van Heijenoort (editors), Oxford University Press, Clarendon Press, 1986.
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