

Moral Integrity during a Difficult Period: Beth and Scholz*

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1 Introduction

Willem Evert Beth started his academic career as a philosopher of mathematics in the mid 1930's, and it should be noted that his approach to this subject at the borderline between philosophy and mathematics was more philosophical than mathematical. It was an ambivalent time, but extremely exciting for scientists working in the area. In their recollections logicians of the time called it the "heroic era." The era lasted, as Georg Henrik von Wright was convinced (von Wright 1993, 21), from 1879 to 1934. This period was marked by Gottlob Frege's *Begriffsschrift* (Frege 1879) and the first volume of David Hilbert and Paul Bernays's *Grundlagen der Mathematik* (Hilbert and Bernays 1934). It was, according to von Wright, relieved by an epoch which began with two incidents being themselves of heroic greatness (26): Kurt Gödel's results concerning the incompleteness of formalized languages and Alfred Tarski's semantic theory of truth. Hans Hermes, on the

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other hand, considered the period between 1930 and 1937 as a period of transition from the “heroic era” which had been instigated by Whitehead and Russell’s *Principia Mathematica* (Whitehead and Russell 1910–13) to a period in which a flood of inventions allowed mathematical logic to become almost a “domesticated” mathematical theory. This transitional period is characterized by the work of Kurt Gödel, Alfred Tarski, Alonzo Church and Alan Turing (Hermes 1986, 45).

However, the dynamic development of the philosophy of mathematics at that time was not an isolated occurrence. It was part of a much broader movement connected with the neopositivistic thinkers of the Vienna circle, of its German pendant, the Berlin Society of Scientific Philosophy, and of other similarly minded philosophers, mathematicians and scientists all over the world. These “scientific philosophers” wanted to put an end to the separation of philosophy from science. This separation was the goal of Hegel and his idealistic fellows. It was revived during the “historical era” at the end of the 19th century, and in the minds of subsequent hermeneutic philosophers. The new movement became especially effective when the hardcore empiricists among the early Neopositivists adopted a more tolerant attitude towards the programme of creating a new *scientific* philosophy of which the philosophy of mathematics became the core. Their major aim was the unity of science. The movement was constituted as an international movement from the very start. After a small introductory conference in Erlangen in 1923 (cf. Thiel 1993), all interested scientists gathered at international congresses which started with the “1. Tagung für Erkenntnislehre der exakten Wissenschaften” (i. e. the first conference on the doctrine of knowledge of exact science) being held in Prague in 1929. The 9th International Congress of Philosophy organized as “Congrès Descartes” in 1937 in Paris was dominated by scientific philosophers and became the highlight of the pre-war era. Even today the effects of this movement are to be seen: modern philosophy of science has its origins in this movement and even some branches of analytic philosophy.

With the designation of the 1930’s as an ambivalent period, reference is made to the political background of the scientific developments mentioned above. After the seizure of power by the National Socialists in 1933, German science and humanities were exploited for political means. Science became ideologically influenced. Scientists of Jewish descent or of deviating political or social attitudes were removed from their positions, later driven out of the country and some finally murdered. The world was inflicted by war, which put a stop to all regular scientific and cultural development. Even before the apocalypse of the 1940’s, new tones of scientific argument were emanating from Germany. Lothar G. Tirla’s talk on the Nordic race and natural science which was given on the occasion of the opening of the Philipp Lenard Institute

in Heidelberg, in December 1935, can be quoted as an example:¹

The so-called Vienna circle, a union of people of mostly foreign race, primarily of Near Eastern and oriental races, has announced a new logic,² which thoroughly differs from Arian logic. This “Vienna circle”, to which Einstein neared, maintained that there was no fixed logic. They regarded formalistic calculatory reasoning as primary and logic only as secondary. You can hear the Near Eastern calculating until reality disappears.

It is useful to remember that three weeks before Tirala’s creation of Arian logic, Beth defended his *proefschrift* on *Rede en aanschouwing in de wiskunde* (Beth 1935) where he was very favourable of German philosophy as it can be found in Immanuel Kant’s critical philosophy.

Another fact may also help to reveal the schizophrenia of German culture at that time: At the end of September 1935, Heinrich Scholz, the head of the Münster group of logicians, published a lengthy report on the First International Congress for Scientific Philosophy which had taken place at the Sorbonne in Paris between the 16th and the 21st of September 1935 (cf. Scholz 1935). He wrote that metaphysical and ethical topics were not treated at the congress. This one-sidedness, he remarked, should not be confused with putative monotony. Scholz referred in detail to Hans Reichenbach’s lecture on induction as a method of scientific knowledge for evidence, presenting in a favourable way the same logic of induction and probability which Tirala had termed as being “thoroughly differing from Arian logic.” Whereas Tirala only needed to mention the name of the pacifist Albert Einstein to defame the Vienna circle, Scholz closed his report by mentioning the impressive statement of the British pacifist Bertrand Russell in favour of “our German master Gottlob Frege.” “For us Germans,” Scholz wrote, “it was an edifying moment.”

The tensions between science and politics in the 1930’s and 1940’s are the topics of the following presentation. They can be exemplified by the relation between Evert Willem Beth and Heinrich Scholz (1884–1957). Most noteworthy is an exchange of letters which took place in the time between July and October 1946 dealing with Scholz’s role in the Third Reich. First of all, however, some biographical information about Heinrich Scholz is presented, then some similarities of Beth and Scholz’s philosophies of mathematics are emphasized.

¹My translation of Tirala 1936, 29; quoted in Hoffmann 1994, 30.

²Tirala refers to probability logic proposed by Hans Reichenbach, see e.g. Reichenbach 1932, Reichenbach 1934.

2 Beth and Scholz

Heinrich Scholz was born on December 17, 1884 in Berlin as son of a protestant parson.³ He studied theology with his famous teacher Adolf von Harnack at Berlin, made his *Habilitation* for the Philosophy of Religion and Systematic Theology in 1911, and obtained an additional doctoral degree in philosophy in Erlangen in 1913. In 1917 he was made full professor of the Philosophy of Religion at the University of Breslau.⁴ Four years later, in 1921, he was called to the chair of Philosophy in Kiel, before finally accepting a call to Münster in 1928 where he served as a full professor for Philosophy first, and then for Mathematical Logic and Foundations.

Scholz's student and follower on his chair at Münster Hans Hermes tells the story of how Scholz discovered his love for mathematical logic by accidentally coming across Whitehead and Russell's *Principia Mathematica* (Whitehead and Russell 1910–13). According to Hermes (Hermes 1958, 34) this incident made Scholz realize that

1. theoretical sciences presuppose logic. They are as rigorous as far as they are founded on logic. And
2. that traditional logic is too imprecise to handle all the demands derived from the claim of logic to constitute a fixed and unshakable base of reasoning.

According to Scholz this lack of precision of traditional logic was due to it being based on natural language. Consequently he demanded to use formalized, i. e. mathematical languages which he called “Leibniz languages.”⁵

Whitehead and Russell's *Principia Mathematica* convinced Scholz of the importance of mathematics, although he had no deeper knowledge of this subject. As a full professor of philosophy he decided to begin formal university studies of mathematics and theoretical physics, and he finally graduated in Kiel. After he moved to Münster, Scholz concentrated on mathematical logic and foundations. He particularly worked on the borderline between mathematics and philosophy, motivated by the problem to distinguish *logical* calculi from general calculi. He rejected the reduction of logic to a mere game with signs and demanded the primacy of semantics. As far as Scholz was concerned the calculus had to be *legitimized* as logical calculus, and he saw this legitimation in a presupposed ontology. On the other hand the “logical precision language”, the Leibniz language, can be used to formulate “scientific

³On Scholz's biography and his work see Wernick 1944, Hermes 1958, Ritter et al. 1961, Meschkowski 1984, Molendijk 1991 (on Molendijk's book see Peckhaus 1993).

⁴On Scholz's philosophy of religion cf. Ratschow 1958, Stock 1987, Molendijk 1991.

⁵On Leibniz languages see, e. g., Scholz's paper “Was ist Philosophie?” (Scholz 1939/40, i. e., Scholz 1961, esp. 373–377).

metaphysics” as Scholz called his formal ontology, presented in the book *Metaphysik als strenge Wissenschaft* (Scholz 1941). The combination of ontologically founded logic and logically reformulated ontology emerged in a non-Hegelian identification of logic and metaphysics. “Our metaphysics,” he wrote, “is indeed logic when applied to the real world” (1941, 151).

However, Scholz’s most important contributions to the development of logic should not be looked for on the systematic side. Indeed, he was one of the most distinguished historians of logic of his time, stressing the value of the contributions of Leibniz and Bolzano to the emergence of modern logic. He devoted effort to the study of Frege’s work and promoted David Hilbert’s metamathematics. He was able to obtain Frege’s estate for Münster in 1935. Later he added the papers of the German algebraist of logic, Ernst Schröder, to his collection which he had obtained from the library of the Technical University of Karlsruhe. It is one of the tragic events of war that Frege and Schröder’s papers were most likely destroyed during the bomb attacks on Münster in March 1945 (see Peckhaus 1988).

Scholz was also effective in a pragmatic way. He gathered the “Gruppe von Münster” and encouraged a number of his students to academic positions. Among his students were Friedrich Bachmann, Hans Hermes, Gisbert Hasenjaeger, Karl Schröter, Hermann Schweitzer and Walter Kinder. They obtained important results in metamathematics, semantics and abstraction theory. In the beginning of the 1930’s Münster still stood in the shadow of Göttingen and Berlin, but when Gerhard Gentzen was enrolled in 1939 and the Berlin logicians lost their positions (Kurt Grelling, Leopold Löwenheim) or were forced into emigration (Hans Reichenbach, Carl Gustav Hempel and Kurt Grelling),⁶ only Münster survived as a centre for logical research in Germany. Most importantly, however, in 1938 Scholz was able to obtain the first German chair for mathematical logic and foundations. It was only then that the long process of the institutionalization of mathematical logic in Germany was completed (cf. Peckhaus 1992).

These comments may already be sufficient to indicate some of the similarities between Beth and Scholz. Like Scholz, Beth approached logic and the foundations of mathematics from the point of view of philosophy, especially from a Kantian position. Beth later characterized his 1935 *proefschrift* approach as follows (Beth 1959, ix):

In this thesis an attempt was made to test Kant’s critical philosophy by confronting it with modern development in mathematical thought and, conversely, to interpret contemporary conceptions about the foundations of mathematics.

⁶On the effects of these politics see Thiel 1984, and the catalogue of the exhibition “Terror and Exile” at the Berlin Technical University in August 1998 (Brüning et al. 1998).

Beth's interests lay in theoretical semantics, another coincidence he had in common with Scholz, and in a field which is now called knowledge representation and empirical knowledge. Else Barth hinted at three further important aspects of Beth's philosophy of logic (see Barth 1990, 6):

1. his analysis of the history of philosophy and systematical surroundings of the so-called method of exposition concerning Aristotelian syllogistics;
2. of the Platonic-Aristotelian cognitive Principle of the Absolute;
3. of the Postulate of Self-Evidence (“het evidentiepostulaat”).

Although Beth became, in the course of time, increasingly sceptical about Kant's critical philosophy, he continued to maintain, like Scholz, that logic is more than a game of symbols. He had held this position in *Rede en aanschouwing in de wiskunde* in connection with a discussion on the philosophy of the Vienna circle (Beth 1935). Beth called the Neopositivists' antimetaphysical endeavour “belangrijk en sympathiek”, deplored, however, that this endeavour was connected with serious one-sidedness. As an example he noted that the foundational problems inherent in the notion of evidence were simply ignored. As a consequence, he said, the Vienna circle held an unsatisfactory conception of logic and mathematics. Beth referred to the opinion derived from Wittgenstein's *Tractatus* and from Whitehead and Russell's logicism that logic and mathematics consist only of tautologies, i. e. of judgements which are valid only because of their form and not because of any process of verification. According to this view, logic and mathematics have no independent relationship with “reality” for they deal with “scientific number”. Beth called this “onjuiste”, erroneous. In his search for the justification of the evidence of logic and mathematics, he regarded Scholz as a like-minded fellow, although he realized the differences in their specific approaches. In his *Inleiding tot de wijsbegeerte der wiskunde* of 1940, he distinguished two forms of logicism, both questioning intuitive evidence and therefore the independence of mathematics and logic. The first direction opposed all philosophy in the classical sense. Rudolf Carnap can be regarded as an exponent. The second links the logicistic foundation of mathematics with a form of chiefly Platonistic metaphysics. This approach is represented by Heinrich Scholz (Beth 1940, 13). Beth seems to lean in Scholz's direction. Textual evidence can be found in his scepticism towards over-estimation of the relativity of logic, especially towards Carnap's tolerance principle which states that each individual may construct his own logic, i. e. his own language formalism (cf. Carnap 1934, 44–45). In his *Geschiedenis der logica* Beth joined Scholz in showing preference for Tarski's logical semantics as opposed to the relativistic tolerance principle (Beth 1944, 84).

I'm not sure when Beth and Scholz first met. Their correspondence began in 1934. A longer exchange of letters took place between October and December 1936.⁷ Beth had submitted a paper on Frege's assertion symbol entitled "Signifische en syntactische beschouwingen over het assertie-symbol" to the series *Forschungen zur Logik und zur Grundlegung der exakten Wissenschaften* edited by Scholz. Scholz rejected this paper arguing in an assessment of three pages, that Beth's considerations didn't convince him according to which the claimed problems in Frege's logic were connected with his introduction of the assertion symbol. He regretted being unable to suggest an alternative journal. He didn't know of an appropriate German journal and even the *Erkenntnis*, the main forum of the neopositivistic movement, was not open for relevant research of this nature. "It is still a very limited fortune," he wrote, "to be a logicist in this world." Nevertheless, he remembered to encourage the younger colleague. "The few logicists which exist are so spread around the world, that they have to stick together as closely as possible." Beth accepted Scholz's criticism and withdraw his paper, a fact which impressed Scholz very much. It was never published to my knowledge.⁸

Scholz and Beth met personally at least at the Congrès Descartes which took place from the 1st to the 6th of August 1937, in Paris. This was the 9th International Congress of Philosophy commemorating the 300th anniversary of the publication of Descartes's *Discours de la méthode*. Three of the six sections of the congress were devoted to scientific philosophy, in particular to the unity of science (section 2), to logic and mathematics (section 3) and to causality and determinism (section 4). Again there were several coincidental aspects to be observed between Beth and Scholz. Both took active part.⁹ Both wrote extensive reports on the sections of scientific philosophy, Beth for the *Algemeen Nederlands Tijdschrift voor Wijsbegeerte en Psychologie* (Beth 1937/38) and Scholz for the *Kölnische Zeitung* (Scholz 1937a). Finally both seemed to feel a similar high esteem for Alfred Tarski who opened the section on logic on the first day of the congress. Tarski's lecture "led immediately to the top," as Scholz wrote, and Beth took the chance in his report to consider Tarski's semantic theory of truth in an extensive manner.

⁷Scholz to Beth, 28th October, 1936; assessment; undated draft of a letter by Beth to Scholz (21 November, 1936); Scholz to Beth, 15th December, 1936; Evert Willem Beth Papers, Rijksarchief in Noord-Holland, Haarlem, General Correspondence, inv. nr. 24. Cf. Velthuys-Bechthold 1995, 192–193.

⁸The paper may have contained the text of a lecture of Beth's with the same title given at a meeting of the the Wiskundig Genootschap on 28th November, 1936. See the inventory of the Willem Evert Beth papers, Velthuys-Bechthold 1995, 299. A discussion of the assertion symbol can be found in Beth's *Inleiding tot de wijsbegeerte der wiskunde* (1940).

⁹The papers were published in the proceedings: Beth 1937, Scholz 1937b.

3 The Correspondence of 1946

Now I would like to skip almost 9 years and report on three letters which were written between July and October 1946. This exchange of letters was obviously triggered off by a letter by Scholz dated 15th July, 1946. This initial letter has not been preserved.¹⁰ According to Beth's answer, dated 28th July, 1946, it is clear that Scholz had attempted to reestablish contact by reporting on the state of affairs in Münster, about Gerhard Gentzen's tragic death¹¹ and about the fact that he was able to help save the Polish logician and philosopher Jan Łukasiewicz and his wife. Among other things Beth wrote in his response:

As a friend, I would now like to put forward a question, which might be unpleasant, but which I cannot suppress. In my country you have always been acknowledged as a friend of the Netherlands and as an opponent of Nazism. I and others were, however, painfully hurt to find articles from your hand in "Das Reich." The articles as such were blameless, one cannot grasp, however, how a respectable man could work for this journal by Mr Goebbels. You will doubtless understand that we have become extraordinarily sensitive after all the evil we have had to suffer under the Germans. I would like to mention only a few facts: I myself had to hide for six months in order to escape the arrest decreed by Mr Seyß-Inquart. Several of my Jewish friends didn't return from deportation. Therefore I would very much appreciate, you forwarding convincing information about further particulars of your collaboration with "The Reich."

Beth's honest words forced his German friend to reveal the motives for his supposed collaboration with the Nazi regime. Scholz accepted the question and answered on 24 August, 1946 that he had never become a member of the Nazi party or one of its divisions, "but had had to associate with the 'Reich' in order (1) to save our research on foundations, and (2) to help the suffering Polish friends in the way I did."

3.1 Scholz's Fight against "German Mathematics"

In sum, Scholz published eight papers and reviews in the journal *Das Reich*¹² edited by the German Minister of Propaganda, Josef Goebbels. This journal was intended for an audience with superior cultural tastes. Scholz's

¹⁰It can be assumed that this letter was similar in form and content to a letter to..., dated ..., which can be found in the Beth papers.

¹¹Cf. the report on Gentzen's imprisonment in Prague, Vihan 1995.

¹²Cf. the bibliography of Scholz's writings Kambartel 1961, and the addition in Peckhaus 1993, 103, n. 6.

contributions concerned the ethos of doing science, and reviews of books on theoretical physics by Carl Friedrich von Weizsäcker and Louis de Broglie. In arguing for the first of the two points, mentioned above, Scholz referred to his struggle with some representatives of “German mathematics”,¹³ some sort of junior partner of “German physics”, the latter having been ennobled by two German Nobel laureates, Philipp Lenard (1905) and Heinrich Stark (1916). One of the “German mathematicians”, Max Steck from the Technical University in Munich, had published a book on the “main problem” in mathematics, *Das Hauptproblem in der Mathematik* (Steck 1942). Scholz wrote to Beth on 24th August 1946:

In this book Hilbert and all the formalized foundational research inspired by him was held responsible in a most shameless way for the “decadence” of the mathematical spirit in the German area. I myself and my school are attacked in this botch in the same manner.

In particular Steck had attested Hilbert’s formalism by saying that it stood stock in mental one-sidedness, “which is simply catastrophic. *Viewed from intellectual history this standpoint is ‘decadence’ which cannot be imagined to be pursued in a more consistent way*” (Steck 1942, 205).

Steck’s attack was not the only one. As early as 1941, Scholz’s paper “Was ist Philosophie?” (Scholz 1939/40) was the target of heavy polemic by the Munich philosopher Kurt Schilling, who criticized Scholz’s attempt to present the new logic and foundational research as philosophy in the Platonic spirit.¹⁴ Schilling ends his discussion as follows (Schilling 1941, 48):

Even though Scholz shows certain courage in recommending to the German people in the middle of the war a single philosophy as the only possible one whose leading representatives (mentioned by Scholz himself) today are only Poles, Englishmen, emigrants, and Americans, and in openly expressing that he organized his teaching as a German ordinary professor “according to the Warsaw model [...]” it seems to me that his courage should have a better concern.

In his letter to Beth, Scholz argued that he was anxious that the regime would survive the war and would end his efforts to institutionalize mathematical logic and foundations studies in Germany. Given a similar situation, he said, he would have reconsidered his association to *Das Reich* once more.

In order to achieve his aims Scholz masterfully employed the propaganda means of his time. Besides his contributions for *Das Reich*, Scholz even employed the organ of the “Deutsche Mathematik” movement entitled *Deutsche*

¹³On “German mathematics” see Lindner 1980, Peckhaus 1984.

¹⁴On Schilling’s role in National Socialist philosophy and the difficulties of a coherent assessment see Schorch 1990, 189–196, 344–353.

Mathematik to place his polemic against the “German mathematicians” Max Steck and others. In the paper “Was will die formalisierte Grundlagenforschung?” published in the same journal (Scholz 1943) he hinted at the eminent logical and semantical contributions of the Polish Jew Alfred Tarski, simply playing on the ignorance of his opponents. Scholz called provocations like this, formulated in a way that they could still be printed, “Igelchen”, little hedgehogs (see von Weizsäcker 1986, 14). His rhetoric shows that he knew how to handle the regime.¹⁵

Scholz’s engagement is understandable if one considers just what he had to lose: the fruits of his efforts to create an institutionalized base for mathematical logic and foundational studies at a German university. Although Ernst Zermelo had the first official lectureship for mathematical logic as early as 1908,¹⁶ the subject was not well established in Germany. There were no professorships or institutes dedicated to it. Thus, the German situation differed considerably from that in other countries, e. g. in the United States of America or particularly in Poland. Scholz succeeded in altering this situation. In 1936 his professorship for Philosophy was linked to a lectureship in Mathematical Logic and Foundational Research. Two years later his professorship was altered into a professorship for the Philosophy of Mathematics and Natural Sciences with special consideration of Mathematical Logic and Foundational Research. At the same time the Logistic Section of the Philosophical Seminar was renamed the Logistic Seminar. It only became an institute of its own in 1943 as the Institute for Mathematical Logic and Foundational Research, which still exists today. This last step took place at the culmination of Scholz’s controversy with the “German mathematicians.”

Scholz’s aide-mémoires of the time show that he used the nationalistic tone, opportune in German political discourse of the period, in order to achieve his aims. His line of argument can be illustrated with a quote from a “Denkschrift über die neue mathematische Logik und Grundlagenforschung,” dated 15th January, 1938, and addressed to the Ministry of Cultural Affairs.¹⁷ “Today mathematical logic and foundational research exist,” Scholz began apodictically. He then continued:

It is in a concise sense a creation of the German genius. *Leibniz* demanded it in a most insistent manner, and it was created admirably by Gottlob *Frege* (1848–1925), the greatest German logician besides *Leibniz*, made the object of deep consideration by *Hilbert*, who followed Bertrand *Russell*’s pioneering transformation of *Frege*’s creation, who

¹⁵This is the assessment of Carl Friedrich von Weizsäcker (1986, 13).

¹⁶Cf. Peckhaus 1990a, 106–122, Peckhaus 1990b.

¹⁷Behmann papers; at present to be found in the Institute for Philosophy at the University Erlangen-Nürnberg.

aimed at the proof of the consistency of classical logic, and of classical mathematics which is profoundly connected to the former.

The subject, he argued, had emerged as a science of its own, and was already established in several foreign countries. He stressed that there were four full professorships and two extraordinary professorships in Poland. In the United States it had become so generally accepted that in 1936 an Association of Symbolic Logic was founded, responsible for the *Journal of Symbolic Logic*, a journal of international importance. Scholz deplored the fact that Germany hadn't taken part in this development, and demanded the establishment of an institutional base for the subject in Germany as well.

Although arguing from a nationalistic position, Scholz was of course aware of the international character of logic. In 1938 he travelled to Warsaw in order to confer the honorary doctorate of the University of Münster on Jan Łukasiewicz on the occasion of his 60th birthday. Ten months later Germany advanced on Poland, later (physically!) extinguishing a considerable part of Poland's intelligentsia.

3.2 Scholz's Engagement on the Part of his Polish Friends

In respect to Scholz's second argument, his assistance for his Polish friends, Scholz wrote to Beth that he helped Jan and Regine Łukasiewicz leave Poland for Germany. They were kept in hiding near Münster until the end of the War. He also mentioned that he maintained contact between Alfred Tarski in the USA, and his wife who had stayed in Warsaw with their two children. With his help they were able to get passports to leave Poland. Scholz wrote the following in regard to the case of Jan Salamucha:

I finally rescued one of Mr Łukasiewicz's best theological disciples, Mr Salamucha, from the concentration camp, before the worst could happen. It is a misfortune which I will never forget, that this excellent man was murdered during the battle of Warsaw in August 1943 [he added in a handwritten note: "not by the Germans!"]. I corresponded with my friends in Warsaw and Cracow although this was strictly forbidden. I will not tell you what I risked. But you will allow me to say that the Gestapo came to my home three times, and that after Salamucha's release from the concentration camp our Minister let me know that in the case of a repetition he would begin disciplinary procedures against me aimed at my dismissal.¹⁸ I soon had only the choice of stopping these activities or to build up a protected position, which became so

¹⁸This letter, dated 2nd October, 1940, can be found in Scholz's personal files in the University Archives, Münster.

strong that I could continue my underground efforts without fearing the worst. I decided on the strengthened position, and, under the same circumstances, I would decide in the same way again.

The story of Polish logic and its fate during World War II has not yet been written, although a lot of research has been and is being done. It is of value here to remember, e.g., the historical work of Jan Woleński on the history of the Lvov-Warsaw school (1989, 1995), Andrzej Bolewski and Henryk Pierzchała's comprehensive study on the fate of Polish scientists 1939–1945 and the loss of lives,¹⁹ and Peter Schreiber's paper on the relationship between Heinrich Scholz and Polish logicians.²⁰ The Salamucha case is treated in these works, here are some further remarks.

Given Scholz's affinity to Polish logic and his deep and friendly contact to Polish logicians, Germany's invasion of Poland must have shocked him, especially when it became clear that German occupation politics aimed at extinguishing the Polish intelligentsia. On 6th November, 1939, 183 scientists of the famous Jagiellonian University in Cracow were imprisoned, of whom 172 were transferred to the concentration camp at Sachsenhausen. On 8th February, 1940, 103 older professors were released. Most of the younger ones, however, were deported to the concentration camp at Dachau. The last of these deportees left the camps only at the beginning of 1941. In sum, 20 scientists lost their lives (cf. Bolewski and Pierzchała 1989, 696). This action caused a storm of international indignation, but only a few German scientists protested, who had to fear personal threats, as the Polish historians Andrzej Bolewski and Henryk Pierzchała stress (696). Scholz's engagement was devoted to Jan Salamucha, a catholic monk and historian of scholastic logic,²¹ and to the younger Jewish logician Joachim Metallmann who was later murdered. The physicist and philosopher Carl Friedrich von Weizsäcker remembered that it was the Salamucha case which led to his personal acquaintance with Scholz. He reported (von Weizsäcker 1986, 12) that at the end of 1939 he received a letter from his teacher Werner Heisenberg, containing a letter by Scholz to Heisenberg. The Dutch mathematician Bartel Leendert van der Waerden, then teaching at the University of Leipzig, had been imprisoned when the war broke out and Heisenberg was able to have

¹⁹Bolewski and Pierzchała 1989, in Polish with a German summary, *ibid.*, 694–698. Polish science lost by death due to war and occupation 440 scientists, among them 245 professors. 169 scientists were murdered in concentration camps or otherwise.

²⁰Peter Schreiber's paper "Über Beziehungen zwischen Heinrich Scholz und polnischen Logikern" was published in Polish (Schreiber 1995a); a German version is in print (Schreiber 1995b).

²¹An example of Salamucha's modern reconstruction of scholastic arguments can be found in his "The Proof 'Ex Motu' for the Existence of God: Logical Analysis of St. Thomas' Arguments" (Salamucha 1958, Polish original Salamucha 1934).

him released within two days. Scholz asked Heisenberg for help in the case of two Poles. Heisenberg wrote to von Weizsäcker saying that he could not do anything, but asked him to help. von Weizsäcker gave Scholz's letter to his father Ernst von Weizsäcker, then undersecretary of state in the German Foreign Office, and some time later Salamucha was freed (but not both Poles, as von Weizsäcker wrote). "I do not know," Carl Friedrich von Weizsäcker continued, "whether my father gave orders, or how it otherwise worked; my father probably took steps." He did indeed, as becomes clear from Scholz's assessment written for Ernst von Weizsäcker after the latter had been charged as a high official of the Foreign Office in the Nuremberg trials.²² In this document Scholz wrote that E. von Weizsäcker had shown and paved the way in which he was able to help Salamucha. Bolewski and Pierzchała published two letters of Scholz from April and May 1940 directed to the Department of Cultural Affairs of the Foreign Office concerning Jan Salamucha²³ which indicate that Scholz remained loyal to his rhetorical principles. He wrote that Jan Salamucha was one of the best experts in late medieval logic which he had investigated by means of the exact methods of the new mathematized logic. This mathematized logic was fundamentally a creation of German genius, he argued. It went back to the great German master Gottlob Frege, a man for whom the world envied Germany. From this followed, Scholz wrote (Bolewski and Pierzchała 1989, 630),

that path breaking work done with the help of this tool serves at the same time in a pregnant sense, the honour of German genius. It follows furthermore, that for years I, as the only accepted representative of mathematized logic at a Great German university, had a lively exchange of ideas by letter with Mr S.

This last remark shows how much Scholz staked on the basis of his authority which had to be preserved at all costs if he wanted to achieve his interests or those of his endangered friends.

In the end Salamucha didn't survive the German occupation of Poland, although Scholz seems to be in error concerning the particulars of his death. He obviously died during the Warsaw revolt of 1944. Bolesław Sobociński tells the tale (Sobociński 1958, 328):

On the first day of the Warsaw revolt, the first of August 1944, Fr[ater] Salamucha volunteered as a chaplain to an insurgent unit to take place of another priest who was unable to come. This unit, fighting in the

²²See the written assessment by Scholz on Ernst von Weizsäcker, dated 2nd April, 1948, Frege Archive, Institut für mathematische Logik und Grundlagenforschung, Münster.

²³Archive of the Foreign Office, Pol. V, AHP; Pol. V, 4790, AHP; Pol. V, 5370, AHP. Published by Bolewski and Piezchała 1989, 630–632. These letters, dated 16th April, 1940, and 16th May, 1940, are also published in Jadacki and Świętorzecka 1997, 24–25, note 22.

sector of Warsaw called Ochota, soon became separated from the main insurgent forces and was destroyed by tanks on August 9th. All the wounded and a great number of civilians were murdered by the Germans. Fr. Salamucha, who decided to stay with the wounded, rather than withdraw with the rest of the unit, was also murdered. His body was found some months later and buried properly in a clergy section of Powązki Cemetery in Warsaw.

What was Beth's reaction? In his response on 19th October, 1946 he remained critical of Scholz's first point. He wrote that in the Netherlands such arguments were unacceptable in analogous cases, both for the authorities and in public opinion. He admitted, however, a great difference. The collaboration of a Dutchman by, e. g., writing for a National Socialist newspaper, meant that he had renounced his national position in favour of the position of the enemy. But this was not true for Scholz, of course. Beth accepts, however, the second point as completely convincing. "I'm sure", he writes, "it will be pleasant for you—as it was pleasant for me—, to hear what Mr Bocheński has written to me: 'M. Scholz . . . s'est comporté d'une manière très noble pendant la guerre.'" Beth admitted that Scholz did an inestimable service not only for science and humanity, but also for the German people. A similar assessment can also be found in the obituary which Beth wrote after Scholz's death (Beth 1956/57). There, Beth noted that Scholz, despite of his strong national feelings, remained not only unfriendly towards National Socialism but also assisted his Polish colleagues and their families, with great danger for himself. A number of them, he stressed, owed their lives to Scholz.

3.3 Ideology and Significs

A last topic dealt with in Beth's letter of 19th October, 1946 needs to be considered. Via Hendrik Josephus Pos, Beth had received Scholz's booklet *Zwischen den Zeiten* (Scholz 1946). In this pamphlet Scholz claimed that it was an expression of the love of truth if Germans accepted collective responsibility for the crimes done in their names. He claimed that the German people had not had the power to rid themselves of their demonic leaders, although they should have realized their characters early enough (11). Scholz emphasized that accepting this collective responsibility accords the German honour, and does not contradict it.

Beth criticized that at several places in the booklet, the language of arrogant nationalism was used. Among the phrases criticized were—they must be quoted in German—"das mehr oder weniger empfindliche nationale Selbstgefühl," "die Ehre des deutschen Geistes" or "Ehre, deren der Tapfere würdig

ist.”²⁴ As a representative of Mannoury’s signific school,²⁵ Beth considered this language inappropriate. The content of the speech is unimportant, however simply its use evokes memories which should no longer be evoked. Beth even demanded that German newspapers should create an “Index verborum prohibitorum” containing words like “völkisch”, “Volksgenosse”, “Blut” and “Ehre”. This would not only protect the reader, but also force writers to be more careful when expressing themselves.

It is doubtful whether Scholz was able to appreciate these arguments. In the booklet he suggested a return to the ideals of the German classics, to Schiller and Goethe, and he used the language of the classical period. It is a matter of course that Scholz knew that language could be used as a weapon, but that it could also be used as a counter weapon. He proved that honest nationalism could be utilized against National Socialist ideology. Strict “political correctness” would not have helped in these situations. The existence of *lingua tertii imperii* does not eliminate the fact that several of its terms and phrases had innocent meanings in former times. It should be possible within the dynamic development of a language to return to these former meanings. To remove all the abused terms and phrases from the opportune language could be read as a belated prostration before ideology.

4 Conclusions

This last subject facilitates a conclusion with a quote from Else Barth’s paper “In the Service of Human Society” which contains her discussion of Evert Willem Beth’s philosophy. The exchange of letters reported on above gives further evidence of her judgement of Beth’s scientific ethos. She writes (Barth 1990, 8):

Beth was—and remained throughout his whole life—extraordinarily preoccupied with the terrors of World War II and its cultural roots, the rise and effects of fascism and other totalitarian modes of thought. He did not, as is usual, relegate his reactions to them to a secluded part of his brain that was closed off from his professional work, or vice-versa.

References

Barth, Else M. 1990. In the service of human society: Formal, informal or anti-logical? The philosophy of the logician Evert Willem Beth (1908–1964). *Informal*

²⁴This last phrase can be found on p. 18, line 8. Beth mentions, however, p. 18, line 18, which does not follow his line of criticism. There Scholz writes: “Wir werden den Popanz um *Nietzsche* abbauen müssen, abbauen müssen bis auf den Grund, wenn wir uns ehrlich wieder herstellen wollen” (line 17–19).

²⁵For a collection of papers on the signific school see Heijerman and Schmitz 1991.

- Logic*, vol. 12, pp. 1–10.
- Beth, Evert Willem. 1935. *Rede en aanschouwing in de wiskunde*. P. Noordhoff N.V., Groningen. Proefschrift Rijksuniversiteit te Utrecht.
- Beth, Evert Willem. 1937. L'évidence intuitive dans les mathématiques modernes. In *Travaux du IXe Congrès international de philosophie (Congrès Descartes Paris 1937)*, fasc. 4, pp. 161–165. Hermann, Paris.
- Beth, Evert Willem. 1937/38. Wiskunde, logica en natuurphilosophie op het Congrès-Descartes. *Algemeen Nederlands Tijdschrift voor Wijsbegeerte en Psychologie*, vol. 31, pp. 130–142.
- Beth, Evert Willem. 1940. *Inleiding tot de Wijsbegeerte der Wiskunde*. N.V. Dekker & van de Vegt, Nijmegen/Utrecht.
- Beth, Evert Willem. 1944. *Geschiedenis der Logica*. Servire's Encyclopaedie. Afdeling: Logica; 37. N.V. Servire, Den Haag.
- Beth, Evert Willem. 1956/57. In memoriam Heinrich Scholz (Berlijn, 17 December 1884 – Munster, 30 December 1956). *Algemeen Nederlands Tijdschrift voor Wijsbegeerte en Psychologie*, vol. 49, pp. 113.
- Beth, Willem Evert. 1959. *The Foundations of Mathematics. A Study in the Philosophy of Science*. Studies in Logic and the Foundations of Mathematics. North-Holland, Amsterdam.
- Bolewski, Andrzej and Pierzchała, Henryk. 1989. *Losy polskich pracowników nauki w latach 1939–1945. Straty osobowe*. Zakład narodowy imienia ossolińskich wydawnictwo, Wrocław et al.
- Brüning, Jochen, Ferus, Dirk, and Siegmund-Schultze, Reinhard. 1998. *Terror and Exile. Persecution and Expulsion of Mathematicians from Berlin between 1933 and 1945. An Exhibition on the Occasion of the International Congress of Mathematicians, Technische Universität Berlin. August 19 to 27, 1998*. Deutsche Mathematiker-Vereinigung, no place (Berlin).
- Carnap, Rudolf. 1934. *Logische Syntax der Sprache*. Schriften zur wissenschaftlichen Weltauffassung, 8. Springer Verlag, Wien.
- Frege, Gottlob. 1879. *Begriffsschrift, eine der arithmetischen nachgebildete Formelsprache des reinen Denkens*. Louis Nebert, Halle. Reprinted in Frege 1977.
- Frege, Gottlob. 1977. *Begriffsschrift und andere Aufsätze mit E. Husserls und H. Scholz' Anmerkungen*, edited by I. Angelelli. Wissenschaftliche Buchgesellschaft, Darmstadt, 3rd edn.

- Heijerman, Erik and Schmitz, H. Walter (eds.). 1991. *Significs, Mathematics and Semiotics. The Signific Movement in the Netherlands. Proceedings of the International Conference Bonn, 19–21 November 1986*. Materialien zur Geschichte der Sprachwissenschaft und der Semiotik, 5. Nodus, Münster.
- Hermes, Hans. 1958. Heinrich Scholz. Die Persönlichkeit und sein Werk als Logiker. In *Heinrich Scholz. Drei Vorträge gehalten bei der Gedächtnisfeier der Math.-Naturw. Fakultät der Universität Münster am 20. Dezember 1957*, pp. 25–45. Aschendorff, Münster.
- Hermes, Hans. 1986. “Logistik in Münster um die Mitte der dreißiger Jahre”. In *Logik und Grundlagenforschung. Festkolloquium zum 100. Geburtstag von Heinrich Scholz*, Schriftenreihe der Westfälischen Wilhelms-Universität Münster; n.s. vol. 8, pp. 41–52. Aschendorff, Münster.
- Hilbert, David and Bernays, Paul. 1934. *Grundlagen der Mathematik*, vol. 1. Grundlehren der mathematischen Wissenschaften; vol. 40. Springer, Berlin.
- Hoffmann, Dieter. 1994. Zur Geschichte der Berliner “Gesellschaft für empirische/wissenschaftliche Philosophie”. In Lutz Danneberg, Andreas Kamlah, and Lothar Schäfer (eds.), *Hans Reichenbach und die Berliner Gruppe*, pp. 21–31. Friedr. Vieweg & Sohn, Braunschweig/Wiesbaden.
- Jadacki, Jacek J. and Świątorzecka, Kordula. 1997. Myśliciel o sercu walecznym. o życiu jana salamuchi. In Jan Salamucha, *Wiedza i wiara. Wybrane pisma filozoficzne*, ed. J. J. Jadacki and K. Świątorzeckiej, no. 72 in *Prace Wydziału Filozoficznego*, p. 15sq. Towarzystwo Naukowe Katolickiego Uniwersytetu Lubelskiego, Lublin.
- Kambartel, Friedrich. 1961. Bibliographie Heinrich Scholz. In Heinrich Scholz, *Mathesis Universalis. Abhandlungen zur Philosophie als strenger Wissenschaft*, pp. 453–470. Wissenschaftliche Buchgesellschaft, Darmstadt.
- Lindner, Helmut. 1980. “Deutsche” und “gegentypische” Mathematik. Zur Begründung einer “arteigenen” Mathematik im “Dritten Reich” durch Ludwig Bieberbach. In Herbert Mehrrens (ed.), *Naturwissenschaft und NS-Ideologie. Beiträge zur Wissenschaftsgeschichte des Dritten Reiches*, pp. 88–115. Suhrkamp, Frankfurt a. M.
- Meschkowski, Herbert. 1984. Heinrich Scholz. Zum 100. Geburtstag des Grundlagenforschers. *Humanismus und Technik. Jahrbuch 1984*, vol. 27, pp. 28–52.
- Molendijk, Arie L. 1991. *Aus dem Dunklen ins Helle. Wissenschaft und Theologie im Denken von Heinrich Scholz. Mit unveröffentlichten Thesenreihen von Heinrich Scholz und Karl Barth*. Amsterdam Studies in Theology, vol. 8. Rodopi, Amsterdam/Atlanta.

- Peckhaus, Volker. 1984. *Der nationalsozialistische "neue Begriff" von Wissenschaft am Beispiel der "Deutschen Mathematik": Programm, Konzeption und politische Realisierung*. Master's thesis, Philosophical Faculty of the RWTH Aachen.
- Peckhaus, Volker. 1988. Karl Eugen Müller (1865–1932) und seine Rolle in der Entwicklung der Algebra der Logik. *History and Philosophy of Logic*, vol. 9, pp. 43–56.
- Peckhaus, Volker. 1990a. *Hilbertprogramm und Kritische Philosophie. Das Göttinger Modell interdisziplinärer Zusammenarbeit zwischen Mathematik und Philosophie*. Studien zur Wissenschafts-, Sozial- und Bildungsgeschichte der Mathematik; 7. Vandenhoeck & Ruprecht, Göttingen.
- Peckhaus, Volker. 1990b. "Ich habe mich wohl gehütet, alle Patronen auf einmal zu verschießen". Ernst Zermelo in Göttingen. *History and Philosophy of Logic*, vol. 11, pp. 19–58.
- Peckhaus, Volker. 1992. Hilbert, Zermelo und die Institutionalisierung der mathematischen Logik in Deutschland. *Berichte zur Wissenschaftsgeschichte*, vol. 15, pp. 27–38.
- Peckhaus, Volker. 1993. Review of Molendijk 1991. *History and Philosophy of Logic*, vol. 14, pp. 101–107.
- Ratschow, Carl Heinz. 1958. Heinrich Scholz der Theologe und der Christ. In *Heinrich Scholz. Drei Vorträge gehalten bei der Gedächtnisfeier der Math.-Naturw. Fakultät der Universität Münster am 20. Dezember 1957*, pp. 10–24. Aschendorff, Münster.
- Reichenbach, Hans. 1932. Wahrscheinlichkeitslogik. *Sitzungsberichte der Preussischen Akademie der Wissenschaften. Phys.-math. Klasse*, vol. 29, pp. 476–490.
- Reichenbach, Hans. 1934. Wahrscheinlichkeitslogik. *Erkenntnis*, vol. 5, pp. 37–43.
- Ritter, Joachim, Hermes, Hans, and Kambartel, Friedrich. 1961. Vorwort. In Heinrich Scholz, *Mathesis Universalis. Abhandlungen zur Philosophie als strenger Wissenschaft*, pp. 7–23. Wissenschaftliche Buchgesellschaft, Darmstadt.
- Salamucha, Jan. 1934. Dowód 'ex motu' na istnienie. Analiza argumentacji św. Tomasza z Akwinu. *Collectanea Theologica*, vol. 15. English translation Salamucha 1958.
- Salamucha, Jan. 1958. The proof 'ex motu' for the existence of God: Logical analysis of St. Thomas' arguments. *The New Scholasticism*, vol. 32, pp. 334–372.

- Schilling, Kurt. 1941. Zur Frage der sogenannten ‘Grundlagenforschung’. Bemerkungen zu der Abhandlung von Heinrich Scholz: Was ist Philosophie? *Zeitschrift für die gesamte Naturwissenschaft*, vol. 7, pp. 44–48.
- Scholz, Heinrich. 1935. Der Pariser Kongreß für Philosophie. Offprint from the *Kölnische Zeitung*, no. 494, 29 September 1935, and no. 502, 3 October 1935.
- Scholz, Heinrich. 1937a. Denken und Erkenntnis des Abendlandes. der Pariser Descartes-Kongreß. Offprint from the *Kölnische Zeitung*, no. 435, 29 August 1937, and no. 448, 5 September 1937.
- Scholz, Heinrich. 1937b. Die Sonderstellung der Logikkalküle im Bereich der elementaren Kalkülforschung. In *Travaux du IXe Congrès international de philosophie (Congrès Descartes Paris 1937, fasc. 6: Logique et mathématiques*, pp. 40–42. Hermann, Paris.
- Scholz, Heinrich. 1939/40. Was ist Philosophie? Der erste und der letzte Schritt auf dem Wege zu ihrer Selbstbestimmung. *Archiv für Rechts- und Sozialphilosophie*, vol. 33, pp. 1–55. Again in Scholz 1961, 341–387.
- Scholz, Heinrich. 1941. *Metaphysik als strenge Wissenschaft*. Staufen-Verlag, Köln.
- Scholz, Heinrich. 1943. Was will die formalisierte Grundlagenforschung? *Deutsche Mathematik*, vol. 7 (1942–44), no. 2/3, pp. 206–248.
- Scholz, Heinrich. 1946. *Zwischen den Zeiten*. Furche-Verlag, Tübingen/Stuttgart.
- Scholz, Heinrich. 1961. *Mathesis universalis. Abhandlungen zur Philosophie als strenger Wissenschaft*, edited by Hans Hermes, Friedrich Kambartel and Joachim Ritter. Wissenschaftliche Buchgesellschaft, Darmstadt.
- Schorcht, Claudia. 1990. *Philosophie an den bayerischen Universitäten 1933–1945*. Harald Fischer Verlag, Erlangen.
- Schreiber, Peter. 1995a. O związkach Heinricha Scholza z logikami polskimi. In Stanisław Fudali (ed.), *Matematyka Polska w stuleciu 1851–1950. Materiały z IX Ogólnopolskiej Szkoły Historii Matematyki. Międzyzdroje 5–9 czerwca 1995*, vol. 16 of *Materiały Konferencji*, pp. 237–254. Uniwersytet Szczeciński, Szczecin.
- Schreiber, Peter. 1995b. Über Beziehungen zwischen Heinrich Scholz und polnischen Logikern. typescript, 15 pp., to be published.
- Sobociński, Bolesław. 1958. Jan Salamucha (1903–1944): A biographical note. *The New Scholasticism*, vol. 32, pp. 327–333.
- Steck, Max. 1942. *Das Hauptproblem der Mathematik*. Lüttke, Berlin.

- Stock, Eberhard. 1987. *Die Konzeption einer Metaphysik im Denken von Heinrich Scholz*. Theologische Bibliothek Töpelmann; vol. 44. de Gruyter, Berlin/New York. Ph.D. thesis Marburg, 1985.
- Thiel, Christian. 1984. Folgen der Emigration deutscher und österreichischer Wissenschaftstheoretiker und Logiker zwischen 1933 und 1945. *Berichte zur Wissenschaftsgeschichte*, vol. 7, no. 6, pp. 227–25.
- Thiel, Christian. 1993. Carnap und die wissenschaftliche Philosophie auf der Erlanger Tagung 1923. In Rudolf Haller and Friedrich Stadler (eds.), *Wien – Berlin – Prag. Der Aufstieg der wissenschaftlichen Philosophie. Zentenarien Rudolf Carnap – Hans Reichenbach – Edgar Zilsel*, Veröffentlichungen des Instituts Wiener Kreis; vol. 2, pp. 175–188. Hölder – Pichler – Tempsky, Wien.
- Tirala, Lothar G. 1936. Nordische Rasse und Naturwissenschaft. In A. Becker (ed.), *Naturforschung im Aufbruch. Reden und Vorträge zur Einweihungsfeier des Philipp-Lenard-Instituts der Universität Heidelberg am 13. und 14. Dezember 1935*, pp. 27–38. Lehmann, München.
- Velthuys-Bechthold, P. J. M. 1995. *Inventory of the Papers of Evert Willem Beth (1908–1964), Philosopher, Logician and Mathematician. 1920–1964*, vol. 4 of *Inventarisreeks Rijksarchief in Noord-Holland*. Rijksarchief in Noord-Holland, Haarlem.
- Vihan, P. 1995. The last months of Gerhard Gentzen in Prague. *Collegium Logicum*, vol. 1, pp. 1–7.
- von Weizsäcker, Carl Friedrich. 1986. Die Logik zeitlicher Aussagen und die Grundlagen der Physik. In *Logik und Grundlagenforschung. Festkolloquium zum 100. Geburtstag von Heinrich Scholz*, Schriftenreihe der Westfälischen Wilhelms-Universität Münster; n.s. vol. 8, pp. 11–32. Aschendorff, Münster.
- von Wright, Georg Henrik. 1993. *Erkenntnis als Lebensform. Zeitgenössische Wanderungen eines philosophischen Logikers*, chap. “Logik und Philosophie im zwanzigsten Jahrhundert”, pp. 13–36. Böhlau, Wien/Köln/Weimar.
- Wernick, Georg. 1944. Heinrich Scholz als Philosoph. Eine entwicklungsgeschichtliche Studie. *Archiv für Rechts- und Sozial-Philosophie*, vol. 37, pp. 1–12.
- Whitehead, Alfred North and Russell, Bertrand. 1910–13. *Principia Mathematica*, 3 vols. Cambridge University Press, Cambridge, England. 2nd edition 1925–27.
- Woleński, Jan. 1989. *Logic and Philosophy in the Lvov-Warsaw School*. Synthese Library; 198. Kluwer, Dordrecht/Boston/London.
- Woleński, Jan. 1995. Mathematical logic in Poland 1900–1939: People, circles, institutions, ideas. *Modern Logic*, vol. 5, pp. 363–405.