Friedrich Ludwig Gottlob Frege\textsuperscript{1} was born November 8, 1848 in Wismar, a small town in Pomerania. His father, Karl Alexander (1809-1866) was a theologian of some repute. He and his wife Auguste (d. 1878) ran a school for girls there. We know very little otherwise of Frege’s youth with his family in Wismar.\textsuperscript{2} He left at age 21 to enter the University at Jena. Frege studied mathematics at Jena for two years, and then at Gottingen for two more, where he earned his doctorate in mathematics in December, 1873 with a dissertation, supervised by Ernst Schering, in geometry. Although mathematics was clearly his primary study, Frege took a number of courses\textsuperscript{1}

\textsuperscript{1}The information in this biography, as in almost all of Frege’s biographies, is drawn from the material in the Frege archives at the University of Münster, and which was first put together in the introduction by Terry Bynum (1972).  

\textsuperscript{2}Two recent contributions, one by Gabriel & Kienzler (1997) and the other by Lothar Kreiser (2001), shed more light on Frege’s youth in Jena.
in physics and chemistry, and most interestingly for us, philosophy. At Jena, he attended Kuno Fischer’s course on Kant’s Critical Philosophy, and in his first semester at Gottingen, he attended Hermann Lotze’s course on the Philosophy of Religion. The influence and importance of Kant is evident throughout Frege’s work, that of Lotze’s work on Logic is tangible but largely circumstantial.\(^3\)

After completing his *Habilitationsschrift* on the theory of complex numbers, Frege returned to Jena in May of 1874 in the unsalaried position of lecturer (*Privatdozent*). The position was secured for him by the mathematician Ernst Abbé, his guardian angel at Jena from the time he arrived as a student to his ultimate position as Professor.\(^4\) Abbé controlled the Carl Zeiss foundation, which received almost half of all the profits from the Zeiss lens and camera factory (which Abbé had helped the Zeiss family establish). Frege’s unsalaried position as Professor at Jena was made possible because he received a stipend from the Zeiss foundation.

Frege taught mathematics at Jena. His first published writings were mainly reviews of books on the foundations of mathematics. In 1879, five years after returning to Jena, he published his *Begriffsschrift*. It was not well received. For one thing, the notation was extraordinarily cumbersome and difficult to penetrate. But also, Frege failed to mention, and contrast with his own system, the celebrated advances in logic by Boole and Schroeder, in which both classical truth functional logic and the logic of categorical statements were incorporated into a single mathematical system. In his review of *Begriffsschrift*, Schroeder ridiculed the idiosyncratic symbolism as incorporating ideas from Japanese, and as doing nothing better than Boole’s and many


\(^4\)Frege begins his Political Diary with an encomium to Abbé. See Mendelsohn (1996).
things worse. Schroeder had not realized how far Frege had penetrated, and neither did many of his contemporaries.

For three years, Frege worked hard to explain and defend his *Begriffsschrift*, though not, I think, with much success.\(^5\) The fault lies in no small measure with Frege himself, for he failed to distinguish in importance the specifics of his notation (which has, thankfully, been totally abandoned) from the logical syntax and semantics it instantiated. What Frege had created, of course, was a formal language in which he axiomatized higher order quantificational logic (flawed only by the lack of an expressly articulated substitution rule), derived many theorems of propositional logic, first-order logic and second-order logic, and defined the ancestral relation. *Begriffsschrift* represents a milestone, in the history of logic, for sure, and, thereby, in the history of philosophy as well, but also in the history of modern thought, for it was the first spark in a hundred year explosion of research into the foundations of mathematics and and into the mathematical and technological nature of computation, this last having become one of the essential paradigms for explanation in the sciences.

Frege soon broke away from this engagement and returned to his creative project announced in *Begriffsschrift*:

\[\ldots\text{we divide all truths that require justification into two kinds, those for which the proof can be carried out purely by means of logic and those for which it must be supported by facts of experience. Now, when I came to consider the question to which of these two kinds the judgments of arithmetic belong, I first had to ascertain how far one could proceed in}\]

\(^5\)We know of at least one article written at the time in explanation of his system that had been submitted for publication and simply rejected.
arithmetic by means of inferences alone, with the sole support of those laws of thought that transcend all particulars. My initial step was to attempt to reduce the concept of ordering in a sequence to that of *logical* consequence, so as to proceed from there to the concept of number... (Black & Geach 1952, p. 5)

Having codified the notion of proof, of logical consequence, and of ordering in a sequence in *Begriffsschrift*, Frege pursued his investigation into the notion of *cardinal number*, publishing his philosophical strategy in 1884 in *Grundlagen*. Unlike his *Begriffsschrift*, *The Foundations of Arithmetic* is almost devoid of formal symbolism and is otherwise directly engaged with the main views current about arithmetic. His polemic against contemporary empiricist and naturalist views of the concept of number is devastating. It is not only the specifics of these views that Frege believed to be wrong, but also the methodology of seeking a foundation for mathematics by identifying referents for the number words, whether they be material objects, psychological ideas, or Kantian intuitions. This is the cash value of his injunction against looking for the meaning of “number words” *in isolation*. The numbers, along with sets and the truth values are *logical objects*: their meaning is intimately bound up with our conceptualization of things. At least this is the thrust of the famous *Context Principle*—never to look to the meaning of a word in isolation, but only in the context of a proposition. For Frege, the foundations of mathematics were to be found in the new logic he had created, the language of which was adequate to express all elementary arithmetic statements, so that the truths of logic could be seen to

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6Although they do not explicitly invite his criticism, I would be inclined to think that abstract Platonic entities belong to this group as well.
be, when spelled out, truths of logic. *Grundlagen* is widely regarded as masterpiece written by a philosopher at the height of his powers: in the years from 1884 through the publication of *Grundgesetze*, in 1893, we see Frege at his creative height.

We remain somewhat in the dark about Frege’s personal life. He married Magarete Lieseberg (1856-1904) in 1887. It is known that he and Magarete had some children together. Sadly, all of them died at a very early age. The two adopted a child, Alfred, around 1900. Alfred was very young when he was adopted because Wittgenstein remembers him as a young lad when he first visited Frege in 1911. Frege’s wife Magarete died soon after Alfred was adopted, and Frege had to raise him on his own. Alfred became an engineer. He died in 1945 in action during the Second World War.\(^7\)

Frege’s *Grundlagen*, although free from the symbolism of his more technical works, did not receive much notice, and the little it did receive was, as usual, full of misconceptions. It is not entirely clear why this is so. Perhaps Frege appeared too philosophical for the mathematicians who were working in similar areas—he was ignored by Dedekind and roundly criticized by Cantor—and too technical for the philosophers. Only the direct interaction with Husserl—Frege (1972) demolished Husserl’s early psychologism in his review—had a clear and immediate impact on active philosophers of his day. Husserl abandoned his psychologism shortly thereafter, but he was none too generous in later life when he recalled Frege to be a man of little note who never amounted to much.

Frege’s own philosophical education and his knowledge of historical and contemporary philosophers is extremely problematic. When he quotes from some of the

\(^{7}\text{G.E.M. Anscombe relayed to me that Alfred had stored a trunk of Frege’s belongings in a farmhouse somewhere in Europe, the location of which has been lost with Alfred’s demise.}\)
classical philosophers like Descartes, Hobbes and Leibniz, it is frequently from a pop-
ular anthology put together by Baumann (1868) of writings on the philosophy of
space and time. Kant gets a great many footnotes, though largely for his work on
arithmetic and geometry. It is never clear how much of a philosopher’s work Frege was
familiar with because he picked and chose discussions that were directly related to the
problems he was working on. Like an autodidact, there appear to be immense holes in
Frege’s knowledge of the history of philosophy; this, plus the single-mindedness with
which he approached issues, as if with blinders to what is irrelevant, just underscored
the intellectual isolation of the man.

*Grundlagen* could not, of course, represent the end of his project. Frege would
never be satisfied until he demonstrated his position formally. And it was the effort
to formalize his view that forced significant changes in the *Grundlagen* story. Frege
tried to make do in *Begriffsschrift* without the notion of set; he had yet to convince
himself that the notion was legitimate and that it belonged in logic. At any rate, with
the publication of *Grundlagen*, Frege’s course was clear: to fill in the logical details
of the definition of number he there presented in the manner of his *Begriffsschrift*.
What was missing was a conception of a set; this Frege won through to. And, along
the way, a sharpening of his philosophical semantics that led to the mature views
in philosophy of language for which he has been justly celebrated. “On Sense and
Reference” was published in 1891, and its companion essays shortly thereafter.

*Grundgesetze* was published in 1893 by Hermann Pohle, a publisher in Jena. Frege
had had difficulty getting a publisher for the book, given the poor reception his other
works had found. Pohle agreed to publish the work in two parts: if the first volume
was received well, he would publish the second one. Unfortunately, it was not received
well, to the extent that it was acknowledged by anyone at all. Pohle refused to publish the second volume, and Frege eventually had to pay for its publication out of his own pocket some ten years later.

Just as Volume II of Grundgesetze was going to press in 1902, Russell communicated to Frege the famous contradiction he had discovered. Here is the beginning of the first letter to Frege, dated June 16, 1902:

Dear Colleague,

I have known your Basic Laws of Arithmetic for a year and a half, but only now have I been able to find the time for the thorough study I intend to devote to your writings. I find myself in full accord with you on all main points, especially in your rejection of any psychological element in logic and in the value you attach to a conceptual notation for the foundations of mathematics and of formal logic, which, incidentally, can hardly be distinguished. On many questions of detail, I find discussions, distinctions and definitions in your writings for which one looks in vain in other logicians. On functions in particular (sect. 9 of your Conceptual Notation) I have been led independently to the same views even in detail. I have encountered a difficulty only on one point. You assert (p. 17) that a function could also constitute the indefinite element. This is what I used to believe, but this view now seems to me dubious because of the following contradiction: Let $w$ be the predicate of being a predicate which cannot be predicated of itself. Can $w$ be predicated of itself? From either answer follows its contradictory. We must therefore conclude that $w$ is not a predicate. Likewise, there is no class (as a whole) of those classes
which, as wholes, are not members of themselves. From this I conclude that under certain circumstances a definable set does not form a whole.

(Frege 1980, pp. 130-1)

Unlike Peano, to whom Russell had also communicated the paradox, Frege acknowledged it with his deep intellectual integrity and attempted to deal with it in an appendix—but to no avail, as he himself acknowledged. He was deeply shaken by this contradiction in an axiom he had, as he said, always been somewhat doubtful. His life’s work in a shambles, Frege’s creative energies withered. He corresponded a bit with Hilbert, but missed the importance of Hilbert’s undertaking in geometry and axiomatics generally; and the foundational paradoxes became a source of immense intellectual stimulation (as Frege himself surmised in a letter to Russell) by the likes of Ernst Zermelo. By the time the young Ludwig Wittgenstein came to see him in 1911 to study foundations of mathematics, Frege referred him to Russell. There is a brief flurry of activity in 1918-1919 when Frege published some work in philosophy of logic in an Idealist Journal. But the foundations of arithmetic are a different story. We find him saying, in the early 1920’s, that he doubts whether sets exist at all. And he is trying to see if the roots of arithmetic are to be found in geometry, a complete turnaround from his earlier views.

That we know of Frege today is largely through his influence on the giants of modern analytic philosophy. Russell was the first to become aware of his work in the philosophy of language and logic. He included an appendix describing Frege’s views in his *Philosophy of Mathematics* of 1903. Indeed, immediately afterwards, Russell appears to have been most deeply preoccupied with working out Frege’s sense/reference theory, an enterprise he abandoned because he thought there were insuperable dif-
difficulties with the view and also because he also had an alternative in his theory of
descriptions. Wittgenstein, too, had been deeply influenced by Frege’s views, and
many parts of the Tractatus are devoted to them. And finally, we mention Rudolf
Carnap, who had attended Frege’s lectures at Jena—indeed, he describes how Frege
lectured into the blackboard so that the handful of students in the room could barely
hear him—and whose book Meaning and Necessity resuscitated interest in Frege and
formal semantics.

Frege retired from Jena in 1918. Frege had became increasingly involved with
right wing political organizations toward the latter part of his life, and the journal he
kept in Spring 1924\(^8\) reveals a side of him that is not very appealing. He died July
26, 1925, at age 77.

References

Baker, G. & Hacker, P. M. S. (1984), Frege: Logical Excavations, Oxford University
Press, New York.

Baumann (1868), Die Lehren Von Zeit, Raum und Mathematik, 2 Vols, Berlin.

Black, M. & Geach, P. (1952), Translations from the Philosophical Writings of Gottlob
Frege, Blackwell, Oxford.

Bynum, T. W., ed. (1972), Conceptual Notation and Related Articles, Clarendon
Press, Oxford.

\(^{8}\)Mendelsohn (1996)


