The 19th century: Philosophy and logic

3.1 Philosophy

Over the course of this book, we will see that the connections between philosophy and linguistics—as with the connections between philosophy and psychology—are deep and present everywhere. The reasons for this are not hard to find: two of the central concerns of philosophy are the nature of mind, and the nature of scientific knowledge, and both of those questions are at the heart of what psychologists and linguists grapple with in virtually everything that they do.

In this chapter, we will give an overview of several of the philosophers whose impact on 20th century developments was profound, and offer a sketch of how their work fit together to form a larger structure. We have no choice but to begin with Immanuel Kant, whose work at the end of the 18th century defined the questions for the following generation of philosophers, and more generally thinkers of all stripes. And we must give an introduction to three important figures, for the most part not well known today, who cast a long shadow over the 20th century: Auguste Comte, Ernst Mach, and Franz Brentano. Their obscurity today is in no way deserved.

3.1.1 Immanuel Kant 1724-1804

Immanuel Kant’s inquiry into the nature of rational knowledge begins with a familiar pair of positions: first, that philosophical discussions wander where they do not seem to have a right to go, a conclusion that we can draw from the simple fact that discussions among philosophers are uncertain and fraught with controversy; and second, that modern science, of the sort established by Galileo and by Newton, is a great example of the kind of knowledge that we should always be looking for.

The rationalists and the empiricists of the 17th and 18th centuries, philosophers such as Descartes and Leibniz, and Hume and Locke, were two parties addressing one and the same set of questions, expressing two variant points of view, but in agreement that understanding the success of modern science was a central philosophical question—or, at the very least, science provided the best clue to help us understand the central philosophical question of knowledge, which is to say, how is it that we can come to understand the universe. Kant hoped to overcome the apparent conflict between the rationalist and the empiricist point.

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1Critique of Pure Reason: Kant, 1998 (1781)
of view, since both sides had strong points and both had vulnerable points—ultimately, to reconcile these two embattled alternatives.

Kant’s central point regarding knowledge was that it is a synthesis that brought together two different things: what the senses provide, and the active mechanism which registers that. If you wish, that active mechanism might well be blank and homogeneous before the world has its way with it, but how it responds to the senses is its own nature. The mind may be a tabula rasa, a blank slate of some sort — but of what sort? A blackboard and a whiteboard are both fine models of a tabula rasa, and so is a piece of glass, an unexposed piece of x-ray film or photography paper, and they all respond differently to light and to scratches. Which one is most like the true tabula rasa, the tabula rasa of the human mind?

Kant argued that there were some basic facts about our thoughts that reflected the active principle that organizes our thought, and of these the most important were space, time, and causality. For space and time he used the term Anschauung, which unfortunately is translated into English and French as intuition whenever Kant is being discussed, though sense-perception is a better translation. Actually, he distinguished between empirical Anschauungen (the -en marks the plural) and pure Anschauungen, and space and time were the distinctive members of that second group; he also called space and time the forms of Anschauung.

Kant’s argument against Lockean empiricism was more sophisticated than Descartes’s or Leibniz’s had been. Descartes’s typical example of an idea that had not come through the senses was a triangle, while Leibniz’s was the unstated premise in a logical argument that we accept as compelling even when the premise is left unstated. In both cases, the nature of that which is innate is very much like that which comes through the senses. Kant’s sense of what is innate is a good deal more abstract than what Descartes or Leibniz had pointed to: for Kant, the crucial points were the aspects of the scaffold of thought without which no thinking about reality is possible, and which is yet not contained inside a sense perception: and his prime examples are space and time.

It is no exaggeration to say that Kant’s proposal is the clearest antecedent of the modern, cognitive view of the mind as an active agent of thought. There is merit in viewing Leibniz as an important antecedent, certainly, and the modern cognitive view could not have become what it is without the invention and development of the modern computer. All that may be true: and yet, Kant’s determination to make it clear that our thought is not possible without an active thinker—and not just a recumbent on-looker, but an active participant—is the most important moment in the rise of the modern, cognitive view of the mind.

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1 A recent view of this history from a point of view similar to the one we describe here can be found in Chater et al., 2015; chapter 1.

2 The awkwardness of that translation reappears time and again; in the bilingual version of Frege’s Foundations of Arithmetic, we find the following, in a discussion of the not so obvious equation 135664 + 37863 = 173527. Frege suggests that this is a provable, not obvious, statement. “Kant thinks he can call on our intuition of fingers or points for support,” reads the English; “Kant will die Anschauung von Fingern oder Punkten zu Hilfe nehman,” reads the German original. What is this thing, an intuition of a finger? we might ask. The English continues, “Moreover, the term ‘intuition’ seems hardly appropriate,” which is the least we might say, though the German says, “Der Ausdruck “Anschauung” scheint auch nicht recht zu passen,” and why does Frege think that “intuition” (or Anschauung) is inappropriate? It is because “even 10 fingers can, in different arrangements, give rise to very different intuitions.” It is clear that Frege has in mind different geometrical arrangements that make 10: two rows of 5 dots, or a triangle with rows of 4, 3, 2, and 1 dots, for example. This is not at all what the English word intuition means; the sense that Kant was trying to evoke was quite clearly more like that of “immediate presentation to consciousness.”
To think about thinking, Kant needed a general framework for understanding thoughts, and for better or for worse, his logical analysis of the content of a thought fell clearly in the classical tradition which sees a universal division of thoughts into subject and predicate. It is hard to overemphasize how important this is, and it will not be until we encounter Gottlob Frege (see p. 167 below) that we will see a clear rejection of this view. It lies at the heart of a critical distinction for Kant, the difference between an analytic and a synthetic judgment: a judgment is analytic if the subject is contained within the predicate, and synthetic if it is not.

Kant gave an example of what he had in mind. “All bodies are extended” is an analytic truth that we know with certainty, while “All bodies are heavy” is a synthetic truth; heaviness is nowhere to be found in the concept lying behind “all bodies.”

What was not obvious at the time was how much effort would be spent over the next century in coming to grips with understanding what the phrase “is contained within” actually means. This would come to be known as analyzing the logic of parts and wholes: what does it mean for one thing to be part of another? Franz Brentano, a philosopher we will meet shortly, brought out how important and difficult a question this is, and his students (and then his students’ students) continued to develop the question in various contexts. There would be consequences of this work all over the intellectual map: when Georg Cantor established set theory at the end of the 19th century, one of the first steps was to distinguish between “being a member of a set” and “being a subset of a set,” a distinction which was far from obvious at the time, but one which flowed from the effort to understand the logic of parts and wholes. Getting clear on this Cantorian distinction also set the stage for the famous antinomy, the apparent contradiction at the heart of set theory, that Bertrand Russell would make famous at the end of the century, the famous set of all sets that do not contain themselves.

Any linguist would find it striking, too, that there is a clear line of intellectual descent from Kant’s use of the German word Merkmal (a word that could be translated into English as “characteristic” or “trait”) all the way down to Trubetzkoy’s use of the very same term in a way that is now translated into English as “feature”, in the context of distinctive features in linguistics, and most especially in phonology. For Kant, a feature (using that word now to translate his word Merkmal) was one of the components of a concept, and thus to understand a concept, one must understand its features, and how its features are put together to form a concept. This understanding would pass down through the 19th century and the work of Trendelenburg, Lotze, and Husserl—all people whose work most people would never think of as significant for modern linguistics, though indeed we begin now to see that it is.

One of the major goals of philosophy, for Kant and later philosophers inspired by him, was to work out and better understand synthetic apriori truths: truths that were not dependent on any particular experience, but which expressed statements in which the predicate asserted something that went beyond the essential meaning of the subject. This goal for philosophy was adopted by many in the following years of the 19th century, and each could be identified, therefore, as some sort of neo-Kantian approach to philosophy. A century

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1 See page 171 below, and Chapter 8 as well. We have attempted to limit as best we can our references to developments in mathematics, and this limitation has had as a consequence that there is too little discussion of George Cantor’s work. Ferreirós, 2007 is an especially good work to complement this present book.
later, as we will see, Frege and Russell would present arguments that the true logical form of many sentences was not, at its highest level, subject/predicate; the highest level was a statement of existence or some other sort of quantification. But all this was a long way off when Kant was alive.

The rationalist tradition of Descartes and Leibniz emphasized the existence and the importance of certain innate ideas, and in a new way, Kant insists on the prior existence of certain intuitions that make thought possible. These innatist tendencies are quite different from nativist views espoused today in the 21st century. There were already in the 19th century thinkers who were quite nativist, sometimes under the influence of Darwin, but the innate dispositions that were studied by such writers as Herbert Spencer should not be confused with rationalist or Kantian innatism. As Max Müller wrote

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And he cited T. H. Green approvingly, who wrote

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Space, time, causality, and quantity: as far as what humans can know, these were inescapable categories that we use and that make our kind of thought possible. After Kant, philosophers would no longer call them innate, but they were brought by the active mind to the process which we know of as encountering the world.

Over the course of the 19th century and then into the 20th, Kant’s assumptions and his framework were taken apart and put back together in a vast number of ways. Space was the first to be subjected to serious and intense scrutiny, beginning not long after Kant’s system was published.

Until the time of Descartes, geometry was considered the heart and soul of mathematics, and the axiomatic method established by Euclid was held up as one of the greatest achievements of the human mind: a method for achieving certainty from a small set of transparent axioms and methods of inference. But careful reflection over the centuries had led geometers to question whether Euclid’s Fifth postulate was indeed as evident as some had once taken it to be. Could it be proven? The Fifth postulate—also known as the parallel postulate—is a bit convoluted. In its original form, it states

1Müller, 1887, 146ff.

2T. H. Green, Works, vol 22, p. 224, cited by Müller, p. 147.
If a line segment intersects two straight lines forming two interior angles on the same side that add up to less than two right angles, then the two lines, if extended indefinitely, meet on that side on which the angles sum to less than two right angles.

In the first three decades of the 19th century, opinion began to turn against the Fifth Postulate. There had been many attempts made to prove it, which is to say, to show that it should not be taken as a postulate, but rather as a consequence of the other postulates. But could sense be made of space if this postulate were not assumed, if space somehow violated the postulate? Surely Kant’s space, as a necessary condition for our perception, required going along with this postulate. And surely the world that we see around us does indeed satisfy this postulate. No?

Carl Friedrich Gauss was the greatest mathematician of the 19th century. He wrote in a letter in 1817.\(^1\)

> I am becoming more and more convinced that the necessity of our geometry cannot be proved... Perhaps only in another life will we attain another insight into the nature of space, which is unattainable to us now. Until then we must not place geometry with arithmetic, which is purely a priori, but rather in the same rank as mechanics.

and twelve years later.\(^2\)

> my conviction that we cannot base geometry completely a priori has, if anything, become even stronger... it is my inner conviction that the study of space occupies a quite different place in our a priori knowledge than the study of quantity... we must humbly admit that if Number is the pure product of our mind, Space has a reality outside of our minds and we cannot completely prescribe its laws a priori.

In 1829 Nicolai Lobachevskij—and independently in 1832, János Bolyai—established the consistency of a non-Euclidean geometry. What then was the status of our familiar Euclidean geometry? Is it still an essential part of our knowledge, and do we now need to put the word “knowledge” in scare-quotes and recognize the irony of speaking of knowledge which may not even be true? There was no immediate satisfactory answer, none at all.

We will return to this theme in Chapter 8, when it will seen as one of the steps that led to foundational crises in mathematics.

German philosophy (and that of much of Western Europe) in the century after Kant can be seen as evolving down a limited number of channels. One channel rejected the optimism of the Enlightenment that is found throughout Kant, and glorified a view of life as subjective activity and action—Nietzsche is one of the leading figure in this tradition—while...
another saw itself as correcting the errors and blindspots of Kant. In this second tradition we can detect three distinct sub-trends: positivism, neo-Kantianism, and the semantic (or linguistic) tradition. We will look first at two important figures in the positivist tradition, Auguste Comte and Ernst Mach, and then at Franz Brentano, an early figure in the semantic tradition who was also influenced by positivism.

3.1.2 Positivism and the antimetaphysical backlash

Auguste Comte (1798-1857), a French philosopher well outside of the academic system of his day, was the most influential of all of the major figures in the backlash against the philosophical systems of Germanic philosophy. He proposed what he called a positive philosophy, and what he championed has come to be known as positivism (though that term is most commonly used today in a larger sense, one which includes many positions than Comte would disown if he were still alive). Comte wrote in a spare and precise style, quite modern and untraditional. Though his work is not widely read today, he articulated a view that not only was very appealing to his contemporaries, it is also one that continues to appeal to us today in many respects. His conclusions may strike us as extreme, but when you are the leading figure of a movement that is responding to a powerful force, you are likely to adopt an extreme position. More importantly, positivist sensibilities have played a major role in many of the discussions of language and the mind, and the views of psychologists and linguists in the periods that we will explore. What we identify as concrete analyses in contemporary linguistics are often motivated by just these sensibilities.

Comte emphasized that our only true and reliable knowledge is of “phenomena,” and he said further that we can notice just two basic kinds of relations of phenomena—the similarity between two phenomena, and their regular succession in time and space. We fall into error if we think we can draw grander conclusions. In the final state of knowledge, towards which we are all evolving, “…the human spirit gives up looking for the origin and the destination of the universe, and knowing the inner causes of phenomena.”

Like all movements that attract a large following, positivism offered a liberation from the heavy chains of the past. Comte was a very appealing writer, as we noted; he wrote simply, with conviction, and with erudition as well, and he left the reader with the sense that the truth was really quite simple and straightforward, once you could look at things the right way.

In the development of all of man’s intelligence in all its various spheres of activity, from the dawn of time until the present, Comte believed he had discerned a fundamental law which governed all of this dynamic, and he said that he could demonstrate the basis of this law both by following its inner logic and by looking at the history of human thought. In every domain of human endeavor, knowledge passes through three stages of development: the theological stage, the metaphysical (or abstract) stage, and the scientific (or positivist) stage. This development was natural, in the sense that it was the result of human nature, the nature of the human mind. The three stages were fundamentally incompatible, or

\(^1\)We draw on the discussion in Coffa, 1991.
\(^3\)Comte, 1830 Comte, 1996:53.
perhaps a better way to put it would be that they are logically incompatible—nonetheless, in the evolution of thought, sometimes earlier forms of thinking survive as hold-overs of the past for a while, as intellectual atavisms.

The logic of the situation, Comte believed, was that the original, theological point of view was necessary as a starting point for humankind, and that the final, positivist point of view was the end point of the evolution of human thought, and that the metaphysical intermediate stage was a necessary transition period between the first and the final. The theological stage of development saw the explanation of everything in the world as grounded in the intentions of individuals, but the individuals need not be just the visible human beings on Earth: they may be all-powerful deities that we cannot see. Still, in this primitive perspective, it is what the gods (or an individual God) wants that is the reason for why things are as they are.

The next stage, the metaphysical, is one in which much the same kind of explanation is sought by humans, but instead of attributing the cause to an unobserved deity, it is attributed to something else unseen and unseeable—what Comte sometimes calls “personified abstractions.”

In the third stage, the scientific stage, we move past searching for absolutes, and rest content with understanding the inviolable rules that govern relations of succession in time, and of similarity of occurrences. Actually, there was an additional point that would come to be quite important later on: not only was the goal of a positivist science to find invariable laws about what can be observed, it was also necessary to find the smallest number possible of laws that will accomplish this.

**Scientism**

Positivism, then, was deeply committed to the view that to advance knowledge was to do more and better science, and the view that the most important way to make philosophy better was to better understand how philosophy can be accomplished in a world in which science is the most important way we attain knowledge. Part of the message that philosophy ought to learn, while learning from science, is that a certain humility (built on a deep respect for the fact that brand new discoveries can dethrone what had once seemed like an eternal verity) is always in order. The flip side to that is that if we are interested in understanding how actions can be understood as steps toward the accomplishment of some future goal (which is always going to be true when we study the mind), traditional science is generally not able to offer helpful advice. Most scientific models take it for granted that when science provides an answer to the question of what caused an event, the answer will be based on events that are close to one another in space and time: think of how we explain the recoil of one billiard ball bouncing off of another. That way of thinking is not likely to provide us with much insight into how to develop a theory of goal-oriented activities.

But by the same token, the actual statements that physicists and chemists were making during this early period of positivism were changing, not because of the influence of philosophy but because of the advances in scientific understanding. The notions of energy and of

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1 Comte, 1994:59
entropy were cutting edge conceptual tools in the physical sciences. The idea that there was both a convertability from one form of energy to another, and that there was nonetheless an overall perfect maintenance of the total quantity of energy, was a very fruitful one, but it also suggested that energy was a kind of thing, and not merely a way of describing the activities of things. Over the course of the century, the understanding was growing that there were different kinds of energy, and that while one kind of energy (like heat, for example) could arise (heat can be created by rubbing two sticks of wood against each other), the heat did not arise out of nothing; it was a transformation of another kind of energy. All of this would eventually become formulated as a law of conservation of energy. Just as importantly, mid 19th century science was coming to grips with the notion that the entropy of a closed physical system would always increase, a conclusion that seemed at times dangerously close to saying that the evolution of a physical system was toward a state—of maximum entropy, in particular.

Psychology

Auguste Comte was quite skeptical regarding the prospects for a positivistic discipline of psychology. He argued that introspection simply could not provide a reliable, or useful, kind of observation from which a science of psychology could arise: the best way to study the mind is to study other people from the outside. “As regards...observing intellectual phenomena while they are unfurling, this is obviously impossible. The thinking individual would not be able to divide itself in two, one part reasoning while the other watched the reasoning. The observed organ and the observing organ being, here, identical, how could the observation take place?”

Comte’s influence and reknown was greatly enhanced by a book that John Stuart Mill wrote about him and his positivism in 1865, just shortly before Comte’s death. Mill wrote that Comte “rejects totally, as an invalid process, psychological observation properly so called, or in other words, internal consciousness, at least as regards our intellectual operations. He gives no place in his series of the science of Psychology, and always speaks of it with contempt. The study of mental phaenomena, or, as he expresses it, of moral and intellectual functions, has a place in his scheme, under the head of Biology, but only as a branch of physiology. Our knowledge of the human mind must, he thinks, be acquired by observing other people.” Mill found this view difficult to take seriously—how can we understand someone else if we do not start with some understanding of ourselves? Comte was convinced “we can learn very little about the feelings, and nothing at all about the intellect, by self-observation.” Comte preferred phrenology—and Mill was aghast at that choice. Was this what it took to make psychology a positive science, Mill asked. “The condition of men-
tal science would be sad indeed if this were its best chance of being positive, and despite what Comte had hoped, serious studies showed little hope for the future of phrenology.

What was phrenology? It was the creation of Franz Gall, a German physiologist about a generation older than Comte whose work concerned what we today call “localization” in the brain. It gained prominence at the end of the 18th and the beginning of the 19th century, when Gall proposed the creation of a sort of cartography of the human brain, where areas of the brain corresponded to recognizable abilities or motivations. He catalogued 27 different zones, including friendship, memory of things, sense of language, mechanics and architecture, and religion.

Gall proposed a “theory of faculties,” and the view that each human personality can be characterized by the way in which, and the degree to which, certain faculties dominate others in individuals. The areas corresponding to the strongest faculties in an individual are more developed, and Gall could therefore read the dominant characteristics right from the scalp: this was the famous theory of bumps, his phrenology. Phrenology would be totally abandoned in the beginning of the 20th century, after a long run of great popularity during the 19th, when it offered what was so greatly sought by anthropometry: measurements, classifications, and typologies. We will return to this in connection with the work of Paul Broca, below (page 201), at a time later in the century when measurements became the central concern—we might just as well say “the hot topic”—of the age, and when measurable differences across the range of human beings became an equally hot topic.

The two leading psychologists of the next generation were Wilhelm Wundt and Franz Brentano, both of whom felt the need to respond to Comte’s challenge, as we will see in the next chapter.

**Discovery and justification**

Comte urged his readers to distinguish between two styles of understanding the development of scientific thought. John Stuart Mill put it this way:

> The philosophy of Science consists of two principal parts; the methods of investigation, and the requisites of proof. The one points out the roads by which the human intellect arrives at conclusions, the other the mode of testing their evidence. The former if complete would be an Organon of Discovery, the latter of Proof. It is to the first of these that M. Comte principally confines himself, and he treats it with a degree of perfection hitherto unrivalled.... We are taught the right way of searching for results, but when a result has been reached, how shall we know that it is true?

Mill wrote this, about Comte’s notion of philosophy of a science, as it differs from the science itself: it is “the science itself, considered not as to its results, the truths which it ascertains, 

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1 op. cit., p. 50.
2 Gall, 1810.
3 Compare with the current perspective of Jerry Fodor Fodor, 1983, Chapter 1.
4 Mill, 1865.
but as to the processes by which the mind attains them, the marks by which it recognizes them, and the co-ordinating and methodizing of them with a view to the greatest clearness of conception and the fullest and readiest availability for us: in one word, the logic of the science. This conception would be adopted with fervor by the logical positivists, as we will see in Chapter 7 as they discussed the difference that they saw between “the context of discovery” and “the context of justification,” precisely Comte’s distinction.

Reconstruction of science

We first encountered Comte in Chapter 1, when we discussed the advantages and disadvantages of presenting a science in a historical fashion. In his discussion, part of which we read then, we can see an early formulation of a distinction which will come to be known as the distinction between context of discovery and context of justification (see below, page 365).

All science can be presented in two essentially distinct ways, and any other manner of exposition can only be some sort of combination of the two: a historical approach, and a dogmatic approach. With the former, we present knowledge in stages, in the same order that the human mind actually encountered them, and adopting, as much as possible, the same paths to arrive there. With the latter, we present a system of ideas as it could be understood today by a single mind which from an appropriate intellectual position and with sufficient knowledge could rebuild all of science. . . . The human mind constantly tends substitute the second, the dogmatic order, for the first, the historic order; the dogmatic order is the only one that satisfies the final state of our intelligence.

Comte’s simple account of the history of ideas contained within it an invitation at particular moments to sweep clean the past—in the transition from the metaphysical perspective to the scientific perspective, the leap forward consists in large part in letting go of concepts that had once been satisfying and even comforting. But those comforting metaphysical visions would have to be dropped, as all of the vestiges of metaphysics were rooted out, exposed, expunged, eliminated.

Synchrony and diachrony

There is a distinction which became essential to the study of language, late in the 19th century, which can be traced back to Comte, who first clearly marked the distinction between analysis which is synchronic and analysis which is diachronic. While those terms are due to Saussure, who emphasized the relevance of the distinction to the analysis of language, but the more general distinction had been clearly developed by Comte decades earlier. Comte emphasized that a positivist philosophy required the development in parallel of both a static and a dynamic analysis. In sociology, always a central concern of his, a radical distinction

1op.cit., p. 39.
2Comte, 1830, p. 79.
needed to be borne in mind, one which kept distinct the static conditions which are vital to the existence of a society at a given moment in time, on the one hand, and the dynamic principles reflected by the changes over time that a society undergoes.

**Whitney**

We have already met the linguist William Dwight Whitney. He too was obviously influenced by Comte’s perspective. Whitney found the three stages in the development of linguistics. The first was the theological stage, which can be found in the writings of those who see language as God’s divine creation, and His gift to man. More interestingly, perhaps, he perceived a second view which would in a few decades be labeled as *behaviorism*, and he saw it as emanating out of this theological phase as well: a doctrine in which “speech is a direct product of the physical constitution of its speakers, a kind of secretion of organs provided for that purpose. . . its varieties represent differences of animal organization. Both these alike cut off all possibility of a real science of language.”

Whitney saw the metaphysical stage of linguistic thought wherever people saw language as having an existence independent of the people who spoke and understood it, as being endowed with properties and being affected by forces. For Whitney, the third stage was the positive stage, which would be achieved when linguists “keep themselves strictly upon the basis of observed fact and legitimate induction. . . and not to cover up ignorance and obscurity of thought with sounding and philosophical phraseology.”

**The posthumous embarrassment of science’s direction**

When we look at the history of science as it evolved after Comte, there are quite a few cases that turn out to be embarrassments for his position—for example, the treatment of gravity and of heat, two of the most important areas of physics in the hundred years following Comte. Newton’s theory of gravitation, he said, was a great success because its predictions were accurate, and it could equally handle astronomical phenomena and the fall of an apple to earth. “But as to what this attraction or weight is in itself, or what are its causes, these are questions that we consider to be unsolvable and which are no longer in the domain of positive philosophy.” Einstein would show this to be wrong; by looking more deeply for an account of a world in which things are not quite what they seem to be (an account in which the fabric of space and time is intertwined, and deeply modified by the presence of matter within), physics made great strides. Comte’s second case turned out to have the same ironic fate. Comte cited Fourier’s work on the nature of heat, and said that it was greatly to its credit that it took no stance on the controversy between those who believed that heat was a substance called *caloric* and those who took heat to be the vibrations of a universal *ether*. At the turn of the next century, the analysis of heat as the vibration of molecules would turn out to be one of the great achievements of all of science, and would show that science could, indeed, discover the truth about domains that once seemed totally out of scientific reach.

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2. p. 31.
3. Comte, 1830: 60-1
Thus for Comte, the fundamental challenges of a healthy science were to develop methods of classification and methods of relating categories, including ways to develop hierarchies of classes, perhaps the very best way of relating categories, just as botanists and zoologists were engaged in doing during Comte’s lifetime.

**Physicalism**

If we were to identify the single most important position associated with positivism, it would be this: that all that is truly real are the objects that are identifiable as perduring things in space, over a certain and determinate period of time. That is all there is to reality.

This leaves no room in reality for sentences, ideas, intents, or meanings, or really anything whose principles of operation are not those of the physical, causal sort. That is a serious problem for most people who want to deal with the nature of the mind: they must either give up on the hope that the things that they care about are actually real, or else they must find some secondary sort of way for thoughts and the like to be real. Some people, most notably the behaviorist movement in the 20th century, would be willing to eliminate ideas and intents from their understanding of reality, but others would not.

We will turn to Wilhelm Wundt below in Chapter 4. An important innovator in 19th century psychology, he saw psychology as rooted both in natural science and in human science.  

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3.1.3 **Ernst Mach**

Like Auguste Comte, Ernst Mach’s name is not well-known today, outside of its use in expressions about the speed of an airplane: an airplane traveling at Mach 3 is flying three times the speed of sound. But Mach was one of the most influential thinkers in the second half of the nineteenth century among philosophers, scientists, and intellectuals generally.

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1Wundt, 1894, pp. 95-96. Translated by Danziger, in Danziger, 1979, p. 207.
Einstein would later point back to him and say that Mach's perspective had helped him greatly in coming to grips with the nature of space and time. Mach was an empiricist, an intellectual descendant of George Berkeley, John Locke, David Hume and Auguste Comte, and he viewed science as a marvelous means for summarizing an enormous amount of observational data. As an empiricist, he believed that all knowledge is founded on immediate sensation.¹

Ernst Mach was born in 1838 in Moravia, which was then part of Austria, and now is part of the Czech Republic, but he grew up and was educated in Vienna. We will see throughout this book how strong the axis was linking Berlin, Prague, and Vienna, and it is good to bear in mind that these three cities lie nearly on a north-south line defining the center of Europe. Mach became professor in Graz in 1864, and after 12 years, moved to Prague, where he worked and taught for 19 years. In 1895, he moved back to Vienna (supported in this move by Franz Brentano) to take a chair as professor, but three years later he suffered a stroke, and he retired in 1901, when his chair was taken by the physicist Ludwig Boltzmann.²

Mach's influence was great in physics, psychology, and the philosophy of science. He became interested in psychology early in his career: psychology was being done by physicists, after all, people like von Helmholtz and Fechner, whose work we will look at shortly (as we saw above on page 133).³

Machi saw clearly how important it is to learn the logic of a science through its historical development, as we in fact are trying to do here, the alternative to what Comte called a dogmatic approach:

The historical study of the evolution of a science is absolutely necessary, for without it the laws which it has acquired through its arduous labor may well turn into a system of half-understood precepts, or worse, a system of preconceived ideas. The historical approach not only helps us to understand what our present understanding is, it also opens up in us new possibilities by showing us that what exists is to a large extent conventional and fortuitous. By taking a historical perspective in which different conceptual avenues converge, we can also see ourselves better and see paths as yet undiscovered.

Mach waged intellectual war on the notions of absolute space and absolute time. He worked hard to force physics to reject the assumption that Newton had made, that space and time were absolutes—that they really exist, even if all we ever see and touch are the things that are in them, whatever that means. What would it mean if space were not something absolute? It would mean that space everywhere was a framework that allows us to compare two lengths that are put next to one another, like a rule and something whose length we want to measure: a pencil, let us say. By lining them up, and assuming that the ruler can be...

¹Mach, 1897, p. 369, cited by Skidelsky fn 20 p. 240.
²It is important to bear in mind that Austria and Germany were two quite different cultural regions, despite the fact that they shared a common language. The rise of the German university system in the first half of the 19th century, for example, was an important event that was strictly German, and not Austrian. The view that Kant and Hegel (and the German Romantic movement) were the central facts of recent intellectual life was taken for granted in Germany, but held little traction in Vienna, or in Prague (Janik and Toulmin, 1973; Smith, 1994) where English empiricism found the sort of sympathetic audience that it did not find in Germany.
trusted not to change sizes, we can determine that the pencil is six inches long. If we can also move the same ruler around to measure other things, then we have the beginning of a good sense of space that is purely relational. There are no absolutes in space, but there are local comparisons of length (or distance) that can be sensibly made.

If we accept Mach's reasoning up to this point, there is a second problem we encounter. Mach's principle so far tells us that all motion in a straight line is relative; that is, we cannot say what an object's velocity is in any absolute sense, but only relative to some arbitrarily chosen frame of reference—and that seems to be right, as far as the universe is concerned. But the same reasoning suggests that there is no absolute sense in which something could be said to be spinning around. But that does not appear to be true: the whole big universe out there does provide a backdrop against which we can define which objects are spinning around others, and which objects are not spinning at all. So Mach raised the question: can we say that somehow it is the distant stars that are fundamentally responsible for us right here on Earth being able to determine what counts as spinning around and what does not? We noted just above that Einstein, whose work would settle this question in the second decade of the 20th century, pointed to Mach as the figure whose thorough-going skepticism about the Newtonian theory of space created the intellectual room for him to rethink the nature of space and time.

Mach was one of the most important figures in the rise of an anti-metaphysical movement in Austria. By “anti-metaphysical,” we mean a great skepticism with regard to the reality and the existence of unseen objects. Objects may be unseen because our senses are ill-equipped to perceive them directly (think of radio waves), or because something more fundamental makes them invisible (like neutrinos), or some religious factors make them invisible (like angels), or because they exist in a world to which there is no sensory connection, like mathematical objects (whole numbers, fractions, complex numbers). These are quite different sorts of invisible things, to be sure, and philosophers can easily disagree as to which of them are real despite our not being able to see them.

It is difficult for today's reader to get a sense of what it means to be on one point or another of this spectrum regarding what should count as real. Chomsky's style of theorizing, for example, is one in which there is a low bar for positing the reality of theoretical objects, such as cases and traces, while most psychologists, we daresay, share a different sense of what may be considered to be real, demanding results caused in a laboratory setting before agreeing that something is real. It is always difficult for people who are at distant positions along this dimension to understand why the other person believes what he does.

Ernst Mach was thus the poster child of skepticism directed at unobservable entities postulated by his scientific colleagues. This skepticism served him in good stead, but only to a certain degree. His skepticism about absolute space and time helped Einstein, in a sense, deconstruct and reconstruct our understanding of how the two relate to one another in his special theory, but Einstein's general theory of relativity brought us back to a picture of space-time which had real properties of its own—in particular, a complex sort of curvature which lay at the heart of his general theory. Mach was also skeptical about the existence of atoms, but in this he was simply wrong: he was one of the very last skeptics who doubted the existence of atoms. Sometimes unobserved entities, like phlogiston and like ether (the hypothetical object eagerly sought during the 19th century as the substance whose vibra-
tions would be what we call “light”), turn out to be myths, but others, like atoms, turn out to be quite real.

Mach worried about limitations on the power explanation if we can appeal to nothing but sensation. As an intellectual heir to the British sensualists, he was convinced that it was sensation that was real, but he was perfectly well aware that there are quite good reasons to believe that many more complex entities were more salient, more real from a subjective point of view: a musical chord or melody, an equilateral triangle, a face, a rhythmic beat all have more salience than a single flash of the color red on the retina. In 1865, he concluded that there must be some additional “presentations” that are shared by all of the perceptions of the melody (or the triangle, and so on). In the case of visual figures, it is the shape that we humans grasp so readily, and the German word for this is Gestalt: we grasp a Gestalt. (We will see Gestalt psychology coming into existence, with a recognition of its early roots in Mach’s ideas.) Mach appealed to a different sort of “presentation,” one that was about the relation between sensory presentations, and he called these Muskelempfindungen, but it is these presentations which are the important ones, and it is the study of these more complex shapes which would eventually become extraordinarily important. The right way to understand the principles of combinations of sensations into Gestalts would eventually include Mach’s other idea, the one that placed a great emphasis on the simplicity of the description of the data.

Mach also influenced the discussion of the notions of cause and effect throughout the natural and social sciences. The positivist view held that causation was largely illusory, and Mach argued that in the core physical sciences, a mathematical formulation has little or no need to engage in discussions of what causes what. “We call cause an event to which another (the effect) is constantly tied.” That, of course, is pure Hume. “In the more highly developed natural sciences the concepts of cause and effect are constantly becoming rarer and more restricted in their use. . . As soon as we can characterise the elements of events by means of measurable quantities. . . the mutual dependence of elements is much more completely and precisely represented by the concept of a function than by those of cause and effect.” Once you have written an equation that describes what you will observe, Mach

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2Because the capacity to comprehend and remember details is limited, the material must be arranged in order. For instance, if we knew for every period of time the space traversed by a falling body we might be well content. But what a prodigious memory it would take to carry the pertinent table of s and t in our heads! Instead of so doing we employ the formula \( s = \frac{1}{2}at^2 \), that is to say, the principle by which we can find the appropriate s for any given t, and this provides a complete, convenient, and compendious substitute for the table. This principle, this formula, this “law” has not one iota more of factual value than the isolated facts taken together, its worth lying merely in its convenience. It has utilitarian value.

This final statement was certainly going too far. Ernst Cassirer expressed why, in the context of criticizing Bertrand Russell: “The content of the concept,” he wrote, “cannot be dissolved into the elements of its extension, because the two do not lie on the same plane. . . The meaning of the law that connects the individual members is not to be exhausted by the enumeration of any number of instances of the law; for such enumeration lacks the generating principle that enables us to connect the individual members into a functional whole.”

See Cao, 1997 for a general discussion.


would have said, you are not improving your account by giving names to unobserved things, like forces.\footnote{In 20th century behaviorism, this view would justify a large part of the program. B.F. Skinner was clear on this: ‘the terms 'cause' and 'effect' are no longer widely used in science…The terms which replace them, however, refer to the same factual core. A 'cause' becomes a 'change in an independent variable,' and an 'effect' a 'change in a dependent variable.' The new terms do not suggest how a cause causes its effect: they merely assert that different events tend to occur together in a certain order.” Skinner 1953, Science and Human Behavior, p. 23, cited in Winston, 2001.} Mach's impact was wide, as we have noted. Another person whose intellectual direction was influenced by Mach was Jacques Loeb, a German physiologist who helped develop the skeptical worldview that grew into American behaviorism: Loeb immigrated to the United States, and was an influential teacher of John B. Watson, the godfather of behaviorism, as we will see in Chapter 5.

3.1.4 Franz Brentano

Brentano is the third principal character we need to meet in our perspective on European philosophy in the middle of the 19th century. He may not be widely remembered in this day and age—his name is certainly not as familiar as Kant's or Hegel's—but his influence on the ways in which we think about the mind today is considerable, and it runs through the separate strands of philosophy and psychology, and even of linguistics. There may be no one who plays a more important role in the development of the mind fields over the course of this book than Brentano. It is essential to our task to see how his influence was felt—and that fact that his influence is so poorly known today is a fact of capital importance to our broader questions of influence.\footnote{Novák, 1988.} As we will see, Brentano's students testified to the power of his intellect and his influence on their development, but he published relatively little during his lifetime, and with the passing of his students by the end of the 1930s, awareness of his importance faded, though important studies of his work continue to this day.\footnote{Such as notably Smith, 1994 and Smith, 1982.}

Brentano's influence is evident in the intellectual range and power of the work that his students engaged in, over a range of disciplines and professions. In a long teaching career, Brentano had quite a large number of students who became both famous and influential, especially in Central and Eastern Europe (thus Vienna, Prague, and Moscow). These included such psychologists as Sigmund Freud, Carl Stumpf, Christian von Ehrenfels, and Karl Bühler; such philosophers as Edmund Husserl, Anton Marty, and Alexius Meinong, the logician Kazimierz Twardowski, and the unclassifiable inventor Nikola Tesla, the man who invented alternating current. The student Edmund Husserl is now much better known than the teacher Franz Brentano; Husserl is widely viewed as one of the very most important and influential European philosophers of the first half of the 20th century. Tomáš Masaryk, who has already entered our story, was also a student of Brentano: Masaryk was the first president of Czechoslovakia, but before he was a politician, he was a philosopher; he earned his PhD in 1879. To Masaryk we will return as well.

Brentano was a scholar of Aristotle, and his entire career was devoted to bringing to life the questions that Aristotle raised in a way that made sense to a 19th century sensibility. This was an enormous undertaking, but several of these questions are directly relevant to our subject, such as the nature of mind, of certainty, and the categories of logic. It will be
helpful to place Brentano in the larger history of the period, after which we will return to Brentano’s account of these questions of mind.

Franz Brentano was born in Germany in 1838 in a small town near Koblenz, and first studied philosophy at Tübingen and then theology, preparing to enter the priesthood in 1864. In his late twenties, he began to lecture at the University of Würzburg, where his students included Carl Stumpf, who would become a leading psychologist of his generation, and Anton Marty. Stumpf wrote that he “had never met an academic, neither in my student days nor since I have been a professor, who dedicated himself to such an extent, both verbally and in writing, to his task as a teacher,” and “the friendly relations with his students, based upon an equally absolute devotion to the highest purposes, was one of the strongest needs of his life.”

Brentano had a difficult academic career. He became full professor of philosophy at the University of Vienna, but was forced by the Austrian government to leave his chair because he gave up the priesthood and married. He remained an unsalaried lecturer (Privatdozent) at the university in Vienna until 1895, when he left Austria following the death of his wife. He spent a number of productive years after that in Florence, as his sight gradually deteriorated, but when World War I broke out, he moved to neutral Switzerland, where he died in 1917.

There are several reasons why Brentano plays an important role in our story: the first is the role that he played in the development of philosophy after him, the result of the many students who studied with him and were influenced by his thought at different moments of his life.

But the second is that during the height of his academic activity, the period around 1890, it was widely thought that there were two quite different poles emerging of how psychology should be done—one with Brentano at its center, developing an “act psychology” and another with Wilhelm Wundt at its center, focusing on experimental psychology. We will turn to Wundt below (see page 174) and come back again to the question of how Brentano’s ideas influenced the mind sciences in the late 19th century. But we should emphasize now that Brentano viewed his own work as developing a scientific form of philosophy that included psychological questions. At one point, he wrote to Carl Stumpf, one of his first students, “I am at the moment wholly a metaphysician. I must confess that, after having been exclusively a psychologist for a few years, the change makes me happy.”

We have to some degree separated philosophers from psychologists in the last chapter and this, and Brentano’s case is one which makes clear how artificial that distinction can be.

Brentano drew a distinction between what he called genetic psychology and what he called empirical or descriptive psychology. Brentano’s genetic psychology is much closer to what we think of as psychology today, certainly to the sort of psychology done in laboratories. Genetic psychology seeks answers that involve the notion of causality, and particular events in space and time: they “specify the conditions with which the individual phenomena are

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1 Stumpf, 1976[1919].
3 Stumpf, 1976[1919], p. 16.
4 Mulligan and Smith, 1983; several important points of the new few paragraphs are developed in this paper.
Fig. 3.1: Genealogy: Franz Brentano and his students
Descriptive psychology, on the other hand, was exact, exceptionless, and we each have a privileged special relation with the principles of descriptive psychology. The modern linguist can think of this sort of psychology as including a speaker’s intuitions about their own native language: in a sentence such as *The last king of France was bald*, a speaker may know that the sentence is composed of two parts, *The last king of France* and *was bald*, and that this is a grammatical sentence. Here is a sharper example to illustrate the difference between the domains of these two kinds of analysis. Imagine hearing someone say, “That’s no way to...to...to help a friend.” The object of genetic psychology is a linguistic act that contains three successive occurrences of the word “to,” and we might develop an account of when it is that a person hesitates in this way. The study of empirical psychology is a sentence, “That’s no way to treat a friend,” and how a speaker or a hearer analyzes and understands it. It was this side of Brentano’s thought that led to phenomenology. If Brentano had heard of Saussure’s distinction between language and speech, he would have put Saussure’s language on the side of his empirical psychology.

Brentano recognized that a considerable part of the challenge in developing a descriptive psychology was understanding the relationship between wholes and parts. At the most inclusive level, understanding the nature of individual consciousness requires understanding how it is that all of what we experience is ours, and forms a whole that we perceive as ours, as all ours. At lower and smaller levels too, we understand the objects of our thought in terms of their component properties, and of how those component properties are integrated into a whole. The component properties may be bound together in quite different ways: a statue may have a head, body, and limbs, just as book has a jacket, a binding, and 236 numbered pages. A consonant like a *p* may be produced with the lips and involve the complete stoppage of air and a ceasing of the vibration of the vocal cords. The analysis of the sound into subgestures seems different from the analysis of a statue. The number 15 can be analyzed as 5 times 3, or as 12 plus 3. A mathematician may find 5 times 3 a much more interesting analysis, because he knows the structure that multiplication imposes on whole numbers is much richer and more interesting than that imposed by addition, just as a linguist knows that the analysis of our earlier sentence into *The last king of France was bald* is richer and more interesting than the analysis *The last king of France was bald*. He wrote something that would make great sense to a phonologist:

If someone believes in atoms he believes in particles [*Körperchen*] that cannot be dissolved into smaller bodies, but even in the case of such particles he may speak of halves, quarters, etc.: parts which, although not really separable, are yet distinguishable. We can call these latter distinctive [*distinktionelle*] parts. In human consciousness, too, there are also, apart from separable parts, mere distinctive parts. And, in so far as the distinguishing continues further than real separability, one might speak of parts (or elements) of elements (p. 13).

Brentano argued by example that descriptive psychology had the responsibility to show the logical structure of the properties of various sorts of sensory perception. If we consider the visual field, for example, we find that objects have a position in our visual field, a

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1. Cited in Mulligan and Smith, 1985, from Brentano *Deskriptive Psychologie*, p. 1
2. Brentano, 1995[1874].
shape, a size, and a color which itself can be analyzed in terms of brightness and saturation (and the list does not end there). This analysis is philosophical and psychological, and necessary (rather than contingent). Virtually all of Brentano’s student, and most of his students’ students, accepted this task as a major goal of psychology and philosophy, and this became a major component of phenomenology (as developed by Husserl and others: see chapter 7 below), of gestalt psychology (as developed by Köhler and others: see Chapter 5 below), and of phonology (by Jakobson and Trubetzkoy, chapter 9 below).

Brentano responded to Comte’s concern about the reliability and trustworthiness of introspection in the development of a scientific psychology. Brentano proposed that a distinction needed to be drawn between inner observation (innere Beobachtung) and inner perception (innere Wahrnehmung), and this response would later be adopted by Wundt as well. The distinction was between an observation of an inner state or process, which requires a split of sorts in the consciousness of the subject, a distancing of the cognizer from the process observed, and an inner perception in which one is aware of where one is, mentally speaking, without an effort to provide an observer seated in a different mental location.

Franz Brentano, the man, is also someone who can teach us something about the nature of rupture and continuity in the academic world. He was a charismatic teacher, and throughout his life inspired students to come work with him, and to take him as a role model for their own lives. His lectures—whose importance cannot be overestimated—were powerful, logical and clear. One of his most famous students, the philosopher Edmund Husserl, spoke with some emotion of how he saw Brentano when he listened to his lectures: “in every feature, in every movement, in his soulful, introspective eyes, filled with determination, in his whole manner, was expressed the consciousness of a great mission.” Is there a better description of charisma? And at the same time, Husserl recalled Brentano’s language as “the language of dispassionate scientific discourse, though it did have a certain elevated and artistic style through which Brentano could express himself in a completely appropriate and natural way.” Brentano left an impression: “he stood before his young students like a seer of eternal truths and the prophet of an other-worldly realm.”

Brentano was, Husserl noted, convinced of the truth of his philosophy. “In fact, his self-confidence was complete. The inner certainty that he was moving in the right direction and was founding a purely scientific philosophy never wavered,” and developing his philosophy was “something he felt himself called to do, both from within and from above. I would like to call this absolutely doubt-free conviction of his mission the ultimate fact of his life. Without it one cannot understand nor rightly judge Brentano’s personality.”

Still, Brentano was “very touchy about any deviation from his firmly held convictions,” and he became “excited when he encountered criticisms of them, adhered rather rigidly to the
already well defined formulations and aporetic proofs, and held out victoriously, thanks to his masterly dialectic, which, however, could leave the objector dissatisfied if he had based his argument on opposing original intuitions.” And “no-one took it harder when his own firmly entrenched convictions were attacked.”

And so the personal connections that form tight bonds, both personal and intellectual, at the beginning of a student’s career evolve into forces that lend themselves to rupture. Husserl, again, explained straightforwardly how this happened in his relationship with his teacher: “At the beginning I was his enthusiastic pupil, and I never ceased to have the highest regard for him as a teacher; still, it was not to be that I should remain a member of his school.” Husserl knew that he was going to move out and become an independent thinker. “I knew, however, how much it agitated him when people went their own way, even if they used his ideas as a starting point.” Even if? Surely Husserl knew perfectly well that that was the worst possible case, from Brentano’s point of view. “He could often be unjust in such situations; this is what happened to me, and it was painful.”

As we listen to Husserl’s words about his relationship to his teacher Brentano, it may be hard for us not to think that Husserl should have had more forebearance in his interaction with Brentano, since, after all, it was Husserl who would become far more famous a century later. But of course Husserl had no way to know that. Like all of us, he was swimming in uncertain waters. And Husserl knew that he could not provide an argument for his point of view that Brentano would find persuasive. Husserl could give in to his teacher’s criticisms, or he could set out on his own, even while he knew that Brentano had better arguments than he did, for the moment. He was obviously talking about himself when he wrote, “the person who is driven from within by unclarified and yet overpowering motives of thought, or who seeks to give expression to intuitions which are as yet conceptually incomprehensible and do not conform to the received theories, is not inclined to reveal his thoughts to someone who is convinced that his theories are right—and certainly not to a master logician like Brentano.” We are left to conclude that Husserl tried, early on, and failed to engage Brentano in a conversation in which Husserl’s ideas were something other than a heresy. He was not able to meet his teacher’s standards for logical persuasion. “One’s own lack of clarity is painful enough,” Husserl went on. But he could neither convince Brentano that something was wrong in his teachings, nor persuade him that Husserl’s alternatives made sense. “One finds oneself in the unfortunate position of neither being able to produce clear refutations nor being able to set forth anything sufficiently clear and definite.” An unfortunate position, indeed: to be struck dumb in the presence of one’s teacher.

“My development was like that,” wrote Husserl, “and this was the reason for a certain remoteness, although not a personal estrangement, from my teacher, which made close intellectual contact so difficult later on. Never, I must freely admit, was this his fault. He repeatedly made efforts to re-establish scientific relations. He must have felt that my great respect for him had never lessened during these decades. On the contrary, it has only increased.”

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1 ibid.
2 Stumpf, 1976[1919], chapter by Husserl. p. 53
3 In McAlister, 1977.
But then many years went by with the two men each going their own ways. Towards the end of his life, while Brentano was living in Florence, Husserl went to visit him there. Brentano was blind at that point, unable to read and able to write only if someone could take dictation. His hair had turned gray, and his eyes had lost the gleam that had once captivated his students. Husserl could see that his former teacher was chafing under the conditions he had to live in, with rarely a colleague to speak to about philosophy. Husserl could listen, though.

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Once more I felt like a shy beginner before this towering, powerful intellect. I preferred to listen rather than speak myself. And how great, how beautifully and firmly articulate, was the speech that poured out.

Once, however, he himself wanted to listen, and without ever interrupting me with objections, he let me speak about the significance of the phenomenological method of investigation and my old fight against psychologism. We did not reach any agreement.

And perhaps some of the fault lies with me. I was handicapped by the inner conviction that he, having become firmly entrenched in his way of looking at things, and having established a firm system of concepts and arguments, was no longer flexible enough to be able to understand the necessity of the changes in his basic intuitions which had been so compelling to me.

Husserl never lost his love for Brentano the teacher. In that final meeting in Florence, Husserl found that Brentano had “a slight aura of transfiguration, as though he no longer belonged entirely to this world and as though he already half lived in that higher world he believed in so firmly.” The world would soon lose a brilliant thinker and teacher. Husserl ended his note with these words: “This is how he lives on in my memory—as a figure from a higher world.”

Of Brentano’s students who became philosophers, Husserl was the most famous, and we will look in greater detail at his ideas and his influence in Chapter 7. Among Brentano’s students who became psychologists, one of the most famous was Carl Stumpf, whose work we will consider in the next chapter. Stumpf’s recollections of Brentano the teacher share something of the heartfelt emotions of Husserl’s: “I wish to express the love and gratitude which I owe to my great teacher,” he wrote, “which I will retain until the day I die. The close relationships he established with his students and which he was so eager to maintain played a more important part in his inner life than is the case with many other thinkers.” Stumpf spoke of the metamorphosis that Brentano produced in him: he had started at the university expecting to study law, but after some weeks that resolution wakened. “Before Christmas I sought him out to inform him of my intention of choosing philosophy and theology as my life’s work. I even wanted to follow him into the priesthood, so much of an example had he set for me.” From that day on, Brentano spent many hours walking and talking with Stumpf. As Stumpf’s professional stature grew, and the two no longer lived in the same city, they naturally grew apart intellectually, and Stumpf bore some of the burden of having been

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1p. 53-55
2op.cit.
3Stumpf, 1976[1919], p. 10.
Brentano’s first student; he wrote about “a certain touchiness on Brentano’s part toward dissension that he thought to be unfounded,” echoing Husserl’s sense as well. If Brentano “encountered basic intuitions in his students’ publications which were considerably different from his own, and which were not thoroughly justified and defended on the spot, he was inclined to consider them at first as unmotivated, arbitrary statements even though they may have been subject to several years’ thorough study or may have matured imperceptibly without one’s having been expressly aware of it. Occasional ill-feelings were unavoidable in the face of this.”

Brentano’s philosophical ideas were central in the development of the third tradition that filled out the 19th century’s response to Kant. The first, as we have seen, was the neo-Kantian tradition that shared with Kant the belief that philosophy could and should develop a deeper understanding of a priori truths about the world and our place in it; in various ways, history and culture were integrated into these neo-Kantian perspectives in ways that would not have pleased Kant himself. The second tradition was positivism: though Kant shared with positivism a deep respect for the work of contemporary science, positivists were gardeners of a sort, intent on clearing out the unwanted shrubbery of philosophical discourse, keeping only the part that passed the inspection of the observational sciences. Brentano was instrumental in the development of the third tradition, the linguistic, or semantical, tradition. This development looked to language and its analysis to provide a different kind of explanation for the statements that Kant had taken to be both synthetic and known a priori. It is to our language we must turn, said the third tradition, if we want to understand our statements and our beliefs.

Brentano’s intellect and personality left a deep mark on Tomáš Masaryk, a mark which included an interest in English empiricism, French positivism, and Aristotle. After defending his dissertation with Brentano, where Brentano had encouraged him to study Auguste Comte, Masaryk moved to Leipzig, where he studied with Wilhelm Wundt and others. Leipzig in the 1870s: this was a crucial nexus, and we will find all of the mind sciences

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1Stumpf, 1976[1919], p. 44

2Brentano’s relevance and importance can be described in another way: through the great influence of his lectures, and of his teaching more generally, both analytic philosophy and phenomenology can claim Brentano as a direct ancestor: analytic philosophy through Meinong (if one focuses of Meinong’s influence on Wittgenstein and Russell), and phenomenology through Husserl, both of whom were students of Brentano.

3Fabian, 1986 cites a letter from Ehrenfels to Brentano Dec 5 1907, extracts published in Fabian 1986, 5-6. This is in a letter to Brentano, note.

deeply influenced by what went on there and then. We have already been there, to the largest university in Germany at the time: this is the place where the Neogrammarians burst on the scene. And Tomáš Masaryk met Edmund Husserl there in Leipzig; Husserl was nine years Masaryk’s junior, but the two were both Moravians, which seemed to matter to them and give them a reason to bond; they attended Wundt’s lectures together, and also participated together in the Academic Philosophical Association, which was heavily influenced by the philosopher Richard Avenarius, who had not yet moved to Zurich. Masaryk then moved back to Vienna to work again with Brentano. Masaryk became chair of the department of philosophy at the Czech university in Prague when it was founded, in 1882—the university in Prague, called the Charles-Ferdinand University, was divided into a Czech-speaking and a German-speaking university that year. There he became friends with two Brentano students: Carl Stumpf, and Anton Marty, who was also lecturing in Prague. Jakobson would later note the important impact that Marty had on Masaryk. As we will see below as well, Masaryk was the teacher of Vilém Mathesius, founder of the Prague Linguistic Circle; see page 478 below. The years before—and during—the First World War was a period during which Masaryk spent a great deal of his time on party and national politics, and he became president of Czechoslovakia on October 28, 1918, at the end of the war, when the Austro-Hungarian empire was dissolved, and an independent Czechoslovakia was established.

In his scientific work, Masaryk emphasized the importance of maintaining a distinction between static and dynamic analysis, two complementary perspectives that, as we have seen, Auguste Comte had emphasized earlier in the century, and which are essentially no different from the kinds of analysis that Saussure would later call synchronic and diachronic analysis; we will discuss this in greater detail in Chapter 9.

### 3.1.5 Christian von Ehrenfels

Christian von Ehrenfels was an aristocratic Austrian who studied in Vienna with Brentano, and with Brentano’s student, Alexius Meinong, both in Vienna and then in Graz. After 1896, Ehrenfels was professor of philosophy at Charles University, the German university of Prague.

His most famous work was Über Gestaltquälitäten (“On Gestalt qualities”), published in 1890, in which he developed the major Brentanian theme we noted just above, the logical relationship of parts and wholes—and he developed the idea that Ernst Mach had begun

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1Masaryk wrote a dissertation on sociology, but it was not accepted, and a later dissertation was, though apparently it was not viewed as very strong academically.
2Novák, 1988, p. 4.
4Jakobson discussed the influences that Masaryk speaks of in his early Foundations of Concrete Logic, notably William Dwight Whitney (Language and the Study of Language, and Life and Growth of Language), and the Neogrammarians: Paul’s Principien des Sprachgeschichte, Delbrück, and Marty’s Ursprung der Sprache. “The basic problem Masaryk poses in his Foundations of Concrete Logic is the place of linguistics in relation to other sciences,” Jakobson wrote. [p. 57]
5Roman Jakobson would later note that “our links with the so-called Prague school of psychology and with its initiator C. von Ehrenfels (1859-1932), the first propounder of the focal concept and label Gestalt, certainly left their imprint on the advancement of the Prague Linguistic Circle”. Jakobson, 1973, p. 17. Like so many of the philosophers and psychologists of this particular time, he was a serious musician; he had, in fact, studied harmony with Anton Bruckner.

In his later years, von Ehrenfels wrote about his two teachers, Brentano and Meinong, with insight:
Fig. 3.2: Tomas Masaryk
to write about in 1865, as we noted just above. We remarked there on the fact that Mach, in his discussion, talked about a shape, a Gestalt, as the thing that is important but which is not the sensory perception itself. Ehrenfels came back to that, with a nod of the head to Mach, and made the study of these Gestalts the centerpiece of his paper, which would ultimately become one of the most influential papers in the entire history of psychology. Now, we often say in casual speech that the whole is not the sum of its parts, but the task was to say exactly what the difference was between the whole and the collection of its parts. Ehrenfels took the example of a melody—the perfect example of a whole that is so much more than its parts (though a word or a sentence is a good example too). A melody is easily recognized as the same even if it is raised or lowered by a musical interval. What is it that is the melody, then, if all of the component notes have changed? It is something relational that ties the parts together.

Ehrenfels article begins, right from the first paragraph, with the recognition that the starting point of his work lay in Ernst Mach's Analysis of Sensation. Ehrenfels wrote to a friend, “I sent Mach ‘Gestalt Qualities’ and he replied in a friendly manner that he had already given the main thoughts in 1865 in volume 46 of Fichte's journal, and had expressed them in a more psychological way. These seems like an unusually gracious recognition of intellectual continuity, but it seems that it was, alas, dismissed by Mach with a toss of a hand.

The theory of gestalt qualities began with the attempt to answer a question: What is melody. First and most obvious answer: the sum of the individual notes which make up the melody. But opposed to this is the fact that the same melody may be made up of quite different groups of notes... Mach, who was struck by this fact, drew from it the conclusion that the essence of melody must reside in a sum of special sensations which as note sensations (Tonempfindungen) accompany the notes."

Mach's great success was in perceiving that his focus on the individual sensations, which he was certain was the basis of our perception, was inadequate to provide an account of

So let me confess right away that I regard Brentano as the greater of the two as regards productive capacity. For keenness of intellect they were perhaps evenly balanced. But Brentano was, in my opinion, by far the more fortunately endowed scholar. He had an immediate instinct for that which was clear and essential and also for the admissibility, where appropriate, of abbreviated methods of thinking, whereas Meinong’s mind seemed to be directly attracted to that which is intricate, minute and laborious. My impression was that Brentano also excelled more as regards economy of effort and the methodical influence exercised by the style of his verbal and written presentation. What we need is the brevity of clarity and not the prolixity of superfluous assurances. ... I must here stress that I was brought most impressively into contact with that living quality which can best be described as scientific conscience or scholarly morality not by Brentano but by Meinong. And yet all the conditions ought to have been here more favourable for Brentano. Brentano was from the beginning for me the more imposing intellectual personality; he was by far the elder and more distinguished of the two (and in those days, as a lad coming up to Vienna from my native Waldviertel and the small town of Krems an der Donau, I still laid some store by outward distinction). Brentano held tutorials lasting several hours, and a private recommendation soon brought me into personal contact with him. Brentano was a charming interlocutor and an attractive figure in speech and appearance. None of this was true of Meinong. And yet it was through Meinong and not Brentano that I came to grips with moral seriousness of scholarship and a scientific sense of responsibility, the categorical imperative of the seeker and disciple of truth. Fabian, 1986

1Smith, Austrian Philosophy, ch 8, points out similarities of this concept to Husserl's Philosophy of Arithmetic, chapter XI, 1891, and then developed further in the Logical Investigations, ten years later. Smith also refers to work by Meinong in work in the 1880s, in which Meinong cites Ehrenfels.
2Friedman, 2003, p. 47 and Blackmore, 1972, p. 47.
our perceptions, and he, perhaps grudgingly, explicitly recognized that more was needed. Ehrenfels saw that what was there was something else past the sensations. Instead of a melody, let us take as our example a sequence of integers: 7, 9, 11, 13, 15. We can remember them and recite them, and in all likelihood you will recognize that there was a difference of 2 between each of the successive numbers. From Ehrenfels’s point of view, we remember not just those five numbers, but a sixth also: the number 2. But it is not until we come to Ehrenfels’s student Max Wertheimer (and the psychologists who got on board with Wertheimer’s program) that something much closer to the real story would come about: the Gestalt was based on an active principle that binds all of the component sensations by an activity that is capable of generating them.

Ehrenfels was the first teacher of Max Wertheimer, who would go on to be a graduate student in Berlin with Stumpf, and then in Würzburg with Oswald Külpe, where he finished his degree; Wertheimer would later develop gestalt psychology, which will be one of the principal themes of Chapter 5 (page 253). Gestalt psychology would succeed better than any preceding school of psychology in making explicit what the active principles are that dynamically organize the perceived world. Ehrenfels provided an important step forward in emphasizing the logical gap between the perception of the parts and the perception of the whole, which can subjectively be far more important than the parts.

3.2 Logic: Boole, Frege, Russell

The middle of the 19th century saw a new trajectory in the study of logic with the work of George Boole, Gottlob Frege, and Charles Sanders Peirce. Before we turn to what they proposed, we need to stop a moment and reflect upon what logic is, and what it is intended to accomplish.

Today, we might say that the goal of logic to make precise what counts as valid inference, from one thought to another, or one sentence to another, or one proposition to another. But in the longer tradition of logic, this is just a part of what is covered by the term logic. Logic is the discipline more generally that studies what makes thought possible. There are at least three areas that need to be covered by this: first, the nature of valid inference; second, the categories of thoughts; and third, the modes of existence. By “categories,” we mean the sorts of things that we need in order to think, such as objects, properties, and relations. By “modes of existence,” we mean the various ways in which statements can be used in their descriptive function, of which the most everyday ways are related to time: a statement that the front door was locked at 9pm last night does not say anything about the state of the lock right now. Modes of existence can also be non-temporal: cars stop at red lights is true in a fashion that is not rendered false by noting that this car or that one went through the red light. Statements can be about a more abstract reality than just is observed in space and time—though positivists will urge us not to be deceived about that way of speaking, to be sure. In short, a mode of existence could be one which specifies socially accepted actions (like stopping at red lights), or rules of a game (like moving a bishop in chess only on the diagonal).

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1 A good overview can be found in Peckhaus, 1999.
Thinking about categories in this sense is one of the oldest traditions in philosophy, rooted in Aristotle’s ideas that he laid out in such works as *Categories* and *Analytics*, and famously treated in many later works, like Kant’s *Critique of Pure Reason*, and Husserl’s work as well, as we will see.

3.2.1 George Boole 1815-1864

George Boole was the author of *An Investigation of the Laws of Thought*, which he published in 1854, at the age of 39. He came from a family in the north of England which was of modest means, but it was one which surrounded him from an early age with opportunities to learn languages, science, and mathematics. For a number of years, he was a teacher and educator, but in 1849, when he was 34, he assumed a position at Queen’s College Cork, in Ireland, where he spent the last fifteen years of his life.

He spent his thirties exploring the development of the laws of thought (which is to say, logic) through the intellectual tools of mathematics. The laws that he referred in the title of his book were divided into those of Logic and those of Probability, and for both it was his intent to develop a Calculus. He was at pains to note the genealogy of this work: on the logic side, he traced it back to Aristotle, and to many others since: Abelard, Ramus, Descartes—and Bacon and Locke. Probability, he noted, finds its roots in the work of Pascal and Laplace, and if its origins lay in the study of gambling and insurance, its importance for understanding the laws of thought was far greater. For this was his goal: to understand the very laws of thought:

> To unfold the secret laws and relations of those high faculties of thought by which all beyond the merely perceptive knowledge of the world and of ourselves is attained or matured, is an object which does not stand in need of commendation to a rational mind.

“To unfold the secret laws”! This was a book that promised to do a great deal: there was mathematics, and a new sort of mathematics based on the old one but which would take logic as its home court, there was analysis of grammar, there was probability and there was valid inference, all put together.

Boole aimed to develop an algebra, a formal system which resembled arithmetic, and which would model thought and logic. Traditional algebra uses variables to stand for measurements of quantity; this innovation was made by François Viète in the late 16th century, and quickly became standard practice. Algebra became a language, and a symbolic system with a grammar; understanding that grammar soon became a standard part of being an educated person. What Boole did was to say that much the same language could be retained, with some significant modifications, to be sure, but still and all, a new dialect of algebra could be developed that said reasonable things about logic and inference.

Boole divided propositions into two sorts, primary and secondary. Primary propositions are about objects, or at least they are in simple cases: *all dogs are mammals* is a primary

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1Boole, [2009[1854]:3

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proposition, as is Socrates is mortal. Secondary propositions are formally complex, and made up of propositional parts: if you leave, you will miss the ice cream is a secondary proposition.

Boole began his discussion with classes of objects, and used lower case letters, like $x$ and $y$, to represent them. “If the name is ‘men,’ for instance, let $x$ represent ‘all men,’ or the class of ‘men.’ ” And adjectives worked with the same kind of algebra as nouns: “if an adjective, as ‘good,’ is employed as a term of description, let us represent by a letter, as $y$, all things to which the description ‘good’ is applicable, i.e., ‘all good things,’ or the class of ‘good things.’ And then the combination $xy$ is said to refer to the objects that satisfy both $x$ and $y$’s description: $xy$ stands for “good men.” It follows immediately, Boole wrote, that $xy = yx$. The phrase navigable rivers that are estuaries, with $x, y$, and $z$ defined in the appropriate way, could be represented as $xyz$, or $zyx$, or any linear combination of the three variables. The commutativity (and he used that term) of this operation is, he said, a law of thought “and not, properly, a law of things.” And what is more, as a law of thought, “it is actually developed in a law of Language.” Boole noted that poetic diction allows inverted orders of nouns and adjectives, as in “the rising world of waters dark and deep.” We are tempted to say that Boole was approaching dangerously close to the point of doing bad linguistics. He proposed that these inverted forms were not simply the fruits of poetry: they were “sanctioned by the intimate laws of thought,” and it was just “convenience” (whatever that might mean) that leads us to rarely exercise our noun-adjective word order more often. But he also noted that if $x = y$, then $xy = x$, from which it follows that $xx = x$, for any $x$. This leads him to some bad linguistics again: “to say, ‘good, good,’ in relation to any subject, though a cumbrous and useless pleonasm, is the same as to say ‘good.” Well, no: we can say, “there’s good, and good”—just as we say “there’s good, and then there’s good,” and the two goods are taken to mean quite different goods: different amounts of good, perhaps. In any event, Boole went on to write that classes of objects, so long as they are disjoint and share no elements in common, can be combined with “and” and “or,” as when we say “trees and minerals,” or “men and women.”

There are further signs, those which express relations, and Boole argued that all verbs would be represented by such signs. But, he wrote, we really only need one such symbol, because all verbs can be paraphrased with is or are: Caesar conquered the Gauls can be rephrased as Caesar is he who conquered the Gauls, and we might as well just use the symbol “=” to mark is and are.

Boole turned then to secondary propositions. The clearest examples of secondary propositions are of the form either $X$ is true or $Y$ is true, or if $X$ is true, then $Y$ is true. Boole argued that these secondary propositions are fundamentally all about time: the second example can be construed as saying that at all times at which $X$ is true, $Y$ is true. In the end, Boole gave every indication that he was quite comfortable with the Kantian category of time as a basis for the meaning of secondary propositions. He was much less certain that there is a corresponding Kantian intuition of space that is the basis for primary propositions, but he gave the very strong impression that something like that must be correct.
Boole discussed the logical distinction between intension and extension, a difference that had long been made in the literature on logic, and one that would play an important role in the decades to come. Frege, whose work we will turn to shortly, chose the German words Sinn and Bedeutung, and others since have used yet other terms. Husserl, at the turn of the next century, would develop a vaster analysis of the ways in which intensions can interact and relate to each other. In phonology, as we will see, the development of an intensional logic of classes was the great contribution of Nikolai Trubetzkoy, which today we call features in English. (We have already noted that Trubetzkoy, writing in German, used the word Merkmal, a term which was already used by von Ehrenfals, and in the context of intensional logic.)

We probably could not do better than Boole in providing an account of what the distinction is:

1 According to a recognised division the concept of a class of things may be considered 1st with reference to its extension as a whole made up of parts, 2ndly with reference to its intension as formed by the union or combination of qualities common to all the individuals which it comprehends.

And so, he wrote, “minerals” is a concept, and it can be viewed as a “class of things including gold, silver, iron, aluminium, etc.”—and this is viewing it in extension. The concept “minerals” can be viewed in intension, and so involves “the qualities of ductility, fiscibility, a peculiar lustre etc. common to all the individuals of the class.” Extension is particularly apt for understanding the operation represented by the English word and, wrote Boole, and he called this addition; then he described subtraction, “that operation by which from the concepts of a whole and the concept of one of its parts we form the concept of the other part, as when from the concept ‘stars’ and the concept ‘planets’ we form the concept ‘stars which are not planets’ or ‘stars except planets.’ ”—as the word except can be used to indicate.

But there is much more to say about “operations founded on intension,” such as composition, whereby the concept “white men” is formed by composing the concept “men” and the concept “white things”. Boole called the opposite of this abstraction, and noted that there are some subtleties and complexities here. Suppose we take the concept of “white flowers,” and that of “flowers.” Can we reconstruct that of “white things”? Yes, we could, and having done so, composition could bring us from “white things” and “flowers” to “white flowers.” But: “this concept ‘white things’ is not the only one from which by composition with that of flowers the concept ‘white flowers’ may be formed.’ The process does not yield a unique concept. If instead of ‘white things’ we had taken the class consisting of “white things” and also (“and,” now, in the extensional sense: we are making a bigger class of things) “red leaves” (that was Boole’s example), we will also arrive at “white flowers” if we compose it with “white things.” Here is how Boole put it:

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1 Boole, 1997, p. 74.
2 Boole, 1997, p. 74.
3 Boole, 1997, 75ff.
4 Boole, 1997: 75
To the concept “white things” we might add the concept of any class of things possessing neither whiteness nor the floral character or of any indefinite portion of such a class of things and still the resulting concept would be one which by composition with [that] of “flower” would generate the concept “white flowers.” Thus if from that class of things which consists of “white things together with red leaves” we mentally select those individuals which answer to the description “flower” we arrive at the concept “white flowers.”

The upshot is this: abstraction may well be understood as the inverse of composition, but what we get out of it is a whole class of concepts—just as in the particular example Boole gave, we can derive not simple “white things,” but an infinite number of variations on that.

We have noted that Boole was quite aware that it was difficult to know just where the study of thought ended and the study of language began. Early on, he noted:

That Language is an instrument of human reason, and not merely a medium for the expression of thought, is a truth generally admitted. It is proposed in this chapter to inquire what it is that renders Language thus subservient to the most important of our intellectual faculties. In the various steps of this inquiry we shall be led to consider the constitution of Language, considered as a system adapted to an end or purpose; to investigate its elements; [and] to seek to determine their mutual relation and dependence...

He then noted that there was no great loss suffered if it turns out that conclusions he draws about thought are more properly said to be about language; the conclusions will still be valid (if slightly misplaced). But he made then an interesting point: the conclusions he expects to draw will hold, he thought, for all speakers of all languages, which suggests that what is important is thought, not language:

Nor could we easily conceive, that the unnumbered tongues and dialects of the earth should have preserved through a long succession of ages so much that is common and universal, were we not assured of the existence of some deep foundation of their agreement in the laws of the mind itself.

Boole certainly expected to have significant things to say about grammar and the logical structure of language:

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2. Boole, [2009][1854], p. 25.
3. Boole, [2009][1854], p. 27.
3.2.2  Gottlob Frege 1848-1925

Gottlob Frege was born in 1848, in what would soon be northern Germany. After studying philosophy and mathematics (as well as other topics), he began lecturing at the University of Jena in 1874, and he would continue there until 1918. During his lifetime, he felt that his fame was limited and that his work little commented upon. His work was reviewed by his peers in the serious journals, but reviewers did not see something revolutionary in his work. Frege was not given to explicitly criticizing views that preceded his, and he was taken to task for not appreciating Boole’s system. In the decades since, the world has come to his door: his lifework has had enormous influence.

During his lifetime, Frege’s work influenced Bertrand Russell greatly, and Whitehead called Frege the greatest logician of the 19th century at the meeting that was to found the Association for Symbolic Logic, in 1936, a decade after Frege’s death. And sitting in on his lectures in Jena was in 1914 was Rudolf Carnap, who was to be an enormously influential in the years to come, and through Carnap, Frege’s ideas were developed.

By the time Carnap attended his one hour a week lecture, Frege was no longer a young man: he was 62, and Carnap thought that he “looked old beyond his years,” and retiring and shy, facing the blackboard rather than the class (which had just a small number of students), and filling the board with his strange formalisms. Never would a student raise a question, either in class or afterwards, and Frege’s lectures were just that: there was no discussion, simply lecture by the professor.

1Bertrand Russell made a point with an irony that we are sure he was aware of—though not all of his readers caught the irony, it would appear. Russell in his Principles of Mathematics (1903) remarked that he had read Frege’s work (and he knew that Frege was attacking much the same problems that he was), but he did not understand Frege until he had independently arrived at a similar position. From Russell’s internal point of view, reflecting on his own understanding of where his ideas stood, that makes perfect sense, but to anyone other than Russell, it is completely unreasonable. If you read my paper on a subject, and then come to the same conclusion, I would not be sympathetic to the view that you had arrived at the same position independently. I would say that I had at the very least helped you considerably on your way to your conclusion.

Carnap's friend Wilhelm Flitner, who Carnap had roped into taking Frege's classes with him, noted that Frege would walk on the street with his eyes cast down to the ground and one hand on his back, the archetypical introvert. Flitner spoke only a few insignificant words to him over the several years he took courses with him; Carnap, he said, never did even that. Looking back, Carnap saw mostly sadness. “It was obvious,” he wrote later, “that Frege was deeply disappointed and sometimes bitter about this dead silence. No publishing house was willing to bring out his main work, the two volumes of Gesetze der Arithmetik; he had it printed at his own expense. In addition, there was the disappointment over Russell's discovery of the famous antinomy which occurs both in Frege's system and in Cantor's set theory. Many years after Frege had passed away, Bertrand Russell wrote an enormously successful history of Western philosophy, and he wrote into it an important role for Frege in it. He noted that Frege “remained wholly without recognition until I drew attention to him in 1903,” when Russell published his Principles of Mathematics.

It was in 1879, when he was not quite 30 years old, that Frege published a revolutionary work that attempted to go well beyond what George Boole had accomplished. He was not at all satisfied with what logic had produced before him; he was willing to put forward a set of new ideas to shake the tree of logic. He wrote,

>If we view Boole’s formal system as a whole, we see that it consists of dressing up abstract logic in the clothing of algebraic symbols; it is not appropriate for the expression of content and that was not its aim, in any event. But that is precisely my aim. I want to blend the several signs that I have introduced with the mathematical signs to arrive at a single formal system. The symbols that already exist would correspond roughly to the stems of words, while the signs I introduce may be compared to suffixes and grammatical elements which establish the logical relationships between the contents of the stems.

Logical form

While Frege's actual formal system—his formalism, let us say—has not stood the test of time, much of his conceptual project has. Frege's goal was to establish that there was a logical form to a sentence, one which is far from obvious, and that project has had an enormous impact on how language has been analyzed in the years since. The three most important ideas that he developed were these: First, that the fundamental structure of a sentence should be understood as a predicate and a set of arguments, just as a function in mathematics is. The arguments of a predicate are typically nouns, or noun phrases. Second, it is possible for the meaning of a sentence to bind together two (or even more) arguments from a logical point of view. And third, quantifiers such as all and every have

\[2\] Carnap, 1963.
\[3\] Russell, 1949.
\[4\] Russell wrote, near the beginning, “Professor Frege's work, which largely anticipates my own, was for the most part unknown to me when the printing of the present work began; I had seen his Grundgesetze der Arithmetik, but ... I had failed to grasp its importance or to understand its contents.” p. xvi.
\[5\] On the goal of ideography Frege, 1879, p. 73.
to be understood not as playing a role parallel to that of words such as *this* or *red* in the logical form of a sentence, but rather as *operators* which take a whole sentence as its scope, “binding” some of the variables within. We will take a look at each of those in a bit more detail.

Frege was at pains to show that it is not sufficient to take the logical form of a sentence to be the attribution of a predicate to a subject—and he insisted that the logician and the philosopher must uncover the logical form of a sentence formulated in a natural language. We need to understand what the view was that he was trying to move beyond. Till then, philosophers had largely been in agreement with traditional grammars: they emphasized the division of a sentence into subject and predicate. A sentence like *Socrates is bald* consists of a subject and a predicate which expresses something said about the subject. The same was taken to be true of a sentence like *The Yankees beat the Mets*: it is formed of a subject *the Yankees* and the predicate is *beat the Mets*. At the same time, the sentence *The Mets were beat by the Yankees* is formed of a subject *the Mets* and a predicate *beat by the Yankees*. This was essential to Kant’s notion of *analyticity*, which pertained to sentences in which the predicate is contained in the subject. Frege said that from the point of view of the meaning of the sentences, the active and the passive sentences were the same, and a better way to specify what they share in common was to think of a mathematical function of two variables, as when we define a mathematical function \( f(x, y) = \frac{x^2}{y} \), with the understanding that in the case of the baseball sentence, our function has as its arguments not two numbers, but two baseball teams\(^1\). A more perspicuous representation would then be: *beat*(*the Yankees, the Mets*), a representation that is valid regardless of whether the *the Yankees* is chosen as the subject, in the active voice, or the *the Mets* is chosen, in the passive voice. What Frege actually wrote is a bit more interesting: “In the mind of the speaker the subject is ordinarily the main argument; the next in importance often appears as object.” Semantically-driven grammatical theories still appeal to such statements. “Through the choice between [grammatical] forms, such as active-passive, or between words, such as ‘heavier’-’lighter’ and ‘give’-’receive’, ordinary language is free to allow this or that component of the sentence to appear as main argument at will, a freedom that, however, is restricted by the scarcity of words.”

The binding of variables is something that is perfectly clear in our mathematical notation, but which needed to be made explicit when Frege tried to lay bare the logical form lying behind a sentence. From a mathematical point of view, if we define a function \( f(x, y) \) as \( x^2 + 2y \), then we know that \( f(2, 1) = 4 + 2 = 6 \), \( f(1, 2) = 1 + 4 = 5 \), and \( f(2, 2) = 4 + 4 = 8 \). The notation makes it perfectly clear that \( x \) and \( y \) are conceptually independent, and we can choose any value we want for either variable; those values can be different, or they can be equal. If we wish to, we can bind those two variables, to create a function that has but a single variable; the natural way to express this is to say that we define a new function \( g(x) = f(x, x) \). The two variables in the function \( f(x, y) \) are now bound, and we can also say that \( g(x) = x^2 + 2x \).

Something very similar is true in language, but in a less obvious way. Let us consider a function in language that has two arguments, and try to find one in which the two argu-

\(^1\)Bear in mind, however, that at the time Frege was writing, mathematicians did not use the term “function” with the same kind of generality we do today; the term “function” was generally assumed to have as its domain the real numbers or the complex numbers (and not, for examples, the integers or some arbitrary set).
ments can perfectly well be different, or perfectly well be the same. We can say John saw Kim or John saw himself, just as we can say Paul killed Kim or Paul killed himself. Frege proposed that a predicate can be understood as having a single variable which binds two argument positions in a function, as we might express with an expression like for someone to kill himself. A similar predicate in which two distinct variables bind the two argument positions could be expressed as for someone to kill someone (else).

The grammar of natural language may not make explicit where all of the variables in a sentence are. In the sentence John tried to open the safe, there are two logical positions bound to the same variable: the subject of try and the subject of open. And the discrepancy can be even greater. Consider the statement no integer is greater than its square, and compare it to my suitcase is larger than its handle. The sentence about my suitcase is much more straightforward: we can identify what object we are talking about by the description I give of it, and we can measure its size, and do the same thing with its handle, and the sentence makes the assertion that the first is larger than the second. But the sentence no integer is larger than its square is not about an object (or a set) “no integer”; what is really involved is a property that we could describe as “being greater than one’s square,” or the property that \( x \) would have just in case \( x > x^2 \). The sentence has the logical structure of denying that there are any integers that have that property: there are no integers \( x \) for which \( x > x^2 \).

It is easy to lose sight of the fact that Frege’s accomplishment lay not only in the solution of a set of problems, but also in the selection of the problems that he solved. Consider three words that can be used to conjoin two sentences: and, or and but. Of the three, and is the easiest to deal with; few will object if we analyze \( S \) and \( T \) as being true just in case both \( S \) and \( T \) are individually true. Or is more problematic, because in some cases, it seems that a sentence which is formed by connected two sentences by or is intended to be false if both of the connected sentences are true; this is the kind of or we call an exclusive or, as in You can learn to put your things away when you are done with them, or you can live like a slob, while in most cases, a sentence built up from or connecting two sentences is true even if both sentences are true (You left the hall light on last night, or someone slipped into the house while we were asleep); Frege decided that he would ignore the first meaning, and focus on the second. And the word but? Frege wrote, “The distinction between ‘and’ and ‘but’ is of the kind that is not expressed in the present ideography. The speaker uses ‘but’ when he wants to hint that what follows is different from what one might at first expect.” [p.20]

From our vantage point today, we can see places where Frege’s insights were more fragile than they appeared to be. For example, there are many examples in natural language when it is not clear how many arguments appear in a given sentence. The case of The Yankees beat the Mets is a clear one, containing two noun phrases that each play a similar role in the action described. But what about John drinks a little bit too much? There is no apparent direct object, though we know perfectly well that there is an implied object: John is drinking

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1. It is true that in a wide range of cases, the act described in the two cases is subtly different, a point considered in detail by Nicolas Ruwet. When we say John saw himself, we typically mean either he saw himself in a mirror, or else in his imagination—perhaps in another time or place, while nothing parallel is expected when the object and the subject are not the same person.

2. This discussion is closely linked to the property of compositionality, a notion that begins to emerge in the work of Boole and Frege. We say that the semantics of a system is compositional if the meaning of a composite expression \( E \) is a regular formation of the meaning of the components of \( E \) and of the way in which the components are put together in forming \( E \). An idiom such as kick the bucket is the clearest case of a violation of compositionality: the meaning of the whole is more than the meaning of its parts and the meaning of how the parts are put together.
too many glasses of liquids that have too much alcohol in them. That paraphrase reassures us that there is another usage of drink in which an overt noun phrase is present, suggesting that the logical form of our first sentence has two arguments—one for the drinker, and one for what is being drunk. But we may be fooling ourselves. *John drinks a little bit too much* seems quite parallel to *he sleeps too much and he works too much*, and neither of those sentences have easy and plausible paraphrases with objects. Even a simple sentence like *John has a car*, which is quite plausibly viewed as describing a relation between two things, John and his car, is not so simple. We cannot say *Which car does John have?*, though we can say *What kind of car does John have?*, suggesting that *John has a car* describes a relation between John and a kind of object, or perhaps a kind of car—in any event, not a particular car; *John has a car* does not have the same logical structure as *John bought a car*. All of this is simply to say: Frege’s decisions about what aspects of natural language he would clean up and deal with in his logical form were decisions, not discoveries, and he opted for the analysis of types of language usage which are particularly prominent in discussions of mathematics, as others after him chose to look at aspects of language which were prominent in philosophy.

If Frege were reading this, he would probably protest that he never claimed that he had provided a tool that solved all problems. He was quite clear about the benefits that accrue to incremental improvements in our analysis of language. We too should bear in mind that Frege would not have claimed that he had discovered the true logical form of sentences; he had taken some steps towards uncovering that logical form, but many others would remain to be taken. Furthermore, it would be a serious mistake to come away from our discussion thinking that Frege hoped that we could learn about logic by studying language *per se*. He made his view on this perfectly clear, in a letter he wrote to Edmund Husserl:

> It cannot be the object of logic to investigate language and to determine what lies in linguistic gaps. Someone who wants to learn logic from language is like an adult who wants to learn thinking from a child.

### Mental acts and their objects

Although readers in the published literature would not encounter the term *psychologism* until later in the century, the groundwork that made the term not only possible but necessary arose during the period that followed Kant and Hegel. Like all of the interesting terms that we care about in this book, the word *psychologism* has been used in a raft of ways, and we cannot expect too much consistency of usage. But this we can say: psychologism refers to a perspective that sees the major grounding of studies of mind in the empirical—read laboratory, for the most part—study of human faculties in particular situations. The basic argument in favor of psychologism? Everything we can learn about how people reason will inform us about the nature and possibilities of reasoning, and if laboratory science can

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2The term first appeared in German in 1866 – see [Kusch](#), p. 101.
teach us about atoms and molecules, surely it can teach us about how we reason. The basic argument against psychologism? People reason well and reason poorly, depending on who they are, what context they are in, and how much they know. Studying what they do and how they reason in context combines in an unholy mess what constitutes good reasoning and what bad reasoning—and bad reasoning is really not what we are interested in.

Bear in mind: psychologism is a term that is almost always used as an accusation, with the sure sense that no one (except perhaps a psychologist!) would choose to pursue psychologism in their account of human knowledge. In one way or another, the charge of psychologism comes down to this: there are deep things to explain about the mind, and psychologism is the easiest way to misunderstand how deep those things are, and to fail to give an appropriately deep explanation.

Frege’s perspective on mental acts (like judging a brownie to be tasty, or an argument to be convincing) stands out against the dominant Lockean tradition: Frege always emphasized the importance of distinguishing between psychological acts, on the one hand, and the content of those acts. My act of judgment is different from yours (for example, it typically occurs at a different time), but the content of the judgments may be exactly the same. We may feel exactly the same way about a given brownie, or a published paper. Frege was thus drawn to the conclusion that to understand a sentence required an understanding that there was something about it (and its meaning) that went well beyond anything that was psychological and subjective, there was something interpersonal, and perhaps even objective. These other things are propositions (though Frege used the word Denken, normally translated as thoughts).

**Bertrand Russell and his antinomy**

Bertrand Russell was a philosopher who would have tremendous influence in several areas, most notably the development of philosophy in the first half of the 20th century, and we will return to his work in Chapter 8. But we must point out here the importance of a discovery that he made, finding a deep flaw in Frege’s system of logic in June of 1901, when Russell was 29 years old. He realized that it was not possible to allow notions like “belonging to a set” to be used uncritically and without reservation, at pain of finding oneself in self-contradiction. In talking about sets, it seemed natural both to say that one set is a subset of another—the even numbers are a subset, for example, of the whole numbers—and also, in other cases, that one set is a member, not a subset, of another set. For example, we could define a set of all the real numbers between 0 and 1, another of all the real numbers between 1 and 2, and so on, up to those between 9 and 10—and then define a set containing exactly those 10 sets. The larger set has 10 members; each element in that larger set has an infinite number of elements.

But if we allow ourselves to talk about one set being a member of another set, Russell realized that without some other restriction, we will arrive at a contradiction, because nothing will stop us from asking questions about whether or not a particular set is member of itself. Suppose we define a set to be normal if it is not a member of itself, and just about any set one has ever thought about is normal, in this sense. The set of integers is not a
member of itself, for example; it is normal, because it contains integers (all the integers, in fact), but no sets of integers.

But what about the set of all normal sets, $\mathcal{N}$—is it normal? We cannot answer the question without falling into a contradiction, which is tantamount to saying that even asking the question lands us in a contradiction. If it is normal, then it is not a member of itself, by the definition we set up for normal. But by the very definition of what we define sets (we say something is a member of it if it satisfied the property we use to define it), that set $\mathcal{N}$ is a member of itself, because it is a member of the set of all normal sets. In just the same way, we land in a contradiction if we start by assuming that $\mathcal{N}$ is not normal. If it is not normal, then by the definition of normal, it is a member of itself. But if $\mathcal{N}$ is not normal, that also means that $\mathcal{N}$ is not a member of $\mathcal{N}$. And we arrive at the same contradiction.

Frege's effort to provide a solid logical foundation for set theory, and arithmetic, came to a standstill once Frege realized the import of Russell's contradiction. Russell sent Frege a letter in 1902, outlining the nature of the problem, ending with the statement, “in your works I find the best I know of our time, and therefore I have permitted myself to express my deep respect for you.” Many years later, when asked if the entirety of his letter might be published, Russell wrote.

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As I think about acts of integrity and grace, I realize that there is nothing in my knowledge to compare with Frege’s dedication to truth. His entire life’s work was on the verge of completion, much of his work had been ignored to the benefit of men infinitely less capable, his second volume was about to be published, and upon finding out that his fundamental assumption was in error, he responded with intellectual pleasure clearly submerging any feelings of personal disappointment.

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These efforts by Boole and Frege were two, but only two, of the most important steps taken in the 19th century which invigorated the design of new logical systems. We see a great deal more effort made to be conscious and aware of the characteristics of the language used in the logical analysis, and an equally great awareness of the subtleties and the sometimes treacherous features of natural language. Treacherous? That would only be the logician’s perspective, the logician who has certain expectations of how a communicative system ought to work and who feels a bit let down when natural language does not live up to those expectations.

The systems that the logician explored, and the new systems that he designed, were things that existed outside of time and space, and they were in that sense abstract. At the same time, psychologists were exploring the abilities as well as the limits and frailties of the ways in which human beings acted and reasoned in real life and in the laboratory. This was a time of tremendous growth in the field of psychology. And it is to this activity that we will now turn.

1 We will return to this in Chapter 8, below.
2 Heijenoort, [1967], p. 127.