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Chapter 2

The Early Empiricist Tradition

0. A Selective History

This work advances a version of scientific empiricism, "small-e empiricism," that draws on the empiricist tradition in philosophy of science. This chapter and the others in this Part I will provide an historical overview of that tradition. The task of identifying that tradition appears straightforward, initially. For the unifying theme in empiricist thought is a privileging of experience; and we might expect that tracing the origin and development of this idea would be straightforward. Matters prove otherwise once we look more closely.

The immediate difficulty for writing the history is that the terms "empiricism" and "empiricist" are now employed in ways that contradict their historical usages. Until the later nineteenth and early twentieth century, to be an empiricist was a term often limited to schools of thought in medicine. Its privileging of experience was not a laudable attempt to proceed prudently in investigations. It was denounced as an excuse for the empiricists' ignorance of the fundamentals of the applicable science. Figures that we now routinely include as core to the empiricist tradition, such as Bacon, Hobbes, Locke, Berkeley, Hume and Mill, did not identify themselves as empiricists. Bacon and Mill both actively disparaged what they called "empiricists" or "empiricism."

This aversion to the label of empiricism was inverted by the twentieth century. It became routine for philosophers of science in the twentieth century to identify as empiricists, even though the specifics of their views might vary greatly. The label came to denote a modesty in one's philosophy, a prudent respect for experience. This meant, inevitably, that versions of empiricism proliferated. In short, prior to 1900, there were too few self-avowed empiricists; after 1900 there are too many.

My goal in these historical chapters is to provide some sense of the rich historical background to modern empiricism; and to provide enough of the history to show the place of small-e empiricism within it. My first criterion for selection of material was to seek work in which "empiricism" is endorsed by name; or at least the adjective "empirical" is used. This criterion is incomplete, since it excludes too many figures from the history that later writers have identified as empiricists, even if these writers do so without any apology that those figures would not have accepted the label.

To proceed, then, I had to do what all historians of empiricism end up doing, tacitly or explicitly. We identify a collection of ideas that are central to empiricism and then write a history that reports their origin and development. To this end, I view two theses as playing central roles in empiricism:

(*source*) Experience is the sole way that we can be informed of contingent truths of the world.

(*totality*) The content of experience is all we can know of the contingent truths of the world.

Empiricists use these ideas to sustain polemical assaults on some elements of the contemporary literature. Their targets vary over time. They may be intuitive ideas, or metaphysical posits, or meaningless statements, or even just claims of realism in science.

Empiricism has been developed within two sorts of analyses that are often intermingled. A psychological analysis takes as its basic elements the thoughts and beliefs of a cognizer, the concepts held by the cognizer and the cognizer's habits of mind. A logical analysis is independent of the minds of cognizers. It investigates both deductive and inductive relations among propositions, some of which are identified as more or less closely related to experience.

Small-e empiricism endorses *source* but renounces *totality*; it continues to reject much of metaphysics; and its analysis lies fully within the logical tradition. Among early twentieth century versions of empiricism, Reichenbach's proves to be most congenial for small-e empiricism. Thus, the history seeks to identify the lineage that passes through Reichenbach's work to small-e empiricism; and neglects later developments that diverge from the lineage.

This need to have some conception of empiricism before writing the history means that other modern versions of empiricism encourage histories with different selections and emphases. In modern epistemology, empiricism is still treated with a mix of psychological and logical

analysis. For example, the debate between empiricists and rationalists was formulated originally in the seventeenth century in terms of the mental states of cognizers. This formulation is retained in present epistemology. Since the present debate is treated as a continuation of the seventeenth century debate, the modern narratives automatically include a history that traces this lineage.[1] This particular history is unimportant for the concerns of small-e empiricism. For them, as elaborated in Chapter 12, this debate is only of historical interest.

Other formulations of empiricism lead to different histories again. We shall see in Chapter 4 that van Fraassen's well-known constructive empiricism evolved in later writings into a severe skepticism. Someone who accepts this skepticism would be inclined to emphasize the more critical elements in past empiricism. Nancy Cartwright, in works such as Cartwright (1989, 2000), gives her version of empiricism. It seeks empirical support for the concept of causation that plays a foundational role in her analyses. This conception diverges from small-e empiricism, which, we shall see in Chapter XXX, assails foundational notions of causation as non-empirical metaphysics. Cobb (2022) writes a history of empiricism heavily informed by Cartwright's conception of empiricism. Cobb's conception of empiricism includes a "realist view of causality" (p. 115) that is uncongenial to small-e empiricism.

These considerations also serve as a prelude to my apologies for the many versions of empiricism that fail to appear in this history. They are not part of the lineage of small-e empiricism. The most noticeable omissions will be some of the empiricisms from the twentieth and twenty-first centuries.

Some are excluded since they are not really forms of empiricism, even though their names may suggest otherwise. Since it invokes the name of Hume, it is tempting to include within the empiricist canon David Lewis' Humean supervenience and the results that depend upon it. In my view, however, Lewis' views were not empiricist, but just the sort of a priori metaphysics that has long been an anathema to empiricists. It is hard to defend his founding of his views on the idea of spatially localized properties, when quantum theory has repeatedly affirmed the existence of non-separable quantum systems. Lewis' (1986, p. xi) announcement that he is "not ready to take lessons in ontology from quantum physics as it now is" reflects no

[1] See, for example, the treatments given in Markie and Folescu (2023) and Nelson (2005).

empiricist sensibilities. It repudiates what has been an established fixture in empirically supported quantum theory since the 1930s. He is right that there is some flux in studies of the foundations of quantum theory. However non-separability has been so enduring that it is hard to see it vanishing with further developments in quantum theory. Lewis (p. xi) justified pursuing his spatially localized ontology as a means of protecting the idea from assaults by (his emphasis) "*philosophical* arguments," independently of empirical considerations. That affirms that his ontological proposal was not responsive to empirical evidence, even though it asserts fundamental physical facts. It was a part of a philosophical game that is played with willful neglect of empirical evidence.

More recent contributions to empiricism have not been included in the history since they have a role in the articulation of small-e empiricism. Notable here is the work of James Bogen and James Woodward (1988) and especially that of Nora Boyd (2018). Their work provides a decisive advance on earlier work in empiricism in developing a conception of experience better adapted to science. Boyd's work will figure in the discussion of experience in Chapter 12 below.

Finally, I offer apologies to readers whose favorite versions of empiricism have been neglected or omitted here.

The remainder of this chapter will recount the development of the empiricist tradition from antiquity to the end of the nineteenth century. Chapter 3 will review the exoneration of doctrines labeled "empiricist" in the first half of the twentieth century through their endorsement by influential philosophers of the time, such as those of the Vienna Circle. Chapter 4 will review van Fraassen's constructive empiricism, but not because it lies in the lineage leading to small-e empiricism. Rather, it is because this version of empiricism became the default view associated with empiricism in the later part of the twentieth century. Chapters 5, 6 and 7 will recount special topics in the history of relevance to the formulation of small-e empiricism.

1. Introduction

In the remainder of this chapter, Section 2 will review the appearance of a view named "empiricism" as a medical doctrine in Greek antiquity. It considered only symptoms of diseases and eschewed investigation of their causes. By the seventeenth and eighteenth centuries in England, the "Empiricks" proceeded as did their ancient namesakes. We shall see in Section 3 that their views were criticized by Francis Bacon and the empiricists themselves were vigorously

denounced by the medical establishment as "quacks." It was only in the nineteenth century that the strongly negative connotations of empiricism started to fade. We shall see in Section 4 that a major factor in this transition was Kant's highly influential writings in philosophy. In seeking a philosophy that melded empirical and rationalist elements, Kant used the term "empirical" in a way quite free of its earlier negative connotations. The German language literature rapidly adopted this rehabilitated sense and the English language literature soon followed. Section 5 recounts how nineteenth century historians of philosophy retrospectively applied the term "British empiricism" to the work of earlier British philosophers who did not themselves identify with the term. Section 6, 7 and 8 reviews the work of the leading members of this group. In the writings of Thomas Hobbes and John Locke, we find one of the most consequential developments: the locus of inquiries into nature is shifted to the mental activities, thoughts and conceptions in the minds of the investigators. George Berkeley's curious development was to take seriously the notion that these thoughts could replace nature. Finally, David Hume[2] introduced a powerful, skeptical analysis of induction, causation and more. His are works of philosophical brilliance that rightly continue to draw attention today.

Section 9 recalls the nineteenth century introduction of positivism through Auguste Comte's "positive philosophy." The work of Ernst Mach, reviewed in Sections 10 and 11, is routinely described as "positivism," although Mach himself did not actively seek the label. His view was "sensationalist" and awkwardly close to Berkeley's idiosyncratic idealism. Mach portrayed the totality of the world as consisting just of sensations. We shall see in Section 12 that later philosophers, working in Mach's tradition, attached and secured the label of "positivism" to the tradition. Section 13 sums up the equivocal attitude to empiricism at the close of the nineteenth century. The strict doctrine was still a target for sustained criticism. However, tamed versions were entertainable and there was a begrudging acceptance that empiricism played a part in the success of science. Section 14 offers a synoptic summary.

2. Ancient Empiricism

Different views on how we gain knowledge of the world permeate ancient scholarship. To what extend do we rely on reason and a priori thinking? To what extent do we draw on

[2] "British"—since he was a Scot, but not English.

experience? Many juxtapositions are possible. It is traditional to contrast Plato's use of a priori ideas and mathematical models with Aristotle's astute observations of real processes, especially among living things. When a view privileges experience, it is routine to identify empiricist thinking within it. Empiricism in this looser form is dispersed throughout ancient writings.

A tacit respect for experience, however, falls short of an explicit empiricist philosophy. The sharpest articulation of empiricism as a philosophical position and even the word itself arose within the literature on ancient medicine. A rivalry between what were then called "empiricists" and "rationalists" began in the middle of the 3rd century BCE and a mediating "methodist" position was added over two centuries later (according to Frede, 1985, p. ix). Our best account of the views comes from Galen's second century ACE writing. His opening formulation in *On the Sects for Beginners* has a surprisingly modern ring to it (Walzer and Frede, 1985, p. 3):

> Some say that experience alone suffices for the art, whereas others think that reason, too, has an important contribution to make. Those who rely on experience [*empeiria*] alone are accordingly called empiricists. Similarly, those who rely on reason are called rationalists. And these are the two primary sects in medicine. The one proceeds by means of experience to the discovery of medicines, the other by means of indication. And thus they have named their sects empiricist and rationalist.

These are extreme views. Galen soon (p. 10) turns to recount another approach, that of the "methodists." It mediates between the empiricist and rationalist position by selectively drawing some ideas from each.

The terms "empiricist" and "rationalist" are much used in later writing in the history of philosophy.[3] Empiricists rely solely on experience. Rationalists employ *a priori* arguments. Galen's usage of the term does not map well onto this later usage. His medical empiricists concentrated on immediate symptoms of ailments and observations of which treatments produced which results. The analysis is restricted to what we can experience. The rationalists were eager to delve beneath these appearances to find the inner workings of living things and

[3] See Markie and Folescu, (2023) for a synopsis. Galen continues the quote above to note that empiricists are also called "observational" and rationalists also known as "dogmatics" and "analogists."

thus be able to treat them better. They were quite willing to dissect bodies, even living people, in order to see first-hand the structures and processes within. We would now find these rationalists closer in their investigative enterprise to the empirically-minded experimentalists in sciences of later eras. We now regard therapies that treat only symptoms as superficial and prefer medicine informed by the real processes underlying our ailments.[4]

Perhaps the ancient writer best known, mistakenly, as an empiricist is Sextus Empiricus. The mistake is easily made. His empirical credentials are apparently there in the name by which he is now commonly known. His extant writings advance skepticism, not empiricism. Sextus himself distinguished medical empiricism from his skepticism in his *Outlines of Skepticism* (Annas and Barnes, 2000, pp. 62-64). The "Empiricus" likely designates his affiliation with the medical community of his time, presumably the empirical medical community. According to Bett (2005, p. xiii), he wrote now lost medical works.

His views are not empirical in so far as empiricism requires the privileging of experience as the most secure or even only secure form of knowledge. Sextus Empiricus' skepticism has no such goal. Sextus takes two views: that we have knowledge of the world; and that we do not have knowledge of the world. He seeks to demonstrate in *Against the Logicians* and *Outlines of Skepticism*, that the arguments for and against each of these positions are of equal strength. Thus, we are in no position to decide between them.[5]

Sense-perception is discussed throughout *Against the Logicians*. However, it is not offered as privileged knowledge. Rather it figures in his attempts to impugn the idea that there are "signs." These are items of evidence supporting further inferences, such as the supposed connection of the sign of smoke to a hidden fire. Sense-perceptions, he argues, cannot be shown unequivocally to be such signs. In his *Outlines of Skepticism*, this attack on the veracity of sense-perception itself is repeated. He discounts systematically the veracity of sight, sound, smell and taste (p. 33)

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[4] For lively details of the ancient empiricist and rationalist traditions, see Cosans (1997).

[5] For terse statements by Sextus Empiricus of this goal, see *Against Logicians,* p. 120 and *Outlines of Skepticism,* p. 5.

> … our eyes contain membranes and liquids inside them. Since, then, what we see is not observed without these, it will not be apprehended accurately; for it is the mixture which we grasp, and for this reason people with jaundice see everything as yellow, while people with a blood-suffusion in the eye see things as blood-red.' And since the same sound appears different in open places and in narrow winding places, and different in pure and in contaminated air, it is likely that we do not have a pure grasp of sound; for our ears have winding passages and narrow channels, and are contaminated by vaporous effluvia which are said to be carried from the region of the head. Further, since certain kinds of matter exist in our nostrils and in the regions of taste, it is together with these, not purely, that we grasp what we taste and smell.
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> So because of the admixtures our senses do not grasp what external existing objects are accurately like.

This blanket skepticism about sense-perception is noteworthy since it is an early and cogent critique of the privileging of experience by empiricism. It depends on approaching the problem from what we would now find to be a scientifically respectable manner: examining the physical operation our sense organs.

3. Interlude: Empiricism and Quackery

By the seventeenth and eighteenth centuries in England, empiricism had few prominent supporters. Francis Bacon's 1620 *Novum Organum* has no praise for it. He listed empiricism as one of the causes of error and false philosophy (Aphorism 62, p. 68). His parable of the ant, spider and bee (Aphorism 95, p. 105) replicates Galen's contrast of empiricists (ants) versus rationalist/dogmatists (spiders) and mediating methodists (bees) and has no praise for the ants. He criticized empiricism for merely relating experience to experience, where he felt the proper goal should be the discovery of causes and axioms in nature. His complaint still stands today if directed at strict empiricist of the modern era. He wrote (Aphorism 117, p. 119):

> My way and method, however (as I have often clearly stated and would like to state again), is not to extract works from works, nor experiments from experiments as the empiricists do, but from works and experiments to extract causes and axioms, and

again from those causes and axioms to extract new works and experiments, as a legitimate interpreter of Nature.

The denouncing of empiricism and its association with a specific type of medicine persisted well into the eighteenth century. The latter underwent a transition from indicating a merely experientially based approach to medicine to designating ill-informed and fraudulent medical practice and outright quackery. The transition is documented in the eighteenth century literature itself. Anon (1715) commences (p. 7) with a sympathetic recounting of the approach of ancient "Empiricks" that was quite close to Galen's original characterization. It then turns to "Modern Empiricks." They are unqualified and incompetent medical practitioners and frauds. The volume is devoted to a colorful exposé of them. Guybon's (1712) *An Essay Concerning the Growth of Empiricism; Or the Encouragement of Quacks* was similarly forthright in its denunciation of medical quackery and demands for regulation of the medical profession. He categorized "quack" and "empirick" together as the target of his ire (e.g. p.2) and gave this definition (p.3):

> … by a Quack or Empirick, I mean any and every one of those who pretend to practise Physick without Knowledge of the *Prerequisita* to that most useful but most difficult Art.

The usage continued in the leading journal literature. In the *Philosophical Transactions of the Royal Society, London,* Banyer's (1743) "Postscript Against Empiricism" denounced incompetent medical practitioners under the same label. Priestly's (1775) *Philosophical Empiricism* turns out to be an animated defense against a charge that he plagiarized some experimental results. Aside from the title, the term "philosophical empiricism"[6] appears only once in its pages (p. 59), where Priestly explains that he uses it to label his critic's incompetence in chemistry.

4. The Rehabilitation of the Empirical

This pejorative sense for empiricism persisted well into the nineteenth century. As late as its 1825 edition, Johnson's celebrated English dictionary defined "Empiric" as "A trier; an

[6] "Philosophical" here likely denoted "pertaining to natural philosophy." The term is better rendered for us now as "scientific empiricism."

experimenter; such persons as have no true education in, or knowledge of physical practice, but venture only hearsay and observation only." (p. 615) and "Empiricism" as "Dependence on experience without knowledge or art; quackery." The eighth edition of the *Encyclopedia Britannica*[7] of 1855 still included among several senses of "Empiric" the pejorative: "a common designation for one who enters on practice without regular professional education; and, in general, for a quack, or pretender to medical skill." The entry for Empiric was eliminated by the 9th edition of 1889.

The beginnings of the rehabilitation of empirical approaches are evident in the writing of Immanuel Kant. The term "empirical" (*empirisch*) appears throughout his *Critique of Pure Reason* (1787) and his *Prolegomena to Any Future Metaphysics* (1783). It is used throughout as an adjective, such as in "empirical cognition" (*empirische Erkenntnis*) (1787, p. 136). The term is defined to mean "have their ground in immediate sense-perception" (Kant, 1783, p. 54). Kant's project was to seek some sort of synthesis of the empirical and the rational. In this usage, it does not carry the negative connotations we have seen elsewhere. As far as I can see, it was not used directly by Kant to identify such figures as Hume as "empiricists."

The free and frequent use of the term "empirical" by Kant in his massively influential philosophical writing is novel, or so it seems. On a less than thorough search of prior German language writings, the use of the German *empirisch* is rare and sporadic and it is no special focus of attention. After Kant's free use of the term, *empirisch* was almost immediately treated as a significant and central term in philosophical analysis in his tradition, free of its negative, medically connected connotations.[8]

An immediate manifestation of its rehabilitation is in Georg Mellin's massive, multivolume *Encyclopedic Dictionary of Critical Philosophy*. The second volume (Mellin, 1799)

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[7] *Encyclopedia Britannica* Vol VIII. 1842. Edinburgh: Adam and Charles Black.

[8] I thank Katherine Brading for urging me to review the German language writing in philosophy from this time.

covers only the letters D and E, even though it is over 500 pages in length. The entry for *empirisch* starts with the general definition (p. 290):[9]

> *a posteriori*, from experience, from behind, *ἐμπειρίκον, empiricum, ex experientia ortum, empirique*, is that intuition or concept that contains sensation (which presupposes the actual presence of the object).

The entry continues for four pages (pp. 290-293) and explores multiple applications of this basic notion. None have the older, negative connotation. The fourth volume, part II, includes a lengthy analysis of "empiricism" (*Empirismus*) within the entry on "rationalism," against which empiricism is presented as a counterpoint. *Empirismus* is defined as (1802, p. 758):[10]

> The assertion … that all our knowledge must be derived from experience and comes to us through the senses, is called empiricism, and if it admits no rational knowledge at all, it is called *pure empiricism*.

Mellin's dictionary was limited in scope, if we are to accept the statement of purpose given on the title page of the second volume: "[an] attempt at a comprehensive and complete explanation of the concepts and results contained in Kant's critical and dogmatic writings."

As late as the mid nineteenth century there was still a sense that the term *empirisch* was an arcane term of the philosopher's art. The celebrated, multivolume German dictionary of the brothers Grimm had no separate entries for *empirisch* or *Empirismus* in the pertinent volume (Grimm, 1862). However, related terms did appear in the definitions of the German word *Erfahrung* (experience) and its derivatives. In the entry for *Erfahrung* (p. 793), the brothers note that:

> For present-day philosophers, experience (*Erfahrung*) is a technical expression and synonymous with *empirie, εμπειρια.*

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[9] "*a posteriori*, aus der Erfahrung, von hinten her, *ἐμπειρίκον, empiricum, ex experientia ortum , empirique*, ist diejenige Anschauung oder derjenige Begriff, worin Empfindung (die die wirkliche Gegenwart des Gegenstandes voraussetzt) enthalten ist."

[10] "Die Behauptung hingegen, dass alle unsere Erkenntniss aus der Erfahrung müsse abgeleitet werden , und durch die Sinne in uns komme , heisst der Empirismus, und wenn er gar keine rationale Erkenntniss zu giebt , *der reine Empirismus*."

They continue with a reporting in some detail on experience in Kant's philosophy that includes multiple uses of the adjective *empirisch*. Other entries are terser. For example, *Erfahrungswahrheit* (truth of experience) is defined as *empirische wahrheit* (empirical truth).

These hesitations had passed by the time of the publication of Duden's German dictionary at the close of the nineteenth century. It supplied terse and modern definitions (1898, p. 86) for *Empirie*, *Empirik*, *Empiriker* as "one who derives knowledge from experience" and gives the adjective *empirisch*.

Whatever hesitations may have been felt by dictionary writers, a benign use of the term *empirisch* entered German language publications almost immediately after Kant's endorsement. An 1819 treatise on heat (Buquoy, 1819) included *empirisch* in its title that began: *The Fundamental Laws of the Phenomena of Heat, empirically founded, and their meaning…* A later, mid-century work (Büchner, 1856) that aimed at a popular audience apparently had no reservations about using the term in its title: *Force and Matter: Empirical-Naturphilosophical Studies. In Generally Understandable Presentation.* A final index of how benign the term had become is its casual use by Ernst Mach in the first 1883 edition of the work now known in English as the *Science of Mechanics*. The term appears just once (1883, p. 175) in reporting Kepler's "three empirical (*empirische*) laws for the motion of the planets."

The German language literature led in its rehabilitation of the notion of the empirical. It is a plausible conjecture that this rehabilitation was carried over by English language authors' reading of German philosophy. In any case, by the second half of the nineteenth century, a more familiar understanding of empiricism was sufficiently established in the English language literature for Fleming's 1860 volume on philosophical terminology to give a sympathetic recounting of it and to summarize it as "*Empiricism* allows nothing to be true nor certain but what is given by experience, and rejects all knowledge *a priori*." (p. 157)

5. The British Empiricists

Given the negative connotation of the term "empiricism" in their time, it is no surprise that seventeenth and eighteenth century British philosophers like John Locke, George Berkeley and David Hume did not identify themselves as empiricists. The term "British empiricism" came into later use. We can see the transition in Masson's 1865 *Recent British Philosophy*, which was written when the term "empiricism" was losing its negative connotations. His was a rollicking,

polemical work designed to arouse British national pride in its philosophy. To this end, he attributed to Hegel the rebuke that (1865, p. 3):

> … England was the only country in Europe where the word Philosophy had become synonymous with natural science, where the barometer and thermometer were spoken of as "philosophical instruments," and where a so-called *Philosophical Journal* treated of agriculture, housekeeping, cookery, and the construction of fire-places.

Masson applied the term "empiricism" to the work of British philosophers, even though he acknowledged in a footnote (pp. 36-37) a popular prejudice that associated a scornful ("opprobrious") sense to "Empiric." He used the term "British Empiricism" (such as on pp. 53, 110, 119, 208, 214) for the work of British philosophers spanning centuries. It seems to embrace work by Francis Bacon, Thomas Hobbes, John Locke, George Berkeley, David Hume and more figures from the nineteenth century.

It is unclear to me whether Masson (p. 214) represented John Stuart Mill as a British Empiricist. Mill himself would not have accepted the empiricist label. His 1843 *System of Logic* disparaged empiricism. He decried the fallacy of confusing mere empirical laws with true causation (1843, Vol. 2, p. 416):

> … the distinction is confounded between empirical laws, which express merely the customary order of the succession of effects, and the laws of causation on which the effects depend.

He then equated (pp. 416-17) "bad generalization *à posteriori*" with "empiricism properly so called." Mill's dismissal of empiricism is sharp in his summary hope for a future social science, guided by the principles he has outlined (p. 612):[11]

> When this time shall come, no important branch of human affairs will be any longer abandoned to empiricism and unscientific surmise: the circle of human knowledge will be complete, and it can only thereafter receive further enlargement by perpetual expansion from within.

The term, "British empiricism," introduced perhaps through Masson's nationalistic pride, lived on, but not with great prominence in the literature. By the time of the mid 20th century

[11] This negative appraisal of the first edition of 1843 survived to the last, eighth edition of 1882.

volumes of Copleston's history of philosophy, use of the term seems to be common. We find in Volume IV (1958, p. 15):

> It is customary to divide pre-Kantian modern philosophy into two main streams, the one comprising the rationalist systems of the Continent from Descartes to Leibniz and his disciple Christian Wolff, the other comprising British empiricism down to and including Hume.

The volume then identifies Locke, Berkeley and Hume as central figures (p. 16).[12] Locke is identified (p. 16) as "real father of classical British empiricism."

6. Empiricism as a Theory of Mental Life

Hobbes (1651) *Leviathan* and Locke's (1689) *Essay* solidified what is, in my view, the most significant transformation of the empiricist tradition. Locke described and took credit for the transformation in his introductory, "Epistle to the Reader." Discussions with five or six friends on an unspecified subject stalled until Locke saw the way forward:[13]

> After we had a while puzzled ourselves, without coming any nearer a Resolution of those Doubts which perplexed us, it came into my Thoughts, that we took a wrong Course; and that, before we set ourselves upon Enquiries of that Nature, it was necessary to examine our own Abilities, and see what Objects our Understandings were, or were not fitted to deal with.

Work in the empiricist tradition so far had concerned a privileging of knowledge of those things in the world most directly accessible to our experience. In the new analysis, the locus shifted from things in the world to the ideas in our heads.

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[12] The identification of this trio was already established in the nineteenth century. The University of Michigan library catalog, for example, lists an 1889 Master's thesis, Elisha Monroe Hartman, *The Scepticism of British Empiricism*, and indicates its subjects as the three philosophers, Locke, Berkeley and Hume.
https://search.lib.umich.edu/catalog/record/990127465090106381?query=Scepticism%20of%20British%20Empiricism&utm_source=lib-site-search

[13] The Epistle is unpaginated. The text quoted is on its third page.

Writing only a few decades earlier than Hobbes and Locke, Francis Bacon (1620) embodied the earlier view. He recommended that inductive investigations begin with tables drawn from experience. To begin investigations of the form of heat, for example, he assembled Tables of Existence and Presence [of heat]; of Absence in Proximity; and of Degrees. Their entries were the starting points in experience for inductive inferences towards the form of heat. They were mind-independent things in the world to which we have ready access in experience. The Tables of Existence and Presence, for example, included (pp. 144-45) "rays of the sun," "fiery meteors" and "burning thunderbolts."

Chapter 1 of Hobbes' *Leviathan* (1651) begins with an examination of mental contents. The chapter is titled "Of Sense" and its opening words are "Concerning the Thoughts of man…" It continues with a recounting of how our various senses produce a mental image that can persist after the object is removed. This is called by Hobbes (p. 5), "imagination" and, as it decays, it is called "memory." What now follows is the completed redefinition of experience as purely mental (Hobbes' emphasis):

> Much memory, or memory of many things, is called *Experience*.

The text continues to explore how the mind uses these imaginations. Simple ones are combined to produce compounded imaginations, such as when the sights of a man and of a horse are compounded to a Centaur. The text passes through "Traynes of Thought, or Mentall Discourse" (p. 9) to ever more elaborate imaginations. The ambition appears to be to recover all mental content from such operations. We can gauge the extent of the ambition from its concern to embrace the notion of infinity, which we would expect by its nature to be beyond the simple compounding of experiences. Hobbes' addressed the issue squarely by denying that an idea can be formed in our minds (p. 11, his emphasis):

> Whatsoever we imagine, is *Finite*. Therefore there is no Idea, or conception of any thing we call *Infinite*. No man can have in his mind an Image of infinite magnitude; nor conceive infinite swiftness, infinite time, or infinite force, or infinite power. When we say any thing is infinite, we signify onely, that we are not able to conceive the ends, and bounds of the thing named; having no conception of the thing, but of our inability.

Hobbes then immediately gave a similar analysis for that which we name God.

Locke's (1689) *Essay concerning Human Understanding* developed similarly. His founding theme is that all ideas come from experience. This theme is pursued with greater vigor than did Hobbes. The mind is like a blank sheet of paper[14] upon which experience writes (p. 67, Locke's emphasis):

> Let us then suppose the Mind to be, as we say, white Paper, void of all Characters, without any *Ideas*; How comes it to be furnished? Whence comes it by that vast Store, which the busy and boundless Fancy of Man has painted on it, with an almost endless Variety? Whence has it all the Materials of Reason and Knowledge? To this I answer, in a word, from *Experience*: In that, all our Knowledge is founded; and from that it ultimately derives itself.

Locke then explained how we arrive at the totality of all our idea from experience (p. 69, his emphasis):

> The Understanding seems to me not to have the least Glimmering of any *Ideas*, which it doth not receive from one of these two. External objects furnish the Mind with the Ideas of sensible Qualities, which are all those different Perceptions they produce in us: and the *Mind furnishes the Understanding with* Ideas *of its own Operations.*

What Locke calls "primary qualities" are the properties of the bodies that produce sensations, such as solidity, extension, figure and motion. (p.98). The ideas they produce are called "secondary qualities" (p. 98). They include colors, smells, tastes and sounds. These preliminaries are followed by elaborate attempts spanning many pages of the text to recover many familiar ideas. As with Hobbes, the idea of infinity attracts special attention. It is not obvious how it can be derived from experience. Locke's analysis is labored and fills a thirteen page Chapter XVII. The conclusion is similar to Hobbes'. We can have no positive idea of any infinite magnitude, but only the idea of its indefinite extendibility.

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[14] This representation of the mind as white paper was almost immediately absorbed into an existing tradition in which the mind is represented as a blank slate—*tabula rasa*. Locke does not use the term here in this *Essay* but does use it elsewhere in other writings. For an account, see Duschinsky (2012).

7. Berkeley's Idealism

Both Hobbes and Locke presumed that our experiences are caused by independently existing bodies. Once they have relocated experience into our mental activities, might not the privileging of experience suggest to someone that this mental activity is not merely privileged but is the totality of it all? Devoted philosophical analysis has the power to warp our thinking. There is, I believe, no idea so absurd that some philosophers, somewhere have not talked themselves into it. George Berkeley fulfils this expectation. He argued in his *Principles of Human Knowledge* (1734) that all that exists are perceptions in minds. (p. 25):

> It is indeed an opinion strangely prevailing amongst men, that houses, mountains, rivers, and in a word all sensible objects have an existence natural or real, distinct from their being perceived by the understanding. … For what are the forementioned objects but the things we perceive by sense, and what do we perceive besides our own ideas or sensations; and is it not plainly repugnant that any one of these or any combination of them should exist unperceived?

He continued to introduce an eternal spirit as a catch-all perceiver who perceives when we do not (p. 26):

> … all those bodies which compose the mighty frame of the world, have not any subsistence without a mind, that their being is to be perceived or known; that consequently so long as they are not actually perceived by me, or do not exist in my mind or that of any other created spirit, they must either have no existence at all, or else subsist in the mind of some eternal spirit :…

We need not linger here to discern the theological motivations that made the notion appealing to the Bishop. We can certainly understand the theological appeal of the idea that all existence arises from the perception of an eternal spirit. We should also note Berkeley's efforts to dispel the notion that the world is just a figment of humanity's imagination. For Berkeley insists that "real things" are "imprinted on the senses by the Author of Nature." (p. 37) They are unlike the irregular perceptions of our imagination. He reassures us (p.38):

> I do not argue against the existence of any one thing that we can apprehend, either by sense or reflection … The only thing whose existence we deny, is that which philosophers call matter or corporeal substance.

What matters for our purposes is that empiricist thinking can lead to skeptical thinking; and here it has done so in the most extreme manner. The precise form of Berkeley's skepticism, however, is open to historical debate.

8. Hume's Skepticism

Hobbes and Locke's relocation of our understanding of experience to mental processes was important for science. Once it was recognized that mere introspection is insufficient for a reliable science of the mind, an empirically grounded science of psychology could emerge. However, the relocation proved to be harmful for epistemology. For consideration of what we are justified in learning from experience was replaced by introspection on how the mind happens to proceed from one idea to another. Many epistemologists now call this "inference." That our thoughts proceed from this idea to that is no basis for concluding that its arrival is justified. Whether it is justified is a matter of mind-independent logic. Much modern epistemology still uses introspection to comprehend an inference as a habit of mind, where these efforts should properly now be pursued by empirically-grounded psychology.

It is to David Hume's credit that his *Treatise* (1739) and later *Enquiry* (1777) revived the consideration of the justification of the connections made by the mind. Its revival is to be welcomed, even if his notorious skeptical conclusion vexed philosophers for centuries.

Hume's overall framework was that of Hobbes and Locke. His overt concern was how the mind forms ideas and proceeds to other ideas. What became known as "Hume's fork" is a development of the two modes of formation of ideas just sketched in remarks from Locke above. That is, in his *Treatise*, Hume distinguished "Relations of Ideas" from "Matters of Fact" (1739, p. 25). However now Hume sought to determine the basis on which we should accept each of these.

Relations of ideas are the simpler case. They are discoverable by the mere operation of thought. An example is arithmetic. We need no experience of the world to know that three times five is equal to half of thirty. Such relations of ideas are demonstrably certain. Their falsity would imply a contradiction. We are justified in accepting them.

Matters of fact are otherwise. They may be true or false. Without experience, we cannot know which. His example concerns the proposition that the sun will rise tomorrow. Its falsity

would imply no contradiction. Hume then formulated the question whose skeptical answer became the most celebrated part of his analysis. (1739, p. 26):

> … what is the nature of that evidence which assures us of any real existence and matter of fact, beyond the present testimony of our senses, or the records of our memory.

Our senses tell us the sun rose today. How are we assured of the matter of fact that it will rise tomorrow? To proceed, Hume assumed what is, to many modern readers like me, an excessive restriction on how we may learn matters of fact (p. 26):

> All reasonings concerning matter of fact seem to be founded on the relation of Cause and Effect. By means of that relation alone we can go the evidence of our beyond memory and senses.

We are inclined by a habit of mind to accept that the fire that has always burned us will continue to do so; and that the bread that always nourished us will continue to do; and that the sun that has always risen will continue to do so. We feel justified in these acceptances since just such acceptances in the past have met with success. We are mistaken in this feeling, Hume claimed famously, for this reasoning is circular (1739, p. 36):

> We have said that all arguments concerning existence are founded on the relation of cause and effect; that our knowledge of that relation is derived entirely from experience; and that all our experimental conclusions proceed upon the supposition that the future will be conformable to the past. To endeavour, therefore, the proof of this last supposition by probable arguments, or arguments regarding existence, must be evidently going in a circle, and taking that for granted, which is the very point in question.

Hume's analysis vexed his philosophical readers. Most famously, Immanuel Kant (1783, p. 7) credited it for "interrupt[ing] my dogmatic slumber." After a hiatus in the nineteenth century, Hume's analysis was revived and generalized in the early twentieth century as one of the most recalcitrant philosophical problems.[15]

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[15] For a brief survey of the history of Hume's problem of induction, see Norton (2024, Ch. 6). There I argue that the material theory of induction escapes the modern formulation of Hume's problem since the theory has no universal rules of inductive inference.

9. Nineteenth Century Positive Philosophy: Auguste Comte

While its proponents do not label themselves as "empiricists," the nineteenth century tradition following Comte's work is closest to that century's implementation of the ideas characteristic of the empiricist tradition. Auguste Comte's *Cours de Philosophie Positive* is a massive, six volume work, published over thirteen years from 1830 to 1842, that sought to give a synoptic picture of the entirety of then present science. Its importance was widely recognized. Martineau's (1880) translation went through multiple editions in England and the US. John Stuart Mill (1866) wrote an entire monograph on it: *Auguste Comte and Positivism*. This monograph also went through multiple printings.

Comte's *Cours* is best remembered for the account of the growth of sciences that was presented in the opening pages of Volume 1, Chapter 1. Each science, he asserted, passes through three states: theological, metaphysical and positive. They are described as (1830, pp. 3-4; translation Martineau, 1880, p. 26):

> In the theological state, the human mind, seeking the essential nature of beings, the first and final causes (the origin and purpose) of all effects—in short, absolute knowledge—supposes all phenomena to be produced by the immediate action of supernatural beings.
>
> In the metaphysical state, which is only a modification of the first, the mind supposes, instead of supernatural beings, abstract forces, veritable entities (that is, personified abstractions) inherent in all beings, and capable of producing all phenomena. What is called the explanation of phenomena is, in this stage, a mere reference of each to its proper entity.
>
> In the final, the positive state, the mind has given over the vain search after absolute notions, the origin and destination of the universe, and the causes of phenomena, and applies itself to the study of their laws—that is, their invariable relations of succession and resemblance. Reasoning and observation, duly combined, are the means of this knowledge. What is now understood when we speak of an explanation of facts is simply the establishment of a connection between single phenomena and some general

> facts, the number of which continually diminishes with the progress of science.

This account contains the two ideas central to positivism.[16] First, the burden of the sciences is merely to discover the connections between phenomena. Second, these connections are the totality of the science. Forces, causes, entities and the like are merely transitional conceptions on our way to the positive account. Here "metaphysics" has an extremely broad meaning and seems to cover anything extending beyond phenomena.

10. Mach's Economy

The positivist approach was pursued by others in the nineteenth century. The work of Richard Avenarius and Ernst Mach seems to have attracted most attention. Mach's prominence outlived that of Avenarius, presumably because of Mach's prodigious contributions in other fields and especially for the influence of his writings on Einstein. We shall see that Mach's positivism was an extreme form of skepticism. It disavowed all counterfactuals in science. It prohibited assertions of what would have happened if circumstances had been different. That skepticism is underwritten by some version of idealism. The totality of the world resides entirely in sensations, while there are no sensors.

Mach's memorable formulation of the approach is terse. "Physics is experience arranged in economical order," he asserted in his 1882 address "The Economical Nature of Physical Inquiry." (1898, pp. 186-235) He made clear just how sparse is this economical arrangement with a simple example (p. 193):

> … to save the labor of instruction and of acquisition, concise, abridged description is sought. This is really all that natural laws are. Knowing the value of the acceleration of gravity, and Galileo's laws of descent, we possess simple and compendious directions for reproducing in thought all possible motions of falling bodies. A formula of this kind is a complete substitute for a full table of motions of descent, because by means of the formula the data of such a table can be easily constructed at a moment's notice without the least burdening of the memory.

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[16] Comte himself calls his view "positive philosophy" ("*la philosophie positive*.") The term "positivism," however, came rapidly into use as the title of Mill's (1866) commentary shows.

Mach denounced Newton's conception of Absolute Space and Absolute Time as untenable metaphysics. It is the view for which he was and is still widely known. Using his economy of description, these Newtonian conceptions were to be replaced by relations among observables. Claims concerning times are, in Mach's reconception, merely statements of relations among observables. The various positions adopted by a rotating earth serves, for example, as a convenient reference. He argued in his *Science of Mechanics* (1919, p. 223, Mach's emphasis):

> When we say a thing A changes with the time, we mean simply that the conditions that determine a thing A depend on the conditions that determine another thing B. The vibrations of a pendulum take place *in time* when its excursion *depends* on the position of the earth.

No such reconception is possible for claims concerning Newton's Absolute Time. Its fate is sealed (p. 224):

> This absolute time can be measured by comparison with no motion; it has therefore neither a practical nor a scientific value; and no one is justified in saying that he knows aught about it. It is an idle metaphysical conception.

The severity of Mach's approach should not be underestimated. The economical descriptions of science are no more that summaries of actual experiences. To go beyond them is merely a creative embellishment in our thoughts. Thus, he said (1898, p. 199, my emphasis):

> Suppose we were to attribute to nature the property of producing like effects in like circumstances; just these like circumstances we should not know how to find. *Nature exists once only.* Our schematic mental imitation alone produces like events. Only in the mind, therefore, does the mutual dependence of certain features exist.

Here we see a strong affinity to Hume's critique of causation. That this has followed that gives us no basis to infer that this will continue to follow that. That it will be so arises merely as a habit of our thought.

From this perspective, Mach's celebrated analysis of Newton's bucket experiment is not advocating a physical mechanism that couples the water of the bucket to the stars.[17] He remarked (p. 232):

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[17] My apologies to readers who do not know the details of Newton's thought experiment and Mach's analysis. An account can be found in Norton (1995).

> No one is competent to say how the experiment would turn out if the sides of the vessel increased in thickness and mass till they were ultimately several leagues thick.

Later authors like Einstein took this to suggest that a fattened vessel wall would manifest the physical mechanism. Yet Mach's point is precisely to deny this suggestion: "No one is competent to say…" he wrote. Lest there be any doubt, he immediately added:

> The one experiment only lies before us, and our business is, to bring it into accord with the other facts known to us, and not with the arbitrary fictions of our imagination.

Here Mach repeated what he asserted in his 1882 address: "Nature exists once only."

11. Mach's Sensationalism

This much of Mach's analysis is already identifiable as a quite extreme view that denies the admissibility of predictions and of counterfactual propositions. A fuller reading of Mach's corpus reveals that his view is still more extreme. Berkeley had urged that the totality is just experience. In his *Analysis of Sensations* (1897), Mach argued for something similar. We are mistaken, he argued, in identifying the contents of the world with the familiar notions of matter, bodies, space and time. They are nothing beyond relatively stable relations—"complexes"—among sensations (p. 6):

> Thing, body, matter, are nothing apart from their complexes of colors, sounds, and so forth—nothing apart from their attributes.

Also (pp. 7-8):

> The physiology of the sense, however, demonstrates, that spaces and time may just as appropriately be called sensations and colors and sounds.

Mach's critique of Newton's Absolute Space and Time gains some credibility from Einstein's later praise for it. However, unlike Einstein's discovery of special relativity, Mach's critique is not grounded in any significant, factual discovery. Mach's critique is entirely the result of his *a priori* reflections on sensations. These same extremist reflections led to Mach's opposition to the atomic theory (p. 152, Mach's emphasis):

> If ordinary "matter" must be regarded merely as a highly natural, unconsciously constructed mental symbol for a complex of sensuous elements, much more must

> this be the case with the artificial hypothetical atoms and molecules of physics and chemistry. The value of these implements for their special, limited purposes is not one whit destroyed. As before, they remain *still* economical symbolisations of the world of experience.

Mach was uncompromising in this reduction of the totality to senses. Prior to this dismantling of bodies, space and time, Mach had already dismantled the notion of the self as something fundamentally distinct from the larger collection of sensations (p. 3):

> As relatively permanent, is exhibited further, that complex of memories, moods, and feelings, joined to a particular body (the human body), which denominated the "I" or "Ego."

Body and ego, Mach soon averred, are "makeshifts" (p. 11).

The idea that the self is merely a relatively stable collection of sensations conforms with the analyses of Locke and Hume. Where Mach advanced the notion at the outset of his analysis and thus gave it great prominence, Locke and Hume were slower to present the view. Much later in his text, Locke (1689, pp. 292-93) had argued that personal identity resides not in a substance, but in consciousness. Socrates asleep and Socrates awake are not the same person, since their consciousnesses are distinct. Similarly, Hume opposed the conception of a soul as delimiting the self. The self is instead (1739, p. 252) "nothing but a bundle or collection of different perceptions, which succeed each other with an inconceivable rapidity, and are in a perpetual flux and movement."

There can be no doubt of the strength of Mach's commitment to the notion that there is nothing beyond sensations in the world. He wrote "The assertion, then, is correct that the world consists only of our sensations" (1897, p. 10) and a startling "… the ego can be so extended as ultimately to embrace the entire world." (p. 10)

Such extreme claims leave us unsure of just what is a "sensation." The ordinary meaning of the term requires a sensor in which the sense arises and something else that is sensed. While Locke retained those components, Berkeley eliminated the something else sensed. To preserve existence when there is no human sensing, Berkeley called upon the sensing of an "eternal spirit." Mach resorted to no such device. Without sensors and things sensed, we may well wonder how the term "sensation" can be used at all. (Mach, 1897, p. 18) recognized the problem and proposed to replace "sensations" by "elements":

> Usually, these elements are called sensations. But as vestiges of a one-sided theory inhere in that term, we prefer to speak simply of elements, as we have already done.
>
> The aim of all research is to ascertain the mode of connexion of these elements

Analysts more sophisticated than me can perhaps understand what Mach intends these elements to be. Mach lists "colors, sounds, temperatures, pressures, space, times and so forth…" (p. 2) as examples of sensations. If there is no sensor, what are they? What is a color without the eyes that sense it? Why are these the fundamental constituents of nature if there are no sensors to privilege them?

It was already noted above that Hobbes, Locke and those who followed them conflated the study of the operation of the mind with an analysis of justification in epistemology. The first is properly advanced as an empirical science and second by traditional philosophical analysis. This conflation is present is the most extreme form so far in Mach's writings. The remarks quoted above identify the world as nothing but sensations. They come in the opening pages of a work, the bulk of which is devoted to the physiology of our sense organs and the mental processes associated with them. These parts of the work, like so much of Mach's corpus of writings, are a contribution to physiology and psychology.

Mach did not keep the two separated.[18] One example illustrates the lack of separation. His 1897 lecture, "On Sensations of Orientations" (1897, pp. 282-308), reports his analysis of how we living beings orient or balance ourselves in space. It includes astute observations of the experience of vertigo, laboratory experiments of Mach's design in which subjects were spun in a cradle and analysis of the physiology of the semi-circular canals in our ears that give us a sense of balance. In the midst of his analysis, Mach reverted to his opposition to Newton's concept of Absolute Space (pp. 289-90):

> Had Newton known them [our sometimes spurious inner sense of motion] and had he ever observed how we may actually imagine ourselves turned and displaced in space without the assistance of stationary bodies as points of reference, he would certainly have been confirmed more than ever in his unfortunate speculations regarding absolute space.

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[18] Mach surely was aware of the merging of the two fields and presumably, but incorrectly, thought it admissible.

Since these perceptions are immaterial to Newton's arguments for Absolute Space, it is hard to see the cogency of Mach's remark. They are cogent, however, if one fails to separate psychology from epistemology.

12. Positivism

While neither Richard Avenarius nor Ernst Mach identified themselves as positivists or their views as positivism,[19] they rapidly became known as such. Moritz Schlick, in his 1918 *General Theory of Knowledge [Allgemeine Erkenntnistheorie]* freely associated both with positivism as if it is no novelty to his readers. He wrote, for example, of the "Avenarius-Machian positivism" (p. 261). The attachment of the positivist label had begun over a decade earlier. Joseph Petzoldt's 1906 *The Problem of the World from the Positivist Standpoint [Das Weltproblem von positivistischen Standpunckt aus]* is dedicated to Ernst Mach "in gratitude and loyalty." Its preface (p. v) attributes the foundation of the "positivistic conception" to Wilhelm Schuppe, Ernst Mach and Richard Avenarius.

That the later Vienna Circle should adopt the label "positivism" in their logical positivism is not a surprising development. Positivism had rapidly become a philosophical movement in Germany. A Society for Positivistic Philosophy [*Gesellschaft für positivistische Philosophie*] had been formed and had published the first issue of its *Journal for Positivistic Philosophy* [*Zeitschrift für positivistische Philosophie*] in 1913. Its first issue begins on page one with a paper, "Positivistic Philosophy," by Petzoldt (1913). It was an extended text of the lecture he had given at the opening session of the Society on November 11, 1912.

13 Empiricism at the Start of the Twentieth Century

When the twentieth century began, the doctrine that carried the name "empiricism" was still, in some quarters, in a transition from its earlier, widely shunned formulation to something more respectable. An enlightened 1909 encyclopedia entry still captured the sense that empiricism had been an extreme and untenable view. Now the weakness reported may have reflected Kantian reservations about a pure empiricism without rationalist elements, as opposed

[19] Mach does accept the label "positivism" when applied to his ideas by Max Planck. See Bradley (2013, p. 206) for details.

to the earlier connection to medical quackery. The basic doctrine was summarized tersely as (United Editors Association, 1909, no page number, entry "Empiricism"):

> The doctrine that all knowledge is gained through or based on experience.

It proceeded immediately with a most welcome distinction that indicated that, at least for this entry, the new science of psychology was distinguished from the philosophers' epistemology. "Empiricism in psychology" pertained to the contents of consciousness. A different sense of empiricism applied "in logic and epistemology" where "the sole test of truth is verification in experience." Bacon, Locke, Berkeley, Hume and Condillac were identified as empiricists and their views deprecated as

> … extreme absurdities … refuted by Kant … who introduced a new view called "critical Empiricism" or "Criticism"…

The article then identified a tamed empiricism whose name could be attached retrospectively to the work of philosophical luminaries of the past century:

> Since Kant's time, extreme Empiricism has been thought untenable, and by Empiricism now is usually meant the attitude of those who regard actual sense experience and concrete scientific observations and experiments as more important tests of truth than purely logical tests, such as consistency and comprehensiveness of thought.
>
> Taking Empiricism in this last sense, among the chief empiricists of the last hundred years may be mentioned, J. S. Mill, W. S. Jevons, Venn, K. Pearson, and L. T. Hobhouse. Auguste Comte and Herbert Spencer may also be reckoned as empiricists, while William James is a "radical empiricist ."

We can see one manifestation of this transition in the critique of empiricism mounted by Henry Sidgwick, who harbored some Kantian sympathies. He was, in his time, a prominent philosopher and economist at the University of Cambridge, where he worked until his death in 1900. The burden of his "Incoherence of Empirical Philosophy" (Sidgwick, 1882) is clear from its title. His principal complaint against empiricism is that inductive inference is too impoverished to carry us fully as empiricism required from experience to the knowledge contained within the science of his time. His later "Criteria of Truth and Error" (Sidgwick, 1900) gave a vivid and terse summary of his complaints. He provided a quite serviceable description of empiricism (p. 15):

> I take the principle of Empiricism, as an epistemological doctrine, to be that the ultimately valid premises of all scientific reasonings are cognitions of particular facts; all the generalisations of science being held to be obtained from these particular cognitions by induction, and to depend upon these for their validity.

His denunciation of empiricism followed immediately:

> I do not accept this principle I think it impossible to establish the general truths of the accepted sciences by processes of cogent inference on the basis of merely particular premises; and I think the chief service that J. S. Mill rendered to philosophy, by his elaborate attempt to perform this task, was to make this impossibility as clear as day.

Sidgwick's then solidified his critique of empiricism by reaffirming his confidence in scientific knowledge. Empiricism, he could now conclude, lacked the means to underwrite this confidence. His 1882 "Incoherence…" paper ended with this point (p. 543):

> If, finally, the reader who has got through this paper should say that my cavils cannot shake his confidence in experience, or in the aggregate of modern knowledge that has progressed and still progresses by accumulating, sifting, and systematising experience—I can only answer that my own confidence is equally unshaken. The question that I wish to raise is not as to the validity of received scientific methods, but as to the general epistemological inferences that may legitimately be drawn from the assumption of their validity. It is possible to combine a practically complete trust in the procedure and results of empirical science, with a profound distrust in the procedure and conclusions especially the negative conclusions—of Empirical Philosophy.

A similar conclusion was added in an appendix to 1900 "Criteria…" paper in a collection of his papers (Sidgwick, 1905, p. 461, his emphasis):

> On the whole, then, I have to reject the claims of Empiricism no less than of Rationalism to put forward a simple infallible criterion for the kind of knowledge which is to be taken as the ultimately valid basis of all else that is commonly taken for knowledge. I regard both criteria as *useful*, as a means of guarding against error, but neither as infallible.

Something close to Sidgwick's critique, we shall see in the next chapter, reappears in 1915 in an influential work by Bertrand Russell.

14. Conclusion

With the close of the nineteenth century, the general idea that experience is an important source of knowledge for science was widespread. Works that we identify now as lying in the empiricist tradition, such as those of Hume and Mach, espoused quite strong forms of skepticism. The terms "empiricist" and "empiricism" retained lingering negative connotations and were adopted or endorsed only hesitantly. Hume's skepticism roused Immanuel Kant to his influential critique. It was Kant's free use of the term "empirical" in this critique that, I believe, played a decisive role in separating empiricism from its earlier, negative connection to medical quackery. Kant, however, mounted a direct challenge to empiricism with the claim that we possess synthetic, a priori knowledge. It consists of contingent factual propositions ("synthetic") whose truth could be known independently of experience ("a priori"). Many found this response to Hume appealing. Kant became one of the most influential—even the most influential—philosopher of the era. His ideas flourished into various forms of non-empirical, neo-Kantian philosophy. The fortunes of empiricist thinking seemed dim. Matters were about to change.

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