



Giant telescope on display at the Palais de l'Optique, Exposition Universelle, Paris, 1900. From *Le panorama* (1900).

The Secret History of Science and Modernity: The History of Science and the History of Religion

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I. The Bullet Train

Before circa 1870, if you had posed the question, “What has modern science got to do with modernity?” the answer would probably have been “not much.” To some of the most perceptive mid-nineteenth-century observers of how society was undergoing unprecedented economic, social, political, and technological changes, science was a sideshow. One of the earliest descriptions of the experience of modernity comes from Karl Marx and Friedrich Engels’s *Communist Manifesto*, written in the febrile early months of the revolutionary year 1848:

Constant revolutionising of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish the bourgeois epoch from all earlier ones. All fixed, fast-frozen relations, with their train of ancient and venerable prejudices and opinions, are swept away, all new-formed ones become antiquated before they can ossify. All that is solid, melts into air, all that is holy is profaned [*Alles Ständische und Stehende verdampft, alles Heilige wird entweiht*].¹

According to Marx and Engels, science and even “steam-navigation, railways, electric telegraphs” were all the effects, not the causes, of these prodigious bourgeois industrial energies, at once so productive and destructive. Just as the modern state had become little more than “a committee for managing the common affairs of the whole bourgeoisie” and family bonds had been reduced to “a money relation,” so the bourgeoisie had “converted the physician, the lawyer, the priest, the poet, the man of science, into its paid labourers.” From this perspective circa 1850, science was not the moving edge of modernity: like almost everything else, it was being dragged along by the juggernaut of industrial capitalism.

Reflecting some fifty years later on the displays of the latest science and technology at the 1900 Paris Exposition Universelle, the American statesman and historian Henry Adams, though no Marxist, took a similar view. Science, like everyone and everything else, had been caught up in what Adams called the

“Law of Acceleration” that had snapped the continuity between past and present:

The motion of thought had the same value as the motion of a cannon ball approaching the observer through the air. One could watch its curve for five thousand years. . . . Galileo and Bacon gave a still newer curve to it, which altered its values; but all these changes had never altered its continuity. Only in 1900, the continuity snapped.²

What had snapped, in Adams’s view, was the serene vision of steady, cumulative progress envisioned by late Enlightenment thinkers such as Condorcet or early nineteenth-century liberals like John Stuart Mill. Mill, writing during the tumultuous 1830s, hoped that the progress of the physical sciences would provide a model of legitimate authority for his own “age of transition” between periods of stability, an age in which institutions and learning were all in flux, in which “[m]ankind have outgrown old institutions and old doctrines, and have not yet acquired new ones.”³ The physical sciences, Mill believed, “are continually *growing*, but never *changing*: in every age they receive indeed mighty improvement, but for them the age of transition is past.”⁴ It was precisely Mill’s vision of smooth, continuous growth without change that the modernizing experience of the rest of the nineteenth century refuted, according to Adams and other observers circa 1900. The sciences themselves had been subjected to Adams’s Law of Acceleration, which was epitomized by the exponential growth of power first from steam, then coal, and, by 1900, electricity. No longer models of serene stability, the physical sciences were reeling from their own new discoveries, such as radioactivity, undeniable but inexplicable.

Adams, as former American secretary of state, was never in the company of a foreign official without mentally calculating the chances that an anarchist bomb might go off, and he chose his metaphors advisedly when he observed that “the man of science must have been sleepy indeed who did not jump from his chair like a scared dog when, in 1898, Mme. Curie threw on his desk the metaphysical bomb she called radium.”⁵ Adams was dismayed to note that the scientists seemed as surprised as anyone else: “In 1850, science would have smiled at such a romance as this, but, in 1900, as far as history could learn, few men of science thought it was a laughing matter.”⁶ Scientific advances were hurtling forward with the speed and force of a locomotive—but no one knew its final destination or even whether there was a destination. All they could do was hang on for dear life.⁷ In the face of what historians have called, with a bow toward Adams, the “Great Acceleration” phase of global modernization circa 1890–1914, neither the scientists nor anyone else thought they were in the driver’s seat of that bullet train.⁸



Georges Garen. *Embrassement de la Tour Eiffel* (Illumination of the Eiffel Tower), 1889. Printed at the Galerie des machines, Exposition Universelle, Paris, 1900.

II. Back to the Future:

Modernity Began in the Seventeenth Century

Yet starting in the 1920s, a clutch of highly influential books began to appear that gave the sciences the leading, if tragic, role in the transformation that by then had become known as modernization. Modern science was now alleged to be the principal cause, no longer just one of the many effects (and victims) of modernization. This reversal was odd enough, given how different things had looked to the scientists themselves only a decade before. But there were further oddities, even more jarring. For one thing, although these books appeared in two waves, in the decade after World War I in the 1920s and then after World II in the late 1940s and early 1950s, they made no mention of the hideous new weapons science had produced at the military's behest: neither the poison gas concocted by the

chemists nor the atomic bomb constructed by the physicists merited even a passing reference. For another, the “modern” science in question was not the technoscience of the late nineteenth and early twentieth centuries, which had joined forces with industrial capitalism to produce the sort of new technologies that had horrified Adams and enthralled the visitors to the 1900 Paris Exposition Universelle. No, in these books, “modern” science was projected backward in time to the seventeenth century: it was not the science of Albert Einstein, whose theory of general relativity had just been spectacularly confirmed by the solar eclipse expedition in 1919, but rather the science of Galileo and Isaac Newton that had forged modernity.

Published in English, French, and German, translated into multiple other languages (including not only Italian, Spanish, Greek, Polish, and Serbian but also Chinese, Japanese, and Korean), and never for a moment out of print since they first appeared, the books will be familiar to many historians and philosophers of science who received their doctorates in the latter half of the twentieth century. Many of us encountered them in introductory courses; some of us were even recruited to the field by reading them; all of them count as classic texts of the discipline—indeed, as texts that helped call the discipline into existence. E.A. Burt’s *Metaphysical Foundations of the Modern Physical Sciences* (1924; 31 printings, 1924–2016); Alfred North Whitehead’s *Science and the Modern World* (1925; 48 printings, 1925–2013); Alexandre Koyré’s *Études galiléennes* (1940) and especially his *From the Closed World to the Infinite Universe* (composed 1952, published 1957; 16 English printings and 18 French, 1957–2018); and Herbert Butterfield’s *The Origins of Modern Science, 1300–1800* (1949; 33 printings, 1949–2013). In German, Edmund Husserl’s *Die Krisis der europäischen Wissenschaften und die transzendente Phänomenologie* (*The Crisis of European Sciences and Transcendental Phenomenology*, composed 1935–37; published 1954) also belongs in this group, but because its publication and reception history is more complicated, I’ll leave it aside for the moment.

These were the first narratives to insist that modern science and capital-*M* Modernity were twinned at birth and that what was truly modern about both was a new kind of mentality. Whitehead, Burt, Butterfield, and Koyré were all emphatic about the magnitude of the event. They were unanimous that the Scientific Revolution represented a historical transformation of the first magnitude, as great an event as the flowering of ancient Greece or the advent of Christianity, beside which the Renaissance and Reformation were reduced to “mere episodes.”⁹ Its reverberations were still echoing all over the globe: “Modern science was born in Europe, but its home is the whole world.”¹⁰ Wherever science spread, modernity arrived in its wake, an

irresistible destructive and creative force. If history had a Richter scale, the Scientific Revolution would register at 9.0.

III. The Modern Mentality

What exactly was this earthquake of the modern mentality? All these authors were in foursquare agreement on three points concerning the modern mentality, although their views diverged on many other points. First, despite—or perhaps because of—the enormity of the changes it had worked, despite even the eruptive label of “the Scientific Revolution,” the modern mentality had established itself only gradually.

Whitehead (who never used the phrase “Scientific Revolution”) thought some slow-working but inexorable “Nemesis” had been at work in science since the seventeenth century and only recently manifested itself in the destruction of the “stable foundations of physics” by relativity theory and quantum mechanics. He likened the meeting of the Royal Society of London at which Astronomer Royal Frank Dyson announced that the results of the 1919 solar eclipse expedition had confirmed the predictions of the general theory of relativity to “a Greek drama,” played out with the portrait of Newton in the background: “we [those present at the event] were the chorus commenting on the decree of destiny as disclosed in the development of the supreme incident.”¹¹ Butterfield did use the phrase “scientific revolution” (though not yet elevated by majuscules) but negated its eruptive associations by stretching the event out over five centuries, from 1300 to 1800, and by maintaining that only from the perspective of the 1950s were historians “in a position to see its implications much more clearly than the men who flourished fifty or even twenty years before us.”¹² Whatever the modern mentality was, it had been a very long while in gestation, anywhere from two to eight centuries. The distinctly odd implication was that the modernity heralded by the Scientific Revolution of the seventeenth century had arrived only in the early twentieth century, as if the news had been traveling to earth from one of those distant stars measured in the 1919 eclipse expedition.

The second oddity about these classic accounts of the emergence of modern science is their tone of plangent ambivalence about the modern mentality that science had allegedly fostered. On the one hand, they bowed before the mighty intellectual transformation they believed had forged the modern world of their titles. But, on the other hand, the most influential of these works openly yearned for the Middle Ages, variously imagined as more enchanted, more intelligible, more poetic, or more hospitable than modernity. Burt waxed elegiac over the “gloriously romantic universe of Dante and Milton, that set no bounds to the imagination of man as it played over space

and time” and had been (again, allegedly) “swept away” by Newtonian geometric space and numerical time.¹³ Koyré mourned the “value-concepts, such as perfection, harmony, meaning and aim” purportedly destroyed by the Newtonian cosmology that had expelled humanity from the cozy “closed world” to the “infinite universe” of absolute space and time, much as the angel with the fiery sword had evicted Adam and Eve from paradise.¹⁴

Playing on Kantian tropes of Enlightenment as reason coming of age but reversing their value from positive to negative, these works were steeped in a Peter Pan nostalgia for the premodern world, rosily imagined as the distinctly pampered childhood of humanity. Becoming scientific, like growing up, demanded renunciation of childish illusions and egoism, chief among them the conviction of being the hub of the universe, both literally and figuratively. Being rational went hand in hand with rationalization, a certain calculating impersonality that favored efficiency over emotional bonds and hard facts over mushy values.

Worst of all, in the minds of these authors, modern science had cast a grey pall over throbbing, thrumming, thrilling experience. The icy touch of mathematics, so integral to the achievements of Galileo and Newton, had blanched all color, silenced song, and generally turned the world into a kind of featureless cold porridge. On this point all of our authors sang in unison. The essence of the modern mentality brought about by science was radically narrowed, flattened, and bleached experience. They may have disagreed vehemently about the when, what, who, and how of the origins of modern science, but they were unanimous that the new mentality occasioned by this Big Bang of modernity inhabited a barren world, a kind of infinite Euclidean desert. The Faustian bargain struck by Galileo, René Descartes, and Newton was, in Whitehead’s words, to trade “our own immediate present experience” for the mathematical and conceptual abstraction that constituted “the greatest single intellectual achievement which mankind has achieved.”¹⁵ In prose of deepest purple dye Burt mourned the loss of “those qualities which were most vivid and intense in his [the medieval natural philosopher’s] own immediate experience—color, sound, beauty, joy, heat, cold, fragrance, and its plasticity to purpose and ideal,” seconded in almost uncannily similar formulations by Whitehead.¹⁶

Those familiar with early twentieth-century writings of philosophers and social theorists such as Max Weber, Benedetto Croce, William James, Henri Bergson, Sigmund Freud, Husserl, Oswald Spengler, and Georg Simmel will by this point be arching eyebrows in recognition. The odor of Weberian disenchantment and Freudian renunciation hangs heavy in the air. But



Elsie Wright. *Frances and the Fairies*, 1917. From Arthur Conan Doyle, *The Coming of the Fairies* (1922).

what interests me here is not the origins or specific contents of this rather dour modern mentality but the very idea of a mentality as a category of historical causation; indeed, as the very engine of modernity.

IV. Worldviews

Since the early nineteenth century, Romantic poets had complained that science had gotten rid of nymphs and fairies, tearing “the Naiad from her flood, / The Elfin from the green grass.”¹⁷ But the flood still roared on, the grass was still green, and some people even refused to relinquish the elves and fairies.¹⁸ The complaint of Husserl (who had briefly been Koyré’s teacher in Göttingen) and other early twentieth-century philosophers of scientific modernity went further: the torrent’s roar and the grass’s green were mere subjective illusions, and the knowledge that this was so wounded the soul. Consider Husserl’s *Lebenswelt*, the “open-ended infinity of possible experience,” that had been—so Husserl claimed—fitted out by Galileo and his successors with a “tight-fitting garment of ideas [*Ideenkleid*], the so-called objective scientific truths”—a kind of corset that in Husserl’s mind “disguised [*verkleidet*]” the *Lebenswelt* and demoted its immediate experience to the lowly rank of merely subjective truths.¹⁹ It was this gap between the *felt* truths of experience and the *known* truths of mathematical science that robbed sensations of their savor and values of their validity. The modern mentality was—again, allegedly—the thoroughgoing internalization of this gap.

Thoroughgoing is the operative word here. Aside from how long it had taken for this eerie sense of living a waking dream to sink in (at least two hundred years), what is striking about these accounts of the modern mentality is that they posited an

all-pervasive transformation. It was not just that the Copernican system had eventually triumphed over the Ptolemaic, or that William Harvey had shown that blood circulated, or that Newton had demonstrated the composition of white light. No specific change in scientific theories, no specific innovation in scientific method, no specific discovery of new worlds via telescope and microscope could have wrought something so general and all-encompassing as the modern mentality. Such novelties might astonish, delight, and dismay, but they remained piecemeal achievements, the full impact of which was registered only by a small group of specialists.²⁰ In contrast, the modern mentality was more like the atmosphere, the all-enveloping, inescapable medium in which all science, indeed all experience, took place. All of the early twentieth-century authors who wrote about scientific modernity struggled to find the right metaphor for the thoroughgoing phenomenon that they believed the modern mentality to be: “frameworks,” “worldviews,” and “worlds of thought” were among their coinages. Where did these metaphors of mentality as thought world come from?

That all of the authors of the classical narratives of the history of science also wrote on religion is perhaps not an accident. Burt had attended the Union Theological Seminary before taking a doctorate in philosophy at Columbia, and he went on to publish books on the history and philosophy of religion, including *Religion in the Age of Science* (1929) and *Types of Religious Philosophy* (1939); a year after giving his Lowell Lectures, Whitehead published *Religion in the Making* (1926) as its bookend; Koyré’s first book was *Essai sur l’idée de Dieu et les preuves de son existence chez Descartes* (1922), and he wrote several studies of Christian mystics; Butterfield’s *Christianity and History* (1949) came out the same year as his *Origins of Modern Science*. These men were personally religious in varying degrees (Butterfield very; Koyré not at all), but their interest in religion was more intellectual than devout: they approached it both historically and comparatively, as a system of thought—and one that both infused every aspect of life and manifested itself under a variety of forms.

This was the approach of late nineteenth-century *Religionswissenschaft*, dramatically staged at the first World Parliament of Religions held in conjunction with the Chicago Columbian Exposition in 1893 and institutionalized shortly thereafter at American universities in academic programs for the comparative study of the history of religions.²¹ Various called “the science of religion,” “comparative religion,” or *études religieuses*, the new discipline ramified into many schools, but common to almost all of them were the precepts that all of the world’s religions, ancient and modern, should be studied com-



World's Parliament of Religions,
Chicago, 1893.

paratively and impartially, without rivalry or apologetics. As Louis Henry Jordan, lecturer in the Department of Comparative Religion at the University of Chicago and author of one of the field's early textbooks, wrote, "Its function consists in placing the numerous Religions of the world side by side, in order that, deliberately comparing and contrasting them, it may frame a reliable estimate of their respective values. . . . It has no end to gain by securing the elevation of one Faith at the expense of another."²² In one of the book's many appendices, Jordan approvingly cited the resolution of the participants of the Chicago World Parliament "never to speak slightly of the religious faith of another."²³

The ambitions of the new discipline reached far beyond a sympathetic and fair-minded understanding of the world's religions, however. Each religion was to be understood as a coherent, even organic whole. *Organic* is used here advisedly: proponents of the new science of comparative religion likened their study to the comparative anatomy pioneered by Georges Cuvier or the comparative philology of Wilhelm von Humboldt and Franz Bopp, both fields among the brightest stars in the constellation of new sciences in the nineteenth century. Cuvier's objects of inquiry were literal organisms; the comparative philologists understood languages more figuratively but no less emphatically as species and genera, united genealogically in elaborate family trees. Von Humboldt admitted that the exhaustive and exhausting collection of linguistic details could be motivated only by "insight into the multiplicity and unity, in which the infinite and inexhaustible whole of the mental striving [of a language] comes together."²⁴ Only at this higher level of analysis did the unifying "personality" of a language become discernible, and with it the unique intellectual and emotional character of the people who spoke it. Languages were not arbitrary grab bags of words bound by mere convention; they possessed an "organic life" of their own.²⁵ In an age in which anatomists like Cuvier were famous for reconstructing extinct species from a single bone by following the basic *Bauplan* of a genus and philologists like Jean-François

Champollion deciphered Egyptian hieroglyphics from a single trilingual decree by following the contours of Coptic, the analogy between organisms and languages and the holistic methods used to study both did not seem far-fetched.

In what many regarded as one of the founding manifestos of the new science of religion, Max Mueller's *Introduction to the Science of Religion* (1873), the comparative philology of von Humboldt and Bopp became the template for the comparative study of religions. The Oxford Sanskritist Mueller, a product of the German approach to comparative philology, hammered home the analogy to comparative religion. The "various dialects of the faith" should be classified as the philologists had classified religions; *pace* ethnologists who would classify peoples by "the blood, the skull, or the hair," it was "language and religion that make a people, but religion is even a more powerful agent than language." Quoting Georg Wilhelm Friedrich Hegel and Friedrich Wilhelm Joseph Schelling concerning the "genius of a people," Mueller located the distinctive individual character of the ethnos, as unmistakable as the morphology of an organic species, in language and still more in religion. Religions harmonized not only with the holistic character of a people but with the historical epoch: "every religion was a true religion, being the only religion which was possible at the time, which was compatible with the language, the thought, and the sentiments of each generation, which was appropriate to the age of the world."²⁶

The would-be science of religion modeled sympathetic, holistic, historicist understanding of apparently strange beliefs of peoples across cultures and epochs, a model that still resonates among historians of science confronted with the equally strange beliefs of past thinkers. To a greater or lesser extent, Burt, Koyré, Whitehead, and Butterfield all sought to understand (in some cases, even exalt) premodern science rather than to condemn its errors, and more than a whiff of their approach still lingers in the anti-triumphalist contextualism that now dominates the history of science. It was after all Butterfield who in another of his books had skewered the Whig interpretation of history and thereby provided Thomas Kuhn with a way of rethinking the history of science as something more than a saga of winners (those who thought like we do now) and losers (those who did not).²⁷ But this evenhanded, holistic stance was not all that the historians of science imbibed from the historians of religion.

The modern mentality that so fascinated and repelled these historians of science and modernity was not only distinctive and coherent; it was all-encompassing and all-permeating. It reached below the level of specific doctrines or beliefs, religious or scientific; it was rooted in the psyches and lived expe-

rience of all who inhabited the modern world forged by science. It was, in the language of the early twentieth century, a *Weltanschauung*. Originally a philosophical term of art used by Kant and German idealists to refer to the mind's capacity to synthesize a whole out of and beyond sense experience, *Weltanschauung* (now often used interchangeably with *Weltbild*, originally a literal picture of the world) by the late nineteenth century could designate everything from philosophical metaphysics to political ideologies.²⁸ In this expansive usage, *Weltanschauung* took on a psychological tinge: it was more than a system of beliefs, more even than a distillation of experience; it was, as philosopher Wilhelm Dilthey described in a 1911 essay, "the structure of our psychic totality," a synthetic attitude toward the world that knit up the scattered threads of knowledge and experience into a meaningful whole. It was, in short, as thoroughgoing and all-encompassing as the modern mentality.²⁹

Many of Dilthey's contemporaries apparently yearned for a *Weltanschauung* that would make sense of experience increasingly fragmented by scientific specialization and historicism. The editor of the collection, titled simply *Weltanschauung*, in which Dilthey's essay appeared wrote of the inextinguishable yearning to order "the shards and fragments" into a "meaningful whole" that would illuminate all of lived experience into a worldview (*Weltbild*). He found the key in religious experience, which sprang "from the depths of the most personal life" that sought a worldview that "must always collide with scientific knowledge of reality and stand in hostile opposition to it."³⁰ Echoing this sentiment, several of the essays in the volume were dedicated to the strained relationships between religion and science.

At a moment when science and religion were being set in ever sharper opposition to one another, the authors of the books that made science the creator of the modern world approached the study of science in the same way they approached the study of religion. The only way to understand an alternative framework was as a coherent whole and from the inside, as its inhabitants would have.³¹ Worldviews (the English translation for both *Weltanschauung* and *Weltbild*) were just that: rounded, self-sufficient worlds that hung together organically.

Here I can give only a few scattered examples of how these authors of classical works that proclaimed science as the herald of modernity approached the study of religion. But I hope they will suffice to show that, different as their positions were on religion (and on the relationships between science and religion), they shared an assumption that religion and science were both holistic thought-worlds. Koyré, in a 1922 article on

the Protestant spiritualist Sebastien Franck (1499–1542) published in the *Revue d'histoire et de philosophie religieuse*, sought to redeem Franck, who had been vilified by Protestants and Catholics alike, from charges of enthusiasm and heresy. Far from being an irrational mystic, Koyré's Franck is the exponent of a "quite coherent conception." His borrowings from learned humanists may not have lived up to Hegelian standards of system, but his thought was nonetheless an "amalgam in no way deficient in unity."³² Even Franck's paradoxes, for example on the subject of free will, were not, according to Koyré, really contradictions. Koyré's treatments of Paracelsus (1493–1541) and the Protestant mystic Valentin Weigel (1533–1588), also published in the *Revue d'histoire et de philosophie religieuse* (in 1933 and 1930, respectively), proceeded in a similar vein: the thought world of even the most apparently inconsistent and irrational figure was revealed, often brilliantly revealed, to be a coherent whole, and one grounded not in faith or inspiration but in metaphysics. Anyone who has read Koyré's later work on Galileo or Newton cannot help but be struck by analogies of tone, argument, and metaphor.

Whitehead did not share Koyré's penchant for German mystics or his formidable erudition. But he, too, imagined rational religion (by which he meant all world religions organized around doctrines, not just a "thoroughly social phenomenon" grounded in emotion) as a "coherent ordering of life—an ordering which shall be coherent both in respect to the elucidation of thought, and in respect to the direction of conduct towards a unified purpose commanding ethical approval."³³ Burt, who went on after his dissertation on the history of science to become a historian and philosopher of religion, specializing in Buddhism, was much more concerned than Whitehead with the conflict between science and religion, specifically the conflict between Darwinism and Christianity. But when he wrote on such topics, Burt, like Whitehead, adopted an Olympian stance that embraced all religions—and, for that matter, all modern science—and characterized both in terms of "fundamental attitudes, pervading ideals as to what is of greatest value in life," albeit different ones.³⁴

Butterfield, who was even more narrowly concerned with Christianity than Burt was, also explored the tension between the scientist's view of human beings as a biological species and the historian's focus on understanding individuals "by insight, sympathy, and imagination."³⁵ Yet even Butterfield saw an analogy between the dilemmas of the historian, who must overcome partisan feeling to "try to see Christian and Mohammedan, black man and white man, conservative and socialist all somewhat from their own point of view" and the scientist who has fallen "into certain habits of mind and easily become the slave

of them.” At precisely this juncture, Butterfield invokes “the transition to the modern outlook” and makes the analogy explicit: “I think that few people could be said to have come to that modern outlook by an authentic process of thinking things out. Men are often the semi-conscious victims of habits of mind and processes of abstraction like those involved in technical historical study or in physical science.”³⁶ If the interpretation of history was a religious decision—and Butterfield insisted that it was—this was so because it was a decision “about our total attitude to things, and about the way we will appropriate life.”³⁷

V. The Way We (Still) Think Now

These authors diverged on many points concerning both religion and science. What they shared was not so much a position as an approach, which they applied to both domains. Historical understanding was sympathetic understanding, and sympathy meant crediting past science or another culture’s religion with holistic coherence around a metaphysical core. “Mentalities,” modern or otherwise, partook of this thoroughgoing, all-pervasive quality: each was a world in its own right.

However much they might have queried the equation of science and modernity—or indeed the very idea of modernity—and however skeptical they were about classical accounts of *the* Scientific Revolution, some of the most influential works of the history of science in the latter half of the twentieth century preserved this notion of the thoroughgoing framework of thought and of abrupt, even inexplicable, transitions between frameworks. Indeed, the one implies the other: if one mentality is as all-pervasive and as all-encompassing as air, the only way for a new mentality to establish itself is to switch to a new medium altogether. Note that this is a mode of analysis directed toward the exotic, not the familiar: Koyré wrote about sixteenth-century German mystics; Burt became an expositor of Buddhism.³⁸ Analogously, historians of science who followed in their footsteps prided themselves on reconstructing the exotic thought-worlds of Aristotle and Joseph Priestley and pointing out the strangeness even of those of Newton and Robert Boyle. The gifted intellectual historian could travel between worlds, but no one could live in two such thought worlds simultaneously. They were, in a word that a later historian of science was to make famous, incommensurable.

Kuhn’s vision of paradigms that embraced every aspect of the thought world of a particular scientific epoch as well as his claims for incommensurability of successive paradigms bear the imprint of the thoroughgoing mentalities described by Burt, Butterfield, and Koyré—and so do Michel Foucault’s thoroughgoing, integrated epistemes and discursive formations.³⁹

That both Kuhn and Foucault shared an intellectual grandfather in Koyré is no accident. Most historians of science would be startled to discover that the founders of their discipline were also historians of religion: it is like finding out that your parents were Martians. Yet our practices of sympathetic understanding and our metaphors of “frameworks” and “thought worlds” still bear the stamp of this ancestry. Whatever we may think now of science’s role as the engine of modernity, we still dwell in the long shadow cast by the “modern mentality” first described in the classical early-twentieth-century accounts of how science made the modern world.

Notes

1. Karl Marx and Friedrich Engels, *Manifesto of the Communist Party* (1848), sec. 1, <https://www.marxists.org/archive/marx/works/1848/communist-manifesto/ch01.htm>.
2. Henry Adams, *The Education of Henry Adams: An Autobiography* (1918; Boston: Houghton Mifflin, 1961), 457.
3. John Stuart Mill, “The Spirit of the Age” (1831), in *The Collected Works of John Stuart Mill*, 33 vols., ed. J.M. Robson et al. (Toronto: University of Toronto Press, 1981–1991), 32:230.
4. Mill, “The Spirit of the Age,” 239–240; emphasis in original.
5. Adams, 452.
6. Adams, 493–495.
7. John L. Heilbron, “Fin-de-siècle Physics,” in *Science, Technology, and Society in the Time of Alfred Nobel*, ed. Carl G. Bernhard (Oxford, UK: Pergamon, 1982), 51–73; and Richard Staley, *Einstein’s Generation: The Origins of the Relativity Revolution* (Chicago: University of Chicago Press, 2008), 166–203.
8. C.A. Bayly, *The Birth of the Modern World 1780–1914: Global Connections and Comparisons* (Oxford, UK: Blackwell, 2004), 451–467.
9. Herbert Butterfield, *The Origins of Modern Science, 1300–1800*, rev. ed. (New York: Free Press, 1957), 7.
10. Alfred North Whitehead, *Science and the Modern World* (1925; New York: Free Press, 1967), 3.
11. Whitehead, *Science and the Modern World*, 10, 16.
12. Butterfield, *The Origins of Modern Science*, 201.
13. E.A. Burt, *The Metaphysical Foundations of Modern Physical Science* (1924; rev. ed. 1932; New York: Doubleday, 1954), 238.
14. Alexandre Koyré, *From the Closed World to the Infinite Universe* (Baltimore: Johns Hopkins University Press, 1957), 2.
15. Whitehead, *Science and the Modern World*, 18, 46.
16. Burt, *The Metaphysical Foundations of Modern Physical Science*, 123; and Whitehead, *Science and the Modern World*, 54.
17. Edgar Allan Poe, “To Science” (1829), in *Al Aaraaf, Tamerlane, and Minor Poems* (Baltimore: Hatch and Dunning, 1829).
18. See, for example, Arthur Conan Doyle, *The Coming of the Fairies* (London: Hodder and Stoughton, 1922).
19. Edmund Husserl, *Die Krisis der europäischen Wissenschaften und die transzendente Phänomenologie* (1935; Hamburg: Felix Meiner Verlag, 2012), 55.
20. Whitehead, like Simmel, warned that the “modern professionalization of knowledge” meant that ever fewer people actually understood science, however much they might participate in the modern mentality. Whitehead, *Science and the Modern World*, 196. Compare Georg Simmel, “The Metropolis and Mental Life” (1902–1903), in *Cultural Modernity*, vol. 2 of *Modernity: Critical Concepts*, 4 vols., ed. Malcolm Waters (London: Routledge, 1999), 39.
21. On the American case, see James Turner, *Religion Enters the Academy: The Origins of the Scholarly Study of Religion in America* (Athens: University of Georgia, 2011). For France, see Patrick Cabanel, “L’institutionnalisation des ‘sciences religieuses’ en France (1879–1908): Une entreprise protestante?” *Bulletin de la Société de l’histoire du protestantisme français* 140 (1994): 33–80. For Germany, see Hans G. Kippenberg, *Die Entdeckung der Religionsgeschichte: Religionswissenschaft und Moderne* (Munich: C.H. Beck, 1997). For the Netherlands, see Arie L. Molendijk, *The Emergence of the Science of Religion in the Netherlands* (Leiden: Brill, 2005).

22. Louis Henry Jordan, *Comparative Religion: Its Genesis and Growth* (Edinburgh: T. & T. Clark, 1905), xi. Jordan provides a comprehensive survey of the state of the discipline, with bibliography, in Europe and North America.

23. Committee of the Religious Parliament Extension of Chicago, circular, 9 June 1902, quoted in Jordan, 572.

24. Wilhelm von Humboldt, "Ueber die Verschiedenheit des menschlichen Sprachbaues und ihren Einfluss auf die geistige Entwicklung des Menschengeschlechtes" (1830–1835), in *Schriften zur Sprachphilosophie*, vol. 3 of *Werke*, ed. Andreas Flitner and Klaus Giel (Darmstadt: Wissenschaftliche Buchgesellschaft, 1963), 369.

25. Wilhelm von Humboldt, "Ueber den Einfluss des verschiedenen Charakters der Sprachen auf Literatur und Geistesbildung," in *Schriften zur Sprachphilosophie*, 26.

26. F. Max Mueller, *Introduction to the Science of Religion* (London: Longmans, Green, 1873), 123, 143, 261.

27. Herbert Butterfield, *The Whig Interpretation of History* (London: G. Bell and Sons, 1931); and Thomas S. Kuhn, "History of Science," in *International Encyclopedia of the Social Sciences*, ed. D.S. Shills (New York: Macmillan and Free Press, 1972), 13:74–83.

28. The most thorough history of the concept of *Weltanschauung* is Helmut G. Meier, "'Weltanschauung': Studien zu einer Geschichte und Theorie des Begriffs" (Ph.D. diss., Westfälische Wilhelms-Universität zu Münster, 1967). Brief overviews are provided in H. Thomé, "Weltanschauung," in *Historisches Wörterbuch der Philosophie*, 12 vols., ed. Joachim Ritter, Karlfried Gründer, and Gottfried Gabriel (Darmstadt: Wissenschaftliche Buchhandlung, 1971–2007), 12:453–460; and "Weltbild," in *Historisches Wörterbuch der Philosophie*, 12:460–463.

29. Wilhelm Dilthey, "Die Typen der Weltanschauung," in *Weltanschauung: Philosophie und Religion*, ed. Max Frischeisen-Köhler (Berlin: Verlag Reichl, 1911), 15.

30. Max Frischeisen-Köhler, "Weltanschauung: Einleitung," in *Weltanschauung*, ix, xvi.

31. Butterfield, *The Origins of Modern Science*, 8–9, 13.

32. Alexandre Koyré, "Sébastien Franck (1499–1542)," in *Mystiques, Spirituels, Alchimistes, Cahiers des Annales*, no. 10 (Paris: Librairie Armand Colin, 1955), 25; originally published in the *Revue d'histoire et de philosophie religieuses*, no. 24 (1922).

33. Alfred North Whitehead, *Religion in the Making* (1926; New York: Fordham University Press, 1996), 27, 31.

34. Edwin A. Burt, *Religion in an Age of Science* (New York: Frederick A. Stokes Company, 1929), 123.

35. Herbert Butterfield, *Christianity and History* (1949; New York: Charles Scribner's Sons, 1950), 17. In this book, delivered as a series of BBC radio lectures in 1949, the year *The Origins of Modern Science* was published, Butterfield is much more openly critical of the scientists' role in World War II: "One of the really disillusioning moments in recent years was the time when, immediately after the announcement of the atomic bomb, so many scientists—even apparently most distinguished ones—talked too much in their exultant mood and gave themselves away, daring even to inform us of the place which this invention was destined to have in the whole march of ages" (5).

36. Butterfield, *Christianity and History*, 20–21.

37. Butterfield, *Christianity and History*, 25.

38. Alexandre Koyré, *La philosophie de Jacob Boehme* (Paris: J. Vrin,

1929); and Edwin A. Burt, ed., *The Teachings of the Compassionate Buddha* (New York: New American Library, 1955).

39. Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 4th ed. (Chicago: University of Chicago Press, 2012), 42, 134; and Michel Foucault, *The Archaeology of Knowledge* (1969), trans. A.M. Sheridan Smith (New York: Pantheon, 1972), 68, 70. Foucault was explicit that he dissolved old unities of epoch, discipline, book, oeuvre, and subject with the aim of discerning still more capacious unities of utterances: “The third purpose of such a description of the facts of discourse is that by freeing them of all the groupings that purport to be natural, immediate, universal unities, one is able to describe other unities, but this time by means of a group of controlled decisions. Providing one defines the conditions clearly, it might be legitimate to constitute on the basis of correctly described relations, discursive groups that are not arbitrary, and yet remain invisible” (29).

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