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Engineering Philosophy

Theories of Technology, German Idealism, and Social Order in High-Industrial Germany

ADELHEID VOSKUHL

ABSTRACT: During the so-called “Second Industrial Revolution,” engineers were constituting themselves as a new social and professional group, and found themselves in often fierce competition with existing elites—the military, the nobility, and educated bourgeois mandarins—whose roots went back to medieval and early modern pre-industrial social orders. During that same time, engineers also discovered the discipline of philosophy: as a means to express their intellectual and social agendas, and to theorize technology and its relationship to art, history, culture, philosophy, and the state. This article analyzes engineers’ own philosophical writings about technology as well as the institutions in which they composed them in 1910s and 1920s Germany. It emphasizes engineers’ contributions to well-known discourses founded by canonical philosophers, the role of preindustrial economies and their imagination in such philosophies, and the role of both the history and the philosophy of technology in engineers’ desire for upward social mobility.

If you own a slide rule and someone comes up with large claims or great emotions, you say: “Just a moment please, first we want to work out the margin of error and the most probable value of all this!”—This was without a doubt a powerful idea of engineering. It served as the foundation for an appealing future self-image.

—Robert Musil, *The Man Without Qualities*¹

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Robert Musil was a novelist, engineer, and mathematician born in Austria in 1880. In boarding school, engineering studies at university, and a six-month research stay at an institute for material sciences at the Technical University in Stuttgart (chaired by the engineering professor and social critic Carl Julius von Bach), he received technological, scientific, and mathematical education that distinguished him from other literary writers. His works are well-known for the unrivaled panorama they offer of the Austrian Empire and its teeming political and cultural life, in particular during the period just before the outbreak of World War I.² Contemporary writers, as well as historians, have used this historical moment to craft accounts of the blossoming and crises of cultural, scientific, and technological modernities.³ Musil was one of a group of prominent twentieth-century writers, artists, and politicians, among them Walther Rathenau, Ludwig Wittgenstein, Charles Steinmetz, Lewis Mumford, and Alfred Hitchcock, who were originally trained as engineers. Their work and biographies bring into focus the encounters in Europe and North America between rapid industrialization and preindustrial social and political structures.

In the passage quoted above from the novel *The Man Without Qualities*, which Musil started writing in 1921 and did not finish before his death in 1942, he offers us an intriguing spotlight on an engineer, complete with unavoidable features like slide-rule ownership, skepticism about large claims and feelings, and specific ideas of manhood that imply resolve, cosmopolitanism, and sophisticated taste. The same passage goes on to describe the self-image of the engineer of the future as “a man with resolute features, holding a shag pipe between his teeth, wearing a tweed cap and wonderful riding boots as he is traveling between Cape Town and Canada.”⁴

This article explores images and self-images of engineers that include and go beyond the rich connotations found in Musil’s literary snapshot.

1. Robert Musil, *Der Mann ohne Eigenschaften*, 37–38. The original reads as follows: “Wenn man einen Rechenschieber besitzt, und jemand kommt mit großen Behauptungen oder großen Gefühlen, so sagt man: Bitte einen Augenblick, wir wollen vorerst die Fehlergrenzen und den wahrscheinlichsten Wert von alledem berechnen!—Das war zweifellos eine kraftvolle Vorstellung vom Ingenieurwesen. Sie bildete den Rahmen eines reizvollen zukünftigen Selbstbildnisses.”

2. David S. Luft, *Robert Musil and the Crisis of European Culture*; Philip Payne, “Introduction,” 1–22; Carl Julius von Bach, “Ueber das Budget von Arbeiterfamilien” and “Inhalt des Ingenieurberufes.”

3. Deborah R. Coen, *Vienna in the Age of Uncertainty*; Suman Seth, *Crafting the Quantum*; Cathryn Carson, Alexei Kojevnikov, and Helmuth Trischler, eds., *Weimar Culture and Quantum Mechanics*; Detlev J. K. Peukert, *Die Weimarer Republik*; Fritz K. Ringer, *The Decline of the German Mandarins*; Thomas Mann, *Der Zauberberg*; Sven Beckert, *The Monied Metropolis*; Robert H. Wiebe, *The Search for Order*; Ronald R. Kline, *Steinmetz*; Leo Marx, *The Machine in the Garden*.

4. Musil, *Der Mann ohne Eigenschaften*: “einen Mann mit entschlossenen Zügen . . . , der eine Shagpipe zwischen den Zähnen hält, eine Sportmütze aufhat und in herrlichen Reitstiefeln zwischen Kapstadt und Kanada unterwegs ist” (38).

Such images were continuously negotiated in a period in which rapid industrialization was still a recent phenomenon and generated persistent tension when it encountered sensibilities and social orders from preindustrial ages. Engineers were also, just at that time, constituting themselves as a new social group and political elite. They found themselves, especially on the European continent, in competition with existing elites—from the military, the nobility, and educated bourgeois mandarins—whose roots went back to medieval and early modern preindustrial societies and their systems of social distinction.⁵ The agendas of literary writers and historians of technology intersect here in their desire to study the place of engineers in social orders, and in their suspicions that this issue is as relevant today as it is as insufficiently understood.⁶

As engineers were grappling with their self-images and seeking wider social recognition as a new professional group, they also discovered the discipline of philosophy as a means to express their intellectual and social agendas and to theorize technology and its relationship to such abstract matters as art, history, culture, philosophy, and the state.⁷ Engineers' interest in philosophy coincided at the time with a larger, better-known intellectual movement in which foundations for a new subdiscipline—the philosophy of technology—were laid by cultural theorists and critics.⁸ This article contributes to previous work by looking specifically at engineers' own philosophical writings about technology, as well as the institutions in which they composed them, and by emphasizing the role of language and imagination from preindustrial ages. Notwithstanding the insights of historians such as Edward Layton and Matt Wisnioski, who described engineers as “not [pretending] to be philosophers” but making “many assumptions about the nature of the universe, of man, and of society” (Layton in 1971) and as “critical theorists of modernity” (Wisnioski in 2012), we know

5. Karin Zachmann, *Mobilisierung der Frauen*, 117–77; Stefen Willeke, *Die Technokratiebewegung in Nordamerika und Deutschland*, 113–50; Kees Gispén, *New Profession, Old Order*, 64–86, 313–33; Tobias Sander, *Die doppelte Defensive*, 99–176; Konrad Hugo Jarausch, *The Unfree Professions*, 216–27.

6. Matthew H. Wisnioski, “‘Liberal Education Has Failed’” and *Engineers for Change*, 18–22; Gary Lee Downey, “What Is Engineering Studies for?”; Sander, *Die doppelte Defensive*, 11–14; Bruce Sinclair, “Local History and National Culture”; Gerd Hortleder, *Das Gesellschaftsbild des Ingenieurs*, 7–17; Ruth Oldenziel, *Making Technology Masculine*, 51–90; Konrad Hugo Jarausch, “The German Professions in History and Theory.”

7. W. H. G. Armytage, *The Rise of the Technocrats*, 238–60; Edwin T. Layton, *The Revolt of the Engineers*, 179–242; William E. Akin, *Technocracy and the American Dream*, 27–79; Burkhard Dietz, “‘Technik und Kultur’ zwischen Kaiserreich und Nationalsozialismus”; Jeffrey Herf, *Reactionary Modernism*, 152–88; Rebecca W. Bushnell, *A Culture of Teaching*, 1–9.

8. Mikael Hård and Andrew Jamison, “Conceptual Framework”; Herf, *Reactionary Modernism*, 49–151; Carl Mitcham, *Thinking through Technology*, 19–61; Robert C. Scharff and Val Dusek, eds., *Philosophy of Technology*; David Kaplan, ed., *Readings in the Philosophy of Technology*.

little about engineers' own philosophy of technology.⁹ We tend to know more about the philosophies of technology drafted by well-known and canonical philosophers, and more about how such philosophies have assessed industrial, high-industrial, and postindustrial ages, than about the place of preindustrial worlds and imagination in such deliberations.¹⁰

One institution in which engineers were pursuing philosophy was an elite association founded in Germany in 1909 exclusively for engineers with advanced university degrees: the Verband Deutscher Diplom-Ingenieure (VDDI) and its periodical, which from 1921 onward was named *Technik & Kultur*. In *Technik & Kultur*, texts on philosophy by engineers were written, edited, selected, and printed. I try to understand the philosophical ideas that these engineers engaged, how these ideas constituted the periodical as a whole, and the role that philosophy played for engineers in their efforts of social emancipation. There were comparable institutions and media founded around this time: the association for technical and industrial civil servants (Bund technisch-industrieller Beamter) and its periodical, for example, which is considered the first union for engineers and a pioneer for organized labor of employed professionals; and the American Institute of Electrical Engineers (AIEE) with its *Transactions of the American Institute of Electrical Engineers*, which was the youngest of four American "founder societies" and set a new example of professionalizing engineers based on mathematical physics rather than "centuries-old craft tradition."¹¹ In the early-twentieth-century landscape of such engineering associations and media, *Technik & Kultur* documents particularly well the convergence of engineers' philosophical interests and their desire to be viewed on par with traditional social elites.

German Engineers between Preindustrial Orders and the Second Industrial Revolution

German engineers constituted themselves as a social and professional elite in an era during which their country was, together with the United States, leading the Second Industrial Revolution, and, with regard to technical and philosophical expertise, a prominent place from which ideas were exported to the rest of the world.¹² Characteristic class struggles

9. Layton, *The Revolt of the Engineers*, 53; Wisnioski, *Engineers for Change*, 45.

10. Lewis Mumford, "Authoritarian and Democratic Technics"; Stanley R. Carpenter, "Developments in the Philosophy of Technology in America"; John Orr, "German Social Theory and the Hidden Face of Technology"; Mikael Hård, "German Regulation"; Michael E. Zimmerman, *Heidegger's Confrontation with Modernity*, 3–93; Andrew Feenberg, *Alternative Modernity*; Langdon Winner, *Autonomous Technology*, 135–70, 237–77; Thomas Parke Hughes, *American Genesis*, 443–71.

11. Layton, *The Revolt of the Engineers*, 38–39, 53–74, quote on 38; Gispen, *New Profession, Old Order*, 231–38; Sander, *Die doppelte Defensive*, 153–71.

12. Terry S. Reynolds, "The Engineer in 19th-Century America," 19; Eric Schatzberg, "Technik Comes to America."

related to industrialization were fought there with particular intensity and visibility, as were ideological conflicts about the benefits and threats of the new industrial way of life. The Weimar Republic is well-known for its intellectual and artistic energy, and it survived for more than a decade in economically tumultuous and taxing conditions. It was founded after World War I in 1919 and lasted until the fateful year 1933. The republic got off to a rough start: Germany had to pay immense reparations to the victorious parties of the war, many Germans perceived the Treaty of Versailles as humiliating, and there was massive inflation between 1921 and 1924. Together with frequent workers' uprisings, intermittent military occupation, and a great deal of distrust in political leadership, these conditions contributed to a profound sense of vulnerability. Mark Mazower quotes the Czech politician Thomas Masaryk, who said that World War I "turned Europe into . . . a laboratory atop a vast graveyard," and Peter Gay describes the Weimar Republic's "tragic death" in 1933 as "part murder, part wasting sickness, part suicide."¹³

The discontent of the middle and professional classes is typically singled out in the historiography of modern Germany as the most important political problem in the period that immediately preceded the rule of the Nazi party. Germany's bourgeois culture (*Bürgerlichkeit*) is, on the one hand, a term of self-description that emerging middle classes used from the Enlightenment onward, capturing their nascent and brittle cultural and political self-consciousness. On the other hand, the term has been used since the late nineteenth century as a category of historical and political analysis describing the problem of Germany's ostensibly "delayed" and "incomplete" modernity and, eventually, the catastrophes of the two world wars and the Holocaust.¹⁴ For engineers, *Bürgerlichkeit* encapsulated a specific conflict: they wanted to be citizens in the right way—to be *bürgerlich*—while at the same time some of them were attracted to anti-modern ideas of the 1920s that rejected the legacy of German bourgeois culture and asked for its abolition. It is no coincidence that reactionary thinkers like Ernst Jünger used the German term for technology, *Technik*, as a rhetorical tool for their claim that the era of the bourgeois subject and state had come to an end. Industrialization was singled out as a historical cause to declare the end of traditional liberal modernity.¹⁵

Engineers in Germany could not take for granted that they would unproblematically be counted among the bourgeois classes. The people defining this group were humanistically trained, and for centuries they had

13. Mark Mazower, *Dark Continent*, ix–x; Peter Gay, *Weimar Culture*, xiii, 147–65.

14. Dieter Langewiesche, "Liberalism and the Middle Classes in Europe"; Peter Gay, *The Bourgeois Experience*; Charles S. Maier, *Recasting Bourgeois Europe*, 3–46; David Blackbourn and Geoff Eley, *The Peculiarities of German History*, 1–35; Charles E. McClelland, *The German Experience of Professionalization*, 73–97, 131–52, 175–92.

15. Hård, "German Regulation"; Herf, *Reactionary Modernism*, 70–108; Thomas Rohkrämer, *A Single Communal Faith?*; Adelheid Voskuhl, "Ambivalenz im Versprechen."

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held the monopoly on senior positions in the German civil service.¹⁶ Their educational canon was encapsulated in the term *Bildung* (cultured education), with mastery of Latin and Greek as its token skill. Their supposedly “non-applied” canon of humanist learning was deliberately distinguished from practical and technical skills. The bourgeois mandarins used the distinction between *Bildung* and practical skills especially during periods of massive industrialization. *Bildung* amounted to an asset that made men not only professionals, but also constituted them as citizens (*Bildungsbürger*). They ran the state bureaucracy, set agendas for political and cultural public debate, and, in their own minds, made up the very foundation of the state and public sphere.¹⁷

Bourgeois mandarins received heavyweight historical and philosophical support for their elaborate professional identities from the ambitious and influential political theories of German idealism from the early nineteenth century. These theories were penned by, among others, Immanuel Kant, Johann Gottlieb Fichte, and Georg Wilhelm Friedrich Hegel, who granted civil servants and public scholars prominent spots in their models of society; these two groups were fashioned as “executors,” as it were, of the social contract among free and rational subjects who agreed with one another to constitute a community or state. German engineers in the early twentieth century looked, among other places, to philosophies and vocabularies from this period to claim for themselves a cultural identity that they saw other, preindustrial elites using. Such vocabularies were available to them because of the strong legacies of the early modern civil service and of German idealism, which by 1900 had percolated into the general cultural discourse about how the German state should be organized and administered.¹⁸

Industrialization and engineering did not occupy prominent places in the theories of the subject and the state articulated by idealist philosophy during the nineteenth century, neither did they figure prominently in the imagination of the German nation and the rhetoric of distinguished senior state administrators. It was not until after World War I, when reactionary philosophers formulated anti-theories of the bourgeois German state, that the *industrial* state became the subject of political theories in a sustained way.¹⁹ In this regard, Germany constituted a specific case. The middle classes diversified in the course of industrialization, just as they did in

16. Hans Rosenberg, *Bureaucracy, Aristocracy, and Autocracy*; Jane Caplan, *Government without Administration*, 1–13.

17. Jarausch, “The German Professions in History and Theory,” 17–20; Hartmut Kaelble, “French Bourgeoisie and German Bürgertum,” 283–89; Jürgen Kocka, “The European Pattern and the German Case,” 22–24; Michael J. Sauter, *Visions of the Enlightenment*, 52–55; Gispén, *New Profession, Old Order*, 30, 73, 87–89, 103–4, 202; Hans-Ulrich Wehler, *Deutsche Gesellschaftsgeschichte*, 3:125–30.

18. Liz Disley, “General Introduction.”

19. Eric Dorn Brose, *The Politics of Technological Change in Prussia*, 3–25; Friedrich Strack, *Titan Technik*; David Skrbina, *The Metaphysics of Technology*, 70–93.

other Western societies, but educational and moneyed bourgeoisie remained more closely interwoven in Germany than elsewhere for a longer time. Traditional bourgeois groups thus retained their hegemony, and they were mostly made up of academically trained men, either members of the free professions or employees of the state or the church. Among the many historians who have explored the history and contours of this group, Wolfgang Mommsen calls them *das ältere Honoratiorenbürgertum* (the traditional bourgeoisie of dignitaries).²⁰

German engineers aimed to become part of an elite stratum that was exemplified by *das ältere Honoratiorenbürgertum*, but such traditional elites themselves, in their turn, called engineers “parvenus” and “interlopers.”²¹ They relied upon language from preindustrial social orders and considered themselves members of traditional “estates” (*Stände*).²² Estates had originally described social groups and their legal status in medieval and early modern Europe: land-owning nobility, privileged knights, dependent peasants, clergy, and merchants. But as a memory and rhetorical tool, the term served until well into the industrial ages for the formation of modern professional identities.²³ Learning from their bourgeois role-models, academic engineers naturally adopted the language of estates. Senior members of the profession lamented, for example, that engineers were lacking a suitable “feeling” (*Standesempfinden*) for their estate (*Ingenieurstand*), and that they neglected to cultivate it. Engineers also discussed their profession’s legal and educational organization in terms of *Bildungs- und Standesfragen*.²⁴ This happened, among other places, in a vehicle in which engineers were writing, editing, publishing, and selecting their texts on philosophy—*Technik & Kultur*, the periodical of the elite association of German engineers with advanced university degrees, VDDI.

The VDDI and Its Periodical

The VDDI was founded in 1909 as an elite society exclusively for academically trained engineers, after earlier efforts had failed to exclude non-

20. Wolfgang J. Mommsen, *Bürgerliche Kultur und künstlerische Avantgarde*, 8–9; Ringer, *The Decline of the German Mandarins*, 2.

21. Max Maria von Weber, “Die Stellung der deutschen Techniker im staatlichen und sozialen Leben,” 5.

22. Rosenberg, *Bureaucracy, Aristocracy, and Autocracy*, 8–15; Albert Pütsch, “Ueber die sociale Stellung der Techniker.”

23. Hans-Ulrich Wehler, *Deutsche Gesellschaftsgeschichte*, 1:134–36; Kocka, “The European Pattern and the German Case.”

24. Carl Weihe and S. Stamm, “Die Ziele des Verbandes Deutscher Diplom-Ingenieure”; Carl Weihe, “Braunschweig 1922” and “Der Verband Deutscher Diplom-Ingenieure”; Kurt W. Geisler, “Entlohnung und Standesbewußsein”; Willeke, *Die Technokratiebewegung in Nordamerika und Deutschland*, 120; “Hochschulnachrichten”; “Literatur”; “Von Vereinen und Kongressen”; “Bildungs- und Standesfragen.”

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academic engineers (such as master mechanics and technicians) from the large, generic association of German engineers VDI (Verein Deutscher Ingenieure), founded in 1856.²⁵ Engineering professors like von Bach, who was a technological expert, social critic, and Musil's mentor during his time as an engineer in Stuttgart, were the particular target of the VDDI: von Bach combined technological expertise with the right social status and interest in nontechnical themes. The VDDI invited him to join it two months after the society was founded, and included an offer for a special membership and donor status.²⁶

The VDDI's periodical was also founded in 1909, first named *Journal of the VDDI*, and then in 1921 named *Technik & Kultur*. It was naturally aimed at the engineers within the VDDI, but quickly became a medium for engineers interested in the intersections among engineering and philosophy, politics, economics, and art. One author, who a few years earlier had finished his dissertation on the theory and construction of lever balances, called the periodical a "lookout for culture" (*Kulturwarte*) for engineers that dealt with topics at the boundaries of engineering and neighboring fields (he mentions philosophy, mathematics, and economics) rather than with specialized engineering topics. In his 1912 article this author defined the journal's task: to prove that engineers were capable of contributing to the expansion and deepening of German culture and therefore deserved to belong to "the leading, the governing classes."²⁷

Articles of this kind were penned by a variety of authors during the early years of the periodical. One on macroeconomics and Germany's new role as an export nation contained theoretical reflections on factory production. It was written by the civil engineer Carl Moritz Lewin from Berlin, who also authored books on accounting and factory organization. Another piece, this one by Ludwig Bernhard, a professor of political science (*Staatswissenschaften*) who had also studied mechanical engineering as a young man, considered individualism, socialism, and the state. Another scholar of political science, whose other published work dealt with the problem of the machine in a political economy, penned "Technology and the Humanities," while an engineer named Wilhelm von Pasinski, who was a member of the VDDI's executive council and became during the 1930s a prominent ideologue for the Nazi party, published a piece on the role of political science and law in engineering education. A piece on the economics of technical and social progress appeared, authored by a member of the Swiss parliament. The patent lawyer Alexander Lang, who had a doctorate in

25. Gispén, *New Profession, Old Order*, 313–20; Dietz, "'Technik und Kultur' zwischen Kaiserreich und Nationalsozialismus"; Sander, *Die doppelte Defensive*, 163–68; Herf, *Reactionary Modernism*, 171–78.

26. Carl Julius von Bach, "Correspondence with Officials of the German Association of Engineers with University Degrees (VDDI)."

27. Franz Lawaczeck, "Die Aufgaben unserer Fachzeitschrift," 5, 6, and *Beitrag zur Theorie und Konstruktion der Wage*.

political science, published on the macroeconomic relevance of the “machine,” and founded the VDDI and was its first president, wrote about the relevance of doctoral degrees in economics and political science for engineers. Another professor of political science wrote about teaching macroeconomics to engineering students at technical universities. Other articles provided an extensive historical survey of obstacles to economic and technical progress from antiquity to the modern age, while wartime articles considered the macroeconomics of warfare and the role of the military in the history of engineering. Architecture and engineering aesthetics also found a place in the periodical.²⁸

Along with such articles there was a regular, well-maintained, and extensive rubric of book reviews and book listings of new works on architecture, art, history, anthropology, and law. There was also an instructive column, equally regular and well-maintained, called *Bildungs- und Standesfragen* (as mentioned above), which dealt with questions of cultivation, education, the engineers’ estate, and the legal questions of professional titles.²⁹ The terms *Bildung* and *Stand* connoted in particularly forceful ways the supremacy of humanistically trained mandarins who worked in the German civil service for the state, church, or universities and thus captured the goals that engineers pursued in their quest for a social status on par with preindustrial elites.

Carl Weihe, Ambitious Editor

In 1921 a new and ambitious editor named Carl Weihe moved the VDDI’s journal even more forcefully in this direction, with considerable deliberation and commitment to the social movement of making engineers a new academic estate. He also renamed the journal *Technik & Kultur*. Under his editorship, the same book review sections and columns

28. C. M. Lewin, “Prinzipien der Fabrikorganisation” (Lewin describes himself as a “consulting engineer for factory organization in Berlin” in Albert Ballewski and Carl Moritz Lewin, *Der Fabrikbetrieb*, 1); Ludwig Bernhard, “Die Zukunft der Sozialpolitik”; Georg Jahn, “Bernhard, Ludwig”; Carl Ergang, “Technik und Geisteswissenschaft” and *Untersuchungen zum Maschinenproblem in der Volkswirtschaftslehre, Rückblick und Ausblick*; Wilhelm von Pasinski, “Gedanken zur rechts- und staatswissenschaftlichen Ausbildung der Diplom-Ingenieure”; von Pasinski and Karl Friedrich Steinmetz, *Ingenieur im Dritten Reich*; Sander, *Die doppelte Defensive*, 232; Dietz, “Technik und Kultur zwischen Kaiserreich und Nationalsozialismus,” 108, 123; E. Sulzer-Ziegler, “Technik und soziale Frage”; Alexander Lang, “Die Diplom-Ingenieure und der nationalökonomische Doktorgrad” and *Die Maschine in der Rohproduktion*; Gispén, *New Profession, Old Order*, 318; Carl Koehne, “Volkswirtschaftliche Seminare an Technischen Hochschulen”; Louis Leopold, “Die Hemmungen des wirtschaftlichen und technischen Fortschrittes”; E. W. Köster, “Der Krieg und die Volkswirtschaft”; Heinrich Reisner, “Der Ingenieur und seine militärische Vergangenheit”; Ernst Hiller, “Pseudoarchitektur und Ingenieurästhetik.”

29. “Bildungs und Standesfragen.”

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remained, but Weihe added new ones and nurtured them with a great deal of engagement. His columns included announcements, miscellanea, and news from the association, but also a more elaborate feature called “cultural survey” (*Kulturumschau*) in which Weihe wrote a wide variety of short texts that highlighted connections among engineers’ training, work, and expertise, their status in society, and the privileges of the existing traditional elites and estates. There is barely an issue during his tenure (1921–28) to which he did not contribute his thoughts.

Weihe also recruited authors who had advanced backgrounds in non-engineering fields to write on topics in philosophy, political science, and economics. One example is Max Zacharias, a high school teacher of mathematics in Berlin, who used the titles “Prof.” and “Dr.” in his published mathematics textbooks. For *Technik & Kultur* he provided articles on the cultural value and unity of mathematics, the Great Pyramid of Giza, the role of Kant’s philosophy in 1920s-era natural sciences and mathematics, and the current state of theories on the atom, in addition to many reviews of books on mathematics, often several in the same issue.³⁰ Another recruit was the engineer and industrialist Nathan Stern, who wrote an article on the psychology of practical work, as well as an extended series of articles on Henry Ford’s autobiography during 1924–25. Stern also wrote book reviews for the journal and was involved in publishing other material on technology.³¹ A prominent contributor to the journal was Wilhelm von Pasinski (see above), who in 1921 wrote an article on capitalism and socialism, and another one the following year on technical thinking and technical building.³² An adjunct professor in Frankfurt named Georg Burckhardt wrote his dissertation in 1908 on Herder’s philosophy of religion and went on to publish widely, from the early 1910s until the 1950s, in the emerging field of the “philosophy of culture” (*Kulturphilosophie*).³³ His work influenced those engineers who, during the 1920s, developed accounts of technology as German *Kultur*.³⁴ In 1922 Burckhardt published an article in *Technik & Kultur* on a cultural-philosophical worldview and its relevance for engineers; another in 1924 on the meaning of technology within the

30. Max Zacharias, *Einführung in die projektive Geometrie*, “Die Einheit der Mathematik,” “Der Kulturwert der Mathematik,” “Das Rätsel der Cheopspyramide,” “Kants Bedeutung für die heutige Naturwissenschaft und Mathematik,” and “Der gegenwärtige Stand der Atomtheorie.”

31. Nathan Stern, “Technisch-Menschliches zur Psychologie des Praktikers”; Hanns Günther, *Taten der Technik*; Erik Eckermann, *Nathan S. Stern*.

32. Wilhelm von Pasinski, “Kapitalismus und Sozialisierung” and “Technisches Denken und Schaffen.”

33. Georg E. Burckhardt, *Was ist Individualismus?* and *Die Anfänge einer geschichtlichen Fundamentierung der Religionsphilosophie bei Herder*; Ralf Konersmann, “Einführung,” 1, and “Kultur der Philosophie und Kulturphilosophie.”

34. See, for example, Robert Weyrauch, *Die Technik*—a text that Georg Burckhardt himself cites in “Kulturphilosophische Weltauffassung in ihrer Bedeutung für Techniker und Ingenieure.”

entirety of culture; and yet another in 1926 titled “Was ist Kultur?” (What is culture?)³⁵ The journal’s tradition of publishing on economics also continued, including, for example, an article on macroeconomics and engineering by someone named Hans Gehrich, who was likely the professor of macroeconomics at the Technical University at Dresden and whose work on social reform is still read and cited to this day.³⁶

A number of articles dealt explicitly with the philosophy or theory of technology. The engineering professor and philosopher Eberhard Zschimmer was among a small though visible group of philosophers who created the growing body of monographs during the 1920s on technology and philosophy, which formed the basis for Jeffrey Herf’s suggestion in the 1980s that there was a “Reactionary Modernism” among engineers and philosophers.³⁷ In the 1910s Zschimmer was the director of the celebrated glass-industry corporation Schott, in Jena, and a decade later was a professor of glass technology at the Technical University Karlsruhe. His work was cited by Walter Benjamin.³⁸ In 1922 Zschimmer published an article in *Technik & Kultur* titled “Ist Technik Geist?” (Is technology spirit?)³⁹

Friedrich Dessauer’s work was similar to Zschimmer’s, but he became an even more prominent philosopher of technology during the course of the twentieth century. From the early 1910s to the 1950s he published a number of book-length texts that are now regarded as foundational in the philosophy of technology.⁴⁰ Like Zschimmer, Dessauer was trained as a physicist who published in physics. His article “Vom Geiste der Technik” (The spirit of technology), which was a transcript of a radio lecture, appeared in *Technik & Kultur* in 1924.⁴¹ Another example of an article published in the journal, this one with the title “Zur Theorie der Technik” (On the theory of technology) (1921), was by the engineer Alfred Schack, who otherwise published widely on engineering.⁴² His standard text on heat transfer went through eight editions between 1940 and 1983, with an

35. Burckhardt, “Kulturphilosophische Weltauffassung in ihrer Bedeutung für Techniker und Ingenieure,” “Die Bedeutung der Technik im Ganzen der Kultur,” and “Was ist Kultur?”

36. Hans Gehrich, “Nationalökonomische Techniker und technische Nationalökonomien”; Hans Gehrig, *Deutsche Staatswissenschaft und Wirtschaftspolitik im 19. Jahrhundert and Die Begründung des Prinzips der Sozialreform* (Gehrig and Gehrich are homophones in German); Gerald Hacke, “Gehrig, Hans”; Rüdiger vom Bruch, “Streiks und Konfliktregelung im Urteil bürgerlicher Sozialreformer,” 150.

37. Eberhard Zschimmer, *Philosophie der Technik and Technik und Idealismus*; Herf, *Reactionary Modernism*, 158.

38. Heinz Brüggemann, *Walter Benjamin über Spiel, Farbe und Phantasie*, 20.

39. Eberhard Zschimmer, “Ist Technik Geist?”

40. Friedrich Dessauer, *Philosophie der Technik, Seele im Bannkreis der Technik, and Streit um die Technik*; Jakob Meier, *Synthetisches Zeug*, 13–18; Skrbina, *The Metaphysics of Technology*, 70–71.

41. Friedrich Dessauer, “Vom Geiste der Technik.”

42. Alfred Schack, “Zur Theorie der Technik.”

English translation in 1933 that also was widely circulated well into the 1960s.⁴³ Next to such visible and prominent authors, there were also articles by others about whom almost nothing is known. These works manifest similar content: ideas about theories of technology, contemporary philosophies of culture, and recent theories in theoretical physics (by Einstein in particular). Little-known authors also made frequent contributions to *Technik & Kultur* concerning the economics and history of engineers and engineering.⁴⁴

The Intersection of Social and Philosophical Engineering Agendas

Technik & Kultur's editor Weihe was listed as a patent lawyer in the *Handbuch für das Deutsche Reich* (Annual handbook for the German Empire) for the years 1906 and 1908. He also taught the history of technology at the Technical University of Darmstadt, which was founded in 1877.⁴⁵ His inaugural lecture at Darmstadt pleaded for teaching the cultural history of technology at technical universities to provide engineers with the humanistic canon they needed to be competitive for positions in the civil service and credible actors in the public sphere.⁴⁶ During his editorship of *Technik & Kultur* he merged engineers' pursuit of philosophy with their desire for social recognition by the traditional academic estates. His texts' demands for the higher social status of engineers derived directly from his historical-philosophical accounts of technology.

Abstract analyses of technology were printed next to petitions by engineers for higher visibility, respect in the public sphere, and integration of engineers into civil service and the German state. Occasionally, these vari-

43. Alfred Schack, *Der industrielle Wärmeübergang für Praxis und Studium mit grundlegenden Zahlenbeispielen* and *Industrial Heat Transfer*.

44. H. Marquardt, "Zur Philosophie der Technik"; F. Devantier, "Kritik der Einstein'schen Relativitätstheorie" and "Bericht zu Vorläufern der Relativitätstheorie"; Klaus Hentschel, *Interpretationen und Fehlinterpretationen der speziellen und der allgemeinen Relativitätstheorie durch Zeitgenossen*, xix; W. Benedict, "Aus der Entwicklung des deutschen Maschinenbaus"; R. Heßler, "Spengler und der Sinn der Zahlen"; Heinrich Hardensett, "Über das Verhältnis von industrieller Technik zur bildenden Kunst."

45. Manfred Hampe and Gerhard Pahl, eds., *Zur Geschichte des Maschinenbaus an der Technischen Universität Darmstadt*, 2–4; *Handbuch für das Deutsche Reich* (1906), 234, (1908), 238; Burkhard Dietz, Michael Fessner, and Helmut Maier, "Der 'Kulturwert der Technik' als Argument der Technischen Intelligenz," 17. I am grateful to Burkhard Dietz, who has helped me throw light on the elusive figure of Carl Weihe.

46. "Immer mehr wird in Zukunft der Techniker sich im öffentlichen Leben betätigen müssen, in den Verwaltungen, den Volksvertretungen, in der Regierung. Da kann ihm eine weitgehende Bildung nur förderlich sein, und diese kann er sich von der geschichtlichen Betrachtung seines Faches ausgehend am leichtesten aneignen. Auch das Näherkommen an andere Berufe, die mehr geschichtlich erzogen sind, an den Juristen, den Volkswirt und Verwaltungsbeamten, wird dadurch erleichtert." See Carl Weihe, "Die kulturgeschichtliche Betrachtung der Technik," 549.

ous themes even appeared in one and the same text.⁴⁷ They represented the connections that Weihe outlined, demanded, envisioned, and forged between German engineers and Mommsen's *das ältere Honoratiorenbürgertum*. By invoking markers of high social and academic status and linking explicit political claims for employment opportunities with philosophical claims about technology and engineering, Weihe established the VDDI and its periodical as a medium for such goals.

The philosophical texts from the 1920s in *Technik & Kultur* usually took one of two forms. The first aimed to bring together the work of a canonical philosopher with typical engineering work (such as drafting or building), with engineering knowledge, and with the status of engineers. Such texts often started out by trying to make an influential, canonical philosopher's work accessible to engineers through an introductory account. The next step was either to apply the ideas of this philosopher to issues in the intellectual or cultural life of engineers, or to challenge the boundaries of the philosopher's work by questioning the place of technology and engineering within it.⁴⁸ The second type made up the larger share and aimed to conflate the terms *technology* and *culture* with each other, and thus to prove that technology was part of German culture. Such texts engaged in a great deal of metaphysical and political reasoning to achieve this confluence. It was a highly relevant exercise at the time and reflects the explosive mixture of Germany's brittle self-image as a nation-state (including rampant nationalism), the political and military thinking on international might and defeat, and a rapidly changing socioeconomic order. A larger, essentialist debate was taking place about the German term *Kultur*, which was sharply distinguished from French and Anglophone *civilization*. German culture aimed to single out the young German nation-state as a mythical entity: while it had been trailing the other large European nations in state-building, industrialization, and imperialism during the nineteenth and early twentieth centuries, it prided itself on being deeply rooted in a long-standing, time-honored spiritual and cultural history that reached back to the equally mythologized Middle Ages. This history was deemed culturally and spiritually unique (and superior to other cultures), with awe-inspiring moments like the cathedrals of the late Middle Ages, Luther's Reformation, and the literary and philosophical canons of classicism and Romanticism during the eighteenth and nineteenth centuries.⁴⁹

47. Carl Weihe, "Technik und Kultur," 2, "Was bietet der Verband dem jungen Diplom-Ingenieur?" 3, "Kultur und Technik," 162–64, "Stützt unsere Zeitschrift," 203; "Buchbesprechungen," 104; N. Stern, "Aus Beruf und Leben"; "Verbandsnachrichten," 185; Geisler, "Entlohnung und Standesbewußsein"; W. Franz, "Unstimmigkeiten im Zielgedanken der Hochschulreform"; Leonhard Roth, "Mensch und Maschine, Zeit und Geld."

48. Carl Weihe, "Verwandtschaftliches in der Denkweise des Ingenieurs und Arthur Schopenhauers"; Voskuhl, "Baumeister, Bildung, and Civil Service," 121–23.

49. Georg Bollenbeck, *Bildung und Kultur*, 11–30, 268–72; Kaelble, "French Bour-

Weihe himself frequently relied upon such broad historical narratives, in particular when presenting histories of technology. He also discussed the works of canonical philosophers and promoted, and probably even commissioned, articles about philosophy from other authors. His first editorial, followed immediately by his first article, appeared in *Technik & Kultur* in 1921; together, they represent the microcosm that he created for his journal. Analyzing his earliest articles also helps ground my readings of later *Technik & Kultur* articles on the epistemic and political theories of Kant and Fichte, the roles of the public scholar and civil servant in them, and the links that the journal's authors suggested existed between such theories and the theory and practice of engineering. Texts of this kind uncover when and how philosophy and social upward mobility met in *Technik & Kultur*.

Two Early Texts by Weihe in *Technik & Kultur*

Weihe introduced himself as the journal's new editor in "Zur Einführung" in January 1921. In this editorial, he reviewed the conditions of running a periodical during the economic turmoil of the early Weimar Republic, mentioning in particular the general psychological exhaustion and problems in paper supply and printing capacity. But Weihe said that he aimed to counter this bleak mood and called for an era of new thought, projects, and the building and creating of new things—"engineering work," as he described it.⁵⁰ He also relied upon key moments of engineers' professionalization in Germany, which culminated in 1899 when Emperor Wilhelm II granted technical universities the right to confer doctoral degrees in engineering.⁵¹ For academically trained engineers, this significant achievement became the symbolic origin of their history as a professional group. However, Weihe claimed that German academic engineers' social mobility "lay fallow" during the ten years between Wilhelm's decree and the VDDI's founding in 1909. He thus claimed the year 1909, with the VDDI's founding, to be the actual beginning of the age of academic engineering.⁵² Weihe also made programmatic points in this introductory editorial, which he went on to repeat regularly throughout the 1920s. The journal, he argued, showed that academic engineers' thinking captured the current era's important issues from the highest viewpoint. Sustained by knowledge, cosmopolitan experience, and responsibility, the academic engineer contributed to

geoisie and German Bürgertum, 1870–1914"; Dietz, Fessner, and Maier, "Der 'Kulturwert der Technik' als Argument der Technischen Intelligenz."

50. Carl Weihe, "Zur Einführung," 1.

51. Wolfgang König, "Vom Staatsdiener zum Industrieangestellten," 203, "Die Ingenieure und der VDI als Grossverein in der wilhelminischen Gesellschaft," 235, and *Wilhelm II und die Moderne*, 119–25; Karl-Heinz Manegold, *Universität, Technische Hochschule und Industrie*, 37–43, 282–305; Gispén, *New Profession, Old Order*, 157.

52. Weihe, "Zur Einführung," 1.

vital concerns, deserved to be heard, added to the common good (*Wohl der Allgemeinheit*), and helped rebuild “our country.”⁵³ *Technik & Kultur* represented the manifold relations among engineering work and economics, culture, and life, Weihe held, and it unified engineers both socially and intellectually.⁵⁴

Immediately after this introductory editorial, Weihe’s first regular article as editor appeared. Titled “Das Zeitalter der Technik” (The age of technology), it outlined many of his beliefs, as well as the metaphysical–historical claims about technology on which his agenda depended.⁵⁵ These claims consisted of the mythologized notion of the German nation and culture, which was often merged with recent ideas about the “struggle for life” from popularized Darwinism. The concepts of antagonism, selection, and sudden random change had become part of the general portrayal of German industrializing society and its class conflicts, and also helped explain the nation’s place in the increasingly unstable diplomatic and military orders of the late nineteenth century that eventually led to the outbreak of World War I.⁵⁶

As a stepping stone for his expansive and bold theoretical ideas, Weihe often used a broad narrative history of technology, which comprised standard periods: the Stone Age, early civilizations in the Middle East, the Greek and Roman empires, the European Middle Ages, the Renaissance, the Enlightenment, the steam engine, and high industrialism. He invoked such large arcs of history on many occasions. In *Technik & Kultur*, one finds at least one narrative, written by him or other authors, for each important technology—transportation, writing, metallurgy, housing, tool-making—that carried it through the key eras of world history. Weihe’s histories of technology were not only simplistic, but also celebratory and gushing in their tone, and they made distinct assumptions about both technological and cultural progress.

His first article in this vein, “The Age of Technology,” was a response to an article by the physicist Richard von Mises that had been published in the journal of the Association of German Engineers (VDI) in August 1920.⁵⁷ Von Mises was trained as a mechanical engineer and became professor for applied mathematics at the University of Berlin in 1920. In 1933 he left Germany and eventually became, in 1939, professor of mechanical engineering at Harvard.⁵⁸ His 1920 article was a popular introduction to the recent breakthroughs in theoretical physics, such as the theories of space-time and the atom by Einstein and Max Planck. However, he framed

53. *Ibid.*, 2.

54. *Ibid.*, 1.

55. Carl Weihe, “Das Zeitalter der Technik.”

56. Fritz Stern, *The Politics of Cultural Despair*, 53–70.

57. Richard von Mises, “Naturwissenschaft und Technik der Gegenwart.”

58. Sooyoung Chang, *Academic Genealogy of Mathematicians*, 59–60.

his text with two claims about technology: first, that there had been an “age of technology” during the recent decades, which was fading; and second, that the technological age would be superseded by a heyday of the speculative natural sciences comparable to the age of Copernicus, Galileo, and Kepler in the early modern period.⁵⁹ Weihe’s article challenged both of these claims.

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In “The Age of Technology” he first pointed out that von Mises refused to grant the current industrial age the same status as the ages of humanism, the Reformation, and the Enlightenment. Those ages were valid measures for both von Mises and Weihe (and many others at the time) as eras whose key ideas could be summarized in a few words and were part of each era’s *zeitgeist*.⁶⁰ Weihe conceded that the foundational thoughts of technology could not be easily expressed in few words or a single formula in the same way as could the ideas of humanism or the Enlightenment. But he challenged the way von Mises’s examined only the exterior, the surface, and not the ideas that were “gushing from” engineering work and its products. Weihe also found it problematic that von Mises seemed to assume that technology only meant industrial technology. Weihe instead insisted that any age could be called an “age of technology.” Here, he engaged in one of his frequent exercises in the history of technology, pointing to the cultural centers of antiquity—the civil, hydraulic, and military engineering of Egypt, Babylonia, and Rome—and even reached beyond, to the stilt houses of prehistory. Such periods, he affirmed, were *all* ages of technology.⁶¹

Weihe carried this one step further. He invoked large historical arcs to demonstrate how technology “has accompanied mankind on its upward path,” and, in the first place, distinguished man from animal. He then connected this claim with his metaphysical ideas regarding technology, culture, and humanness: man without hands and opportunity of technical engagement would not have superseded the threshold of animal existence, even with his intellectual disposition, if a benevolent creator had provided for the most basic needs of food, shelter, and protection against adversaries; any intellectual potential would necessarily shrivel in an environment of scarce opportunities. It was only in a struggle for existence and with nature, Weihe said, that the intellect (*Geist*) could strengthen and grow and man could “create a culture for himself.”⁶² He repeated this account often in other versions and other places in *Technik & Kultur*.

59. Von Mises, “Naturwissenschaft und Technik der Gegenwart,” 687. Weihe’s paraphrase of von Mises’s claims is found in Weihe, “Das Zeitalter der Technik,” 3.

60. Weihe, “Das Zeitalter der Technik,” 2: “Zeitalter, in denen bestimmte leitende Gedanken das allgemeine Bildungsbewußtsein beherrscht haben.”

61. *Ibid.*

62. *Ibid.*: “Nur im Kampf nicht allein ums Dasein sondern mit der Natur kann der Geist erstarken, der Mensch sich eine Kultur schaffen.” I use *man* and *mankind* instead of *human* and *humankind* to illustrate the thoroughly male-centered tone in this text of Weihe’s (and all others), even though he himself uses the more gender-neutral *Mensch* and *Menschheit*.

In a final step in this article, it is as if Weihe wanted to make technology and the industrial age more similar, in their defining features, to the ages of humanism and the Reformation: he addressed the question of whether “we have already had” an age during which the general consciousness had been pervaded by the idea of technology.⁶³ He conceded that the permeation of the cultural values of technology into the age’s consciousness had yet to begin, but he also emphasized that technology was a product of the human intellect, not merely a system of artifacts, and that the intellectual work embodied in technology was capable, as any other intellectual work, of “capturing the heart and soul of humans.”⁶⁴

German Idealism by and for Engineers

Weihe not only presented such accounts of the history and theory of technology, together with introductory articles on philosophy and the philosophy of technology, but he also promoted, and most likely commissioned, texts by other authors that introduced canonical philosophers’ work and demonstrated their relevance to engineering.⁶⁵ Among these texts was a study of the political philosophy of Fichte. In the late eighteenth and early nineteenth century, Fichte (together with Kant and others) founded the widely influential philosophical tradition of German idealism. To capture its essence, I refer briefly to two articles from *Technik & Kultur* whose authors explained Kant’s philosophy to engineers, and conclude with the article about Fichte.

German idealism was a momentous intellectual program that connected questions about knowledge with those about political and social theory, and history.⁶⁶ The idealist tradition continued to be a leading way of thinking about philosophy and society into the twentieth century.⁶⁷ Engineers in Germany were part of such debates in mediated ways, and German idealism was, from the engineers’ perspective, an obvious choice:

63. Ibid., 3: “ob wir überhaupt schon ein Zeitalter der Technik hatten, d. h. eine Zeitspanne, in der das allgemeine Bildungsbewußtsein von dem Gedanken der Technik durchdrungen war.”

64. Ibid.

65. Carl Weihe, “Die kulturellen Aufgaben des Ingenieurs” and “Spengler und die Maschine”; Zacharias, “Kants Bedeutung für die heutige Naturwissenschaft und Mathematik”; Herbert Graf, “Die Bedeutung der theoretischen Physik Kant’s für den Naturwissenschaftler und Ingenieur”; Werner Heinze, “Fichtes ‘Ueber die Bestimmung des Gelehrten’ und die heutige Berufsauffassung des Ingenieurs.” See also the citations in footnote 48.

66. My account of German idealism relies in crucial parts upon Frederick Neuhouser, “Introduction”; Dan Breazeale, “Johann Gottlieb Fichte”; Gunnar Beck, *Fichte and Kant on Freedom, Rights, and Law*; and David James, *Fichte’s Social and Political Philosophy*.

67. Karl Ameriks, “The Legacy of Idealism in the Philosophy of Feuerbach, Marx, and Kierkegaard”; Espen Hammer, “Habermas and the Kant-Hegel Contrast”; Hans Jörg Sandkühler, “Der Deutsche Idealismus zur Einführung.”

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it possessed the intellectual cachet and provided an account of the very role that VDDI engineers wanted to occupy in German society. This role had its roots in specific traditions of public scholarship and civil service, and for centuries had shaped the social identities of engineers' most immediate role models and competitors. Weihe was well-aware of this historical and philosophical capital; he used it explicitly as a model for academically trained engineers' role in society, and promoted articles in *Technik & Kultur* that elaborated on such social philosophies and their connections with engineers' social realities and desires.

In 1781 Kant had proposed a new account of knowledge about the world in response to an ongoing dispute between empiricism and rationalism that, in Descartes's work, extended back to the beginnings of modern philosophy. Kant claimed that knowledge of the world was a combination of the sensual impressions received from the world, together with something that reason contributed by itself. According to him, reason's contribution to knowledge about the world preceded any sensual impression, and reason thus constituted our knowledge in a fundamental way. Extending this principle, he also claimed that reason constituted the consciousness of free and rational human beings. Kant devoted most of his subsequent philosophical work to the analysis of reason, and later applied his initial epistemic ideas to moral philosophy and aesthetics as well. Fichte and others after him radicalized and universalized Kant's philosophy into a new form.⁶⁸

Fichte considered himself a direct intellectual successor to Kant, and he put at the center of his work a sustained inquiry into the nature and conditions of human freedom.⁶⁹ More so than Kant, he thought of the problems of human freedom and consciousness as social phenomena, and political and social theory therefore played a more distinct role in his thought than in Kant's.⁷⁰ Ideas surrounding the social contract had already been formulated earlier (by philosophers like Hobbes, Locke, and Rousseau); Fichte built on these, developing a theoretical account of how free and rational individuals had to agree among one another to constitute a legitimate political order (such as a state) that protected, delimited, and enforced their freedom.⁷¹

Fichte divided his community of free and rational beings into groups called "estates," and one of them, the "professions," is particularly interesting for our case. The professions included the scholar, the cleric, and the artist. The estate as a whole was meant to act on the community of rational beings: their intellect, moral sense, and aesthetic sense. The estate also included the state official, who built and ensured the legal relationships among

68. Neuhouser, "Introduction," vii.

69. Beck, *Fichte and Kant on Freedom, Rights, and Law*, 2–3, 10.

70. Neuhouser, "Introduction," vii; Breazeale, "Johann Gottlieb Fichte."

71. Neuhouser, "Introduction," vii–viii.

human beings, represented and executed the common will (through representing the state), administered the community of rational beings, and resolved conflicts among legislation, the constitution, and reason.⁷² This distinguished status of the state official in Fichte's political theory has an analog in the history of state administration in Germany. During the age of Frederick the Great, educated men in Prussia had ascended to the top of a carefully balanced sociopolitical world, and being an intellectual in the service of the German (or Prussian) state (or the king) meant being a man of honor.⁷³ These ideas from the 1780s and 1790s about public expertise, professional identity, and social status continued to provide an important vocabulary and intellectual resources for the unstable social orders of the German industrial state of the 1910s and 1920s, and in particular for engineers within them. This history also helps to explain the high social prestige of civil servants, professors, pastors, and judges, which was still relevant during the twentieth century and that provided such a powerful model for the nascent profession of engineers.

Weihe frequently used this cultural capital from the preindustrial world, such as at the end of his inaugural lecture in Darmstadt, when he cited passages from the works of Fichte and Friedrich Schiller. The two philosophers had begged, in the late eighteenth century, for academics and scholars to pursue their works with the highest ideals for the betterment of men and society. Weihe derived from their pleas a similar claim for the professional ethos of the academic engineer, saying that the academic engineer was, after all, a scholar in his field in the same way that other scholars at universities were in their respective fields.⁷⁴ An engineer named Werner Heinze, who like Weihe was from Frankfurt, used these passages from the inaugural lecture as a cue. His 1921 article in *Technik & Kultur* offered readers an interpretation of a prominent work of Fichte, *Einige Vorlesungen über die Bestimmung des Gelehrten* (The vocation of the scholar) (1794).⁷⁵

72. Beck, *Fichte and Kant on Freedom, Rights, and Law*, 2–3, 10; James, *Fichte's Social and Political Philosophy*, 82–83, 150–55, 165.

73. Sauter, *Visions of the Enlightenment*, 52–55, 97, 194.

74. Weihe, “Die kulturgeschichtliche Betrachtung der Technik,” 550: “Hat Schiller den Akademiker in seiner berühmten Antrittsvorlesung . . . darauf hingewiesen, daß er nicht als Brotgelehrter, sondern als philosophischer Kopf mit weitester Bildung an seine Arbeit gehen solle, hat uns Fichte . . . vorgehalten, stets als erste Pflicht des Gelehrten die sittliche Veredelung des Menschen im Auge zu behalten, so müssen wir diese Forderungen . . . auch für den Jünger der Technik, der ja auch ein Gelehrter in seinem Fach ist, . . . in Anspruch nehmen.”

75. Heinze, “Fichtes ‘Ueber die Bestimmung des Gelehrten’ und die heutige Berufsauffassung des Ingenieurs”; Johann Gottlieb Fichte, *Einige Vorlesungen über die Bestimmung des Gelehrten*.

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Heinze's article related Fichte's ideas on learning and society to engineers' professional self-understanding. Two other articles published in 1924 introduced engineers to the ideas of Kant's epistemology: one by an engineer, Herbert Graf, of Berlin, the other by Zacharias.⁷⁶ Both elucidated the relevance of Kant's ideas about the contribution that reason makes to knowledge before any experience, and emphasized that it was naïve to assume that our images about the world were identical with the world itself, and that the empirical progress in recent physics could philosophically justify this belief. Both also emphasized that philosophy was indispensable "for the engineer who is aware of the place of engineering in the larger cultural context of today's world."⁷⁷

In his 1921 article, Heinze started out by stating that Fichte would not have been able to foresee the recent massive change in technological development, its influence on culture, and the emergence of a new estate—the engineers' estate. But it was still possible, he held, to apply Fichte's ideas to this estate. Heinze was apparently in a position to claim early in his article, matter of factly and without much corroboration, that members of the engineers' estate took a distinguished, more universal position toward the empirical world than members of most other professions. He claimed that this position was close to the position that Fichte himself claimed in the 1790s for the estate of scholars and the professions. The legacy of German idealism in the popular political imagination of the twentieth century made this possible, and here, Heinze made the same claim that Weihe continuously made: for a higher status of engineers in society. The former did so not in the language of the relevance of technology in society, but in the language—still valid at the time—of late-eighteenth-century social philosophy. Heinze then outlined Fichte's reflections in *Einige Vorlesungen über die Bestimmung des Gelehrten*, explaining for readers the philosopher's ideas of the vocation of "man as such," the vocation of man in society, of man's need as a reasonable being to live with other reasonable beings, and Fichte's claim that scholars were scholars only insofar as they were social beings.

Given the complex social and intellectual situation in which engineers were finding themselves in the early twentieth century, Fichte's ideas about the scholar were appealing to the authors who wrote in *Technik & Kultur*. As for Fichte himself, ideas about the scholar were not a side project in his

76. Graf, "Die Bedeutung der theoretischen Physik Kant's für den Naturwissenschaftler und Ingenieur"; Zacharias, "Kants Bedeutung für die heutige Naturwissenschaft und Mathematik."

77. Graf, "Die Bedeutung der theoretischen Physik Kant's für den Naturwissenschaftler und Ingenieur," 59, 61; Zacharias, "Kants Bedeutung für die heutige Naturwissenschaft und Mathematik," 21: "der sich der Einordnung seiner Berufstätigkeit in den Kulturzusammenhang der Gegenwart bewusst ist."

overall work: they were at the very root of his idealist philosophy of society. Heinze explained how Fichte conceived of the stratification of society into estates, and of disparity and inequality in society, and how he derived the legal foundation of the diversity of estates in society from his account of the relationship between the individual and society.⁷⁸ For Fichte, the “estate state” (*Ständestaat*) was the only social form in which man could pursue his vocation. Fichte thus explicitly created space for the division of labor, expertise, and specialization, and for government supervision.⁷⁹ He singled out the estate of scholars as the one that had the greatest breadth of vision and thus should supervise society and its historical development.⁸⁰ Naturally, this model of society and the role of educated men in it became for Heinze a model for the role of the estate of the engineers within the German nation. At the end of his article, Heinze derived from Fichte’s work the distinct claim that it was up to the engineers’ estate, as a model for society, to prevent the decline of the West.⁸¹

Conclusion

The ways in which engineers have thought of the interrelations among philosophy, politics, and their work closely depend on the intellectual resources they had at their disposal at a given historical moment: the type of philosophy, the overarching canon, and the relevance they felt of philosophical ideas with engineering work and their social situation. In this case of German high industrialism, engineers’ choices had a great deal to do with the accounts of German society and philosophy that were in use at the time as legitimate and appealing models. Their choices also came from how they assessed their social situation and constituted themselves as a professional group. As the image of the professional engineer was becoming better known to the public through rapid industrialization, engineers made efforts to formulate criteria of a social status they deemed appropriate for themselves, and one of parity with existing elites. The pursuit of philosophy was certainly an activity that characterized the traditional elites in Germany, with whom engineers were trying to become equal.

There is a social, as well as an intellectual, history of engineers’ professionalization, humanistic elites, and German idealism, and it creates a small and rich analytical space to discuss the place of engineering in soci-

78. Heinze, “Fichtes ‘Ueber die Bestimmung des Gelehrten’ und die heutige Berufsauffassung des Ingenieurs,” 34–35.

79. Beck, *Fichte and Kant on Freedom, Rights, and Law*, 131.

80. Manfred Kühn, *Johann Gottlieb Fichte*, 242–47.

81. Heinze, “Fichtes ‘Ueber die Bestimmung des Gelehrten’ und die heutige Berufsauffassung des Ingenieurs,” 37: “An dem richtigen Vorbild durch den Ingenieurstand, im Fichte’schen Sinne, liegt es nicht zuletzt, wenn der Untergang des Abendlandes verhindert wird.”

ety. This helps us to better understand the origin of engineers' ideas, which they used to establish social and cultural identities that did not exist prior to the emergence of their profession as an institution and academic discipline. Even today, there continue to be open questions, even complaints about whether engineers have carved out an appropriate professional identity.⁸² I have presented a microcosm of engineers' efforts to come to terms with their technical expertise, philosophical expertise, and desired self-image in a rapidly industrializing modernity whose complex social orders were nevertheless replete with traditional symbolism and established male professional identities. The connections between the theories they pondered and the ways in which they assessed their social status suggest that often the social and intellectual histories of technology coincided, and that no clear distinction may be drawn between engineering and philosophy.

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