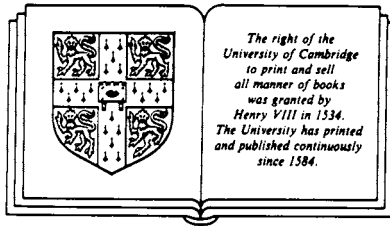


# New profession, old order

Engineers and German society, 1815–1914



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## Introduction

In 1914, after trying for almost a century, German engineers had achieved only modest gains in their pursuit of professional standing. In fact, as a group the engineers probably were further from their goal on the eve of World War I than they had been thirty or forty years earlier. In the throes of a deep crisis, the profession was wracked by internal conflict, fragmented into numerous subspecialties and class positions, separated by wide differences in formal education, and locked in bitter combat with industrial employers, social reformers, and the incumbents of the civil-service bureaucracy. In addition, engineers suffered from a debilitating oversupply, and their various projects for legal reform, creation of new career opportunities, and restriction of access to the profession were getting nowhere. The frustrations attendant upon this state of affairs, which carried over into the Weimar Republic, go a long way toward explaining the utopian politics and the double-edged hostility for Germany's established elites and the proletarian left that the overwhelmingly middle-class engineering profession developed.

The massive discontent of the middle classes after World War I was arguably the single most important problem of German society between 1918 and 1933.<sup>1</sup> Historians continue to debate whether this disaffection and the political crisis it produced can ultimately be explained only with reference to a long history of German exceptionalism and the survival of preindustrial traditions or whether it should be accounted for primarily in terms of industrial capitalism.<sup>2</sup> Obviously a study of engineers and

1 E.g., Thomas Childers, *The Nazi Voter: The Social Foundations of Fascism in Germany, 1919–1933* (Chapel Hill: University of North Carolina Press, 1983); Konrad H. Jarausch, "The Crisis of German Professions 1918–1933," *Journal of Contemporary History* 20, 3 (July 1985): 379–98.

2 David Blackbourn and Geoff Eley, *The Peculiarities of German History: Bourgeois Society and Politics in Nineteenth-Century Germany* (Oxford University Press, 1984); Geoff Eley, "What Produces Fascism: Preindustrial Traditions or a Crisis of a Capitalist State?" *Politics and Society* 12, 1 (1983): 53–82; Jürgen Kocka, *White Collar Workers in America 1890–1940: A Social-Political History in International Perspective* (Beverly Hills: Sage Publications, 1980); Ralf Dahrendorf, *Society and De-*

German society in the century before 1914 cannot answer this question directly. What it can do, however, is show that neither preindustrial factors nor industrial capitalism alone caused the engineers' most intractable problems. Only the unique and peculiar convergence of developments originating in the early nineteenth century and the dynamics of industrial capitalism after 1850 did so, creating conditions that profoundly traumatized engineers in the decade before 1914 – and after.

As would-be professionals, the German engineers always found themselves on the dividing line between capitalist industry and the old order. With the exception of certain subgroups, engineers never quite succeeded in fully becoming part of either world and ended up being squeezed mercilessly between the two. The result was that eventually they developed a deep-seated resentment of both: of the surviving preindustrial world of high culture, classical learning, and the state, which had never really accepted them, and of the realm of capitalist bosses and proletarians, which demanded that they surrender their aspirations to professional autonomy. The possibility of turning left had been ruled out because of the revolutionary Marxist rhetoric of the working class, leaving only the options of impotent democratic reform, radical right-wing protest, or flight into dangerous and utopian fantasies. Engineers embraced all three in the years before World War I. Their multifaceted hatred of the establishment and the left is precisely the attitude that Wolfgang Sauer has identified as being at the center of National Socialism.<sup>3</sup> It emerged among the best educated and ostensibly most cultured engineers in the years before 1914.<sup>4</sup>

The engineers' sociopolitical failure probably was intimately related to Germany's industrial successes in the second half of the nineteenth century. The astonishing dynamism of German industry may well have been a function of the inability of technically educated groups to become "feudalized" or fully integrated into the establishment. The rift separating *Technik* from *Bildung* and *Besitz* remained so wide and deep in Germany that engineers were forced to develop something like a counterculture and to compete rather than amalgamate with the dominant social order.<sup>5</sup> They

*mocracy in Germany* (Garden City, N.Y.: Doubleday, 1969); Hans-Ulrich Wehler, *The German Empire 1871–1919* (Leamington Spa, Dover: Berg Publishers, 1985).

3 Wolfgang Sauer, "National Socialism: Totalitarianism or Fascism?" *American Historical Review* 73, 2(1967):404–24. It should be noted, however, that there is virtually no evidence of anti-Semitism among engineers prior to 1914. Jews were rare in the engineering profession.

4 Some of the ideological aspects of this development are discussed in Karl-Heinz Ludwig, *Technik und Ingenieure im Dritten Reich* (Düsseldorf: Droste Verlag, 1974); also Jeffrey Herf, *Reactionary Modernism: Technology, Culture and Politics in Weimar and the Third Reich* (Cambridge University Press, 1984).

5 This was in contrast to British and French developments. On France, see David S. Landes, "French Entrepreneurship and Industrial Growth in the Nineteenth Century," in *The Experience of Economic Growth*, ed. Barry E. Supple (New York: Random House, 1963), 340–55; idem, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*



did so in terms of a technological prowess that was the envy of other industrial societies and the motor of economic success, but also the fuel for eventual hostility toward the entrenched elites.

Closely related to the issue of the engineers' discontent is the problem of their fragmentation and internal divisiveness. In this regard, as well, they were a microcosm of the larger society. As the nineteenth century progressed, a rapidly expanding number of new, highly diverse positions related to industrialization, up and down the scale and in a wide variety of settings, came to be occupied by men who called themselves engineers or men who were engineers but thought of themselves as something else. Their educational and functional diversity, unlike that among contemporary physicians, lawyers, military officers, professors, or higher civil servants, was enormous, and there is some question whether or not engineers became a profession at all, in addition to the question of what it meant to be a profession in the German context.<sup>6</sup> Because this is a historical rather than a definitional question, one way to read this study is as a "thick description" of the meaning of "profession" and its development in an age of industrial capitalism.<sup>7</sup>

I have adopted a similar approach with regard to the meaning of the term *Ingenieur*. The suggestiveness, vagueness, and shifts in meaning that accompanied the use of the term contributed to more than a hundred years of imprecision, confusion, and conflict over the definition of the engineering profession in Germany. Throughout the nineteenth century, the word *Ingenieur* was used interchangeably with the more neutral term *Techniker*, or technician. Depending on the context, however, *Techniker*

(Cambridge University Press, 1969), 131–7, 189, 202–10, 339–48; Terry Shinn, "From 'Corps' to 'Profession': the Emergence and Definition of Industrial Engineering in Modern France," in *The Organization of Science and Technology in France, 1808–1914*, ed. Robert Fox and George Weisz (Cambridge University Press, 1980), 183–203; Charles P. Kindleberger, "Technical Education and the French Entrepreneur," in *Enterprise and Entrepreneurs in Nineteenth- and Twentieth-Century France*, ed. Edward C. Carter II, Robert Forster, and Joseph N. Moody (Baltimore: Johns Hopkins University Press, 1976), 3–40; John Hubbel Weiss, *The Making of Technological Man: The Social Origins of French Engineering Education* (Cambridge, Mass.: MIT Press, 1982). On Britain, see Martin J. Wiener, *English Culture and the Decline of the Industrial Spirit, 1850–1980* (Cambridge University Press, 1981).

6 This problem is discussed more fully in Kees Gispén, "German Engineers and American Social Theory: Historical Perspectives on Professionalization," *Comparative Studies in Society and History* 30, 3(Summer 1988):550–74.

7 As a history of engineers' professionalization, the study's questions and open-ended point of termination in 1914 are distinct from a perspective that locates the "culmination" of German history in 1933–45. In practice, the two were intertwined and cannot be separated: The world did not stop in 1914, nor does one get to the present without passing through the Nazi era. I have tried to address this problem by operating with a double *Fragestellung* throughout: a more sociological one centered on fundamental changes in social organization that reach to the present, and a more historical one focusing on Germany's unique and tragic political history before 1945. For the concept of "thick description," and the concomitant decision to forgo operationalizing the terms "profession" and "engineer," see Clifford Geertz, *The Interpretation of Cultures* (New York: Basic Books, 1973), 3–30.

could also refer to a lower species of technologist – roughly the equivalent of the English “mechanic” or “machinist.” *Ingenieur*, for its part, had connotations that varied by region and over time. In the early nineteenth century in southern and southwestern Germany, *Ingenieur*, as in France, typically meant civil engineer – a hydraulics expert or a road builder trained and employed by the state. In northern Germany, the same person would be known as *Baubeamte* (“building civil servant”), whereas an *Ingenieur* was a technologist of uncertain educational background, active in the private sector and typically concentrating on mechanical subjects. Although these regional variations in usage gradually disappeared, the lack of precise meaning did not. On the contrary, it increased, with *Ingenieur* becoming a generic term for all technical functions above skilled blue-collar work and foreman duties. An unprotected occupational designation (comparable to, e.g., “accountant,” as opposed to “certified public accountant”), the term was frequently manipulated for purposes of social advancement. Until the 1960s, anyone could become an *Ingenieur* in the German Federal Republic simply by appropriating this label at will.

Though partly autonomous, the legal and terminological confusion was not so much a cause as a consequence of the engineers’ most basic problem. Their inability to form a cohesive professional group had two deeper causes: one pertaining to the peculiarities of nineteenth-century German society, the other inherent in engineering work as such. Going through the historical evidence, the dictionary, and the sociological literature, one searches in vain for a good German equivalent of the concept “profession.” This is because it is essentially an Anglo-American notion that until very recently did not exist in the German context.<sup>8</sup> It has been shown, however, that the concept is intimately related to Max Weber’s model of bureaucracy and that “profession” and “bureaucracy,” often thought to be antithetical, share so many basic traits that they can be viewed as variations on a common theme. Both were avenues for middle-class emancipation and the quest for privilege through technical expertise, instrumental rationality, objectivity, examinations, closure, and loyalty to a higher cause or service to an impersonal master.<sup>9</sup> Their kinship helps explain why the values and traditions of Germany’s preindustrial public officialdom spread so widely among a new industrial occupational group such as engineers, employed overwhelmingly in the private sector.

8 Recent German work that has been measurably influenced by the concept profession: Werner Conze and Jürgen Kocka, eds., *Bildungsbürgertum im 19. Jahrhundert*, vol. 1: *Bildungssystem und Professionalisierung in internationalen Vergleichen* (Stuttgart: Klett-Cotta, 1985); Claudia Huerkamp, *Der Aufstieg der Aerzte im 19. Jahrhundert: Vom gelehrten Stand zum professionellen Experten: Das Beispiel Preussens* (Göttingen: Vandenhoeck & Ruprecht, 1985).

9 Gispén, “German Engineers and American Social Theory,” and the literature cited there.

The civil-service bureaucracy was not merely a historically plausible, though structurally alien, reference group for the engineers; it also represented the substance of professionalism in the German environment. Many engineers therefore readily adopted the bureaucratic ethos, which included values such as a premium on social harmony and service to the general welfare, the moral superiority of objective technical expertise and of administrative solutions over political solutions, and above all the need for "general cultivation" imparted by classical training.

Significantly, however, not all engineers adopted the bureaucratic model. The evidence shows that even though many of them did so, the occupation as a whole did not readily embrace the bureaucratic ethos or fit the bureaucratic version of the professional model. This is because the bureaucratic option, though indeed a major feature of the German historical landscape, was not the only model of professionalism available for emulation. In the first two decades of the nineteenth century, a historical development was set in motion that introduced "democratic principles in a monarchical government."<sup>10</sup> That is to say, while the bureaucratic elite and "the state" retained ultimate political control, their conscious pursuit of a liberal economic policy and other liberal political reforms helped bring about an autonomous "society," that is, an incipient liberal polity and market economy. Initially weak and lacking in self-confidence, these liberal elements in German society gradually matured, acquired considerable strength, and finally rose up in revolt against the bureaucratic state in 1848.<sup>11</sup> Though, politically, Liberalism was defeated in 1848, in the economic arena it prevailed, and Germany continued uninterruptedly on its free-market path until Bismarck's dramatic change of course in 1878–9. Meanwhile, the country underwent rapid economic growth and massive industrialization after 1850.

Within the tenacious shell of the bureaucratic old order, therefore, Germany developed many of the characteristics of a more liberal industrial society. The incongruities of this combination, and the uncontrollable tensions it produced, were repeated in the cleavages of the occupational structure. Next to the traditional bureaucratic-professional colossus there arose the relatively insignificant and weakly developed institution of the

10 Prince Hardenberg, quoted in Hans Rosenberg, *Bureaucracy, Aristocracy and Autocracy: The Prussian Experience, 1660–1815* (Boston: Beacon Press, 1966), 202–3.

11 Werner Conze, "Das Spannungsfeld von Staat und Gesellschaft im Vormärz," in his *Staat und Gesellschaft im deutschen Vormärz, 1815–1848* (Stuttgart: Ernst Klett Verlag, 1970), 207–69; Jürgen Kocka, *Unternehmensverwaltung und Angestelltenschaft am Beispiel Siemens 1847–1914: Zum Verhältnis von Kapitalismus und Bürokratie in der deutschen Industrialisierung* (Stuttgart: Ernst Klett Verlag, 1969), 41–7; Reinhart Koselleck, *Preussen zwischen Reform und Revolution: Allgemeines Landrecht, Verwaltung und soziale Bewegung von 1791 bis 1848* (Stuttgart: Ernst Klett Verlag, 1967), passim.

so-called free professions (*freie Berufe*) (e. g., physicians, private legal counsel, “free” architects, independent consulting engineers).<sup>12</sup>

The engineering occupation also reflected these rifts and divisions. One recognizes patterns that seem to fit the Anglo-American mold of profession, but are then arrested, or apply to only a segment of the occupation. Likewise, bureaucratic tendencies, though clearly present, also were only partially and unevenly developed. Even when put together, moreover, these two related models account for only part of the picture, because the engineering occupation also belonged in part to Germany’s emerging community of businessmen and entrepreneurs.

As the nineteenth century progressed, the relationship involving the bureaucratic, professional, and entrepreneurial tendencies in Germany’s economic and occupational structure shifted. Until the 1870s, a liberal, market-oriented economy rapidly grew in opposition to, but against the background of, a still vigorous preindustrial bureaucratic tradition. Toward the end of the century, this trend was reversed as industrial capitalism became bureaucratized and converged with the existing bureaucratic patterns to lay the foundation for a new historical phenomenon, variously described as the rise of organized capitalism, corporate capitalism, managerial capitalism, or the postliberal interventionist state – trends that did not, however, become dominant until World War I.<sup>13</sup> Many of the liberal, decentralized, and competitive features of the occupational structure that might have stimulated further development of professions on an Anglo-American pattern grew more slowly or stopped growing altogether, whereas bureaucratic dimensions – albeit substantially modified by market rationality – regained prominence.<sup>14</sup>

The rapid succession and kaleidoscopic interplay of these various patterns and cleavages help explain why the case of the German engineers presents such difficulties. Located at the juncture of several different principles of organization, pulled back and forth between contradictory tendencies, and split into a variety of factions and segments, the German engineers never had much of a chance to follow any one line of development

12 Otto Hintze, “Der Beamtenstand,” in *Soziologie und Geschichte: Gesammelte Abhandlungen zur Soziologie, Politik und Theorie der Geschichte*, 2d ed., ed. Gerhard Oestreich (Göttingen: Vandenhoeck & Ruprecht, 1964), 77; Huerkamp, *Aufstieg der Aerzte*; Conze and Kocka, *Bildungssystem und Professionalisierung*; Dietrich Rueschemeyer, *Lawyers and Their Society: A Comparative Study of the Legal Profession in Germany and in the United States* (Cambridge, Mass.: Harvard University Press, 1973).

13 E. g., Heinrich August Winkler, ed., *Organisierter Kapitalismus: Voraussetzungen und Anfänge* (Göttingen: Vandenhoeck & Ruprecht, 1974); Gerd Hardach, *The First World War* (Berkeley: University of California Press, 1977); Alfred D. Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass.: Belknap Press of Harvard University Press, 1977).

14 Kocka, *Unternehmensverwaltung*, 13–29, 521, 547–59; for similar trends in the United States, see Edwin T. Layton, Jr., *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland: Case Western Reserve University Press, 1971).

very long. For one reason or another, patterns could never solidify, trends were prematurely interrupted, or context abruptly changed.

Exogenous factors like the overall historical environment were not the only causes of the engineers' lack of cohesion. Their inability to develop into a true occupational community was inherent in the nature of engineering as well. Although Durkheim and his functionalist followers were right to draw attention to the group-formative powers of a shared occupation, it should not be forgotten that occupation has powerful competitors in religion, ideology, class, gender, and birth – all of which can cut across or complicate occupational solidarity.<sup>15</sup> Even if these other factors could be ignored, engineering itself developed many separate subspecialties as industry diversified and bureaucratized, leading to countless gradations of skill, training, responsibility, employment setting, and prestige for engineers. This balkanization counteracted occupational community or tended to produce an array of separate communities within the larger occupation.<sup>16</sup> This was the case not only in Germany but also in other countries. American engineers, for example, exhibited many of the same educational, social, and career cleavages as did the German engineers. The tendency toward fragmentation in the American case was so pronounced that Robert Perrucci and Joel Gerstl speak of engineering as a “profession without community.” While acknowledging that “engineering *is* a profession,” they also conclude that “it lacks the one characteristic traditionally deemed the essence of professionalism – a community of shared values.”<sup>17</sup>

In fact, the ideal type of a homogeneous occupational community corresponds so poorly with the known facts in a number of occupations that social scientists have developed a complementary model, known as the “segment” or “process” approach. Pioneered by the occupational sociologists Rue Bucher and Anselm Strauss to analyze the medical profession, the segment approach “develop(s) the idea of professions as loose amalgamations of segments pursuing different objectives in different manners and more or less delicately held together under a common name at a particular period in history.”<sup>18</sup> Bucher and Strauss view the segments within a profession as coalitions of opposed interests, each possessing a

15 Emile Durkheim, *The Division of Labor in Society*, 2nd ed. (New York: Free Press, 1964), preface; William J. Goode, “Community within a Community: The Professions,” *American Sociological Review* 22 (1957): 194–200; Graeme Salaman, *Community and Occupation: An Exploration of Work/Lesure Relationships* (Cambridge University Press, 1974).

16 William M. Evan, “Engineering,” *International Encyclopedia of the Social Sciences*, vol. 5 (New York: Macmillan, 1968), 69–79.

17 Robert Perrucci and Joel E. Gerstl, *Profession Without Community: Engineers in American Society* (New York: Random House, 1969), 176.

18 Rue Bucher and Anselm Strauss, “Professions in Process,” *American Journal of Sociology* 66 (January 1961):325–6.

common occupational situation, a distinctive professional identity or ideology, and a shared historical perspective, in consequence of which they "tend to take on the character of social movements."<sup>19</sup>

One of the most important causes of segmentation relates to the knowledge base of a profession. Different views of its "sense of mission" associated with the emergence of a new specialty and the attendant claims and denials of exclusive competence are potential sources of conflict. Other knowledge-related issues around which different segments have crystallized have concerned the primacy of application (practice) or innovation of knowledge (theory, research), as well as the roles of teaching, public service, consulting, and general or specialized practice as the profession's core activities. Yet another example of this sort is disagreement over methodology and techniques, which can produce the kind of deep divisions and struggles between factions that have been documented with reference to scientific revolutions.<sup>20</sup>

A second cause of segment formation pertains to the audience or clientele of a profession. All professions need an audience as the basic condition of their survival, and conflict may arise over how to maintain the clientele, prevent it from shrinking, or promote its growth. Thus, segmentation is intimately linked to the question of the targeted audience: Does it consist primarily of the public at large, or is it composed of large and influential customers, colleagues, bureaucratized corporations, or the government? Is it in the process of changing from one to the other? A third cause of segmentation is the organization of occupational practice. One's role as a sole practitioner, a partner, or an associate, whether one is self-employed, is a salaried employee, is a civil servant, or works in a large or small organization – all these differences are potential sources of conflict and, in the case of the German engineers, became the basis for divisiveness and eventually for separate patterns of association.<sup>21</sup>

The existence of segments is also reflected in the history of professional associations, which "are not everybody's association but represent one segment or particular alliance of segments."<sup>22</sup> Control over associations often is intimately bound up with a segment's chances of survival, because it means the ability to forge special relationships with preferred clients and to influence the educational policies or curricula by which segments replenish themselves or become dominant. Because of such advantages, control over professional associations often is disputed, and associations can provide the battleground between competing factions, or segments can split off to form their own associations.

19 Bucher and Strauss, "Professions in Process," 326–30.

20 Thomas S. Kuhn, *The Structure of Scientific Revolutions* (University of Chicago Press, 1971).

21 A. L. Mok, *Beroepen in Actie: Bijdrage tot een Beroepensociologie* (Meppel: Boom, 1973), 68–9.

22 Bucher and Strauss, "Professions in Process," 330.

Set against the background of the wider occupational community posited by Durkheim and the functionalists, the segment approach sheds a great deal of light on the history of engineers. Perrucci and Gerstl employ a combination of the two models in their analysis of the engineering profession in the United States. Harry Lintsen does the same in his study of the Dutch civil engineering corps in the nineteenth century. Monte Calvert's history of the American mechanical engineers, written largely in terms of a fundamental conflict between "shop culture" and "school culture," is an obvious, albeit unacknowledged, application of the segment approach.<sup>23</sup> For a history of the German engineers, these concepts are valuable as well.

The German engineers who are the subjects of this study – the men who described themselves as *Ingenieure* or as *Techniker* and who were overwhelmingly active in the private sector in mechanical specialties – were from the outset split into two fundamental camps. One was headed by engineering professors and technical educators; the other was led by senior managerial engineers and businessmen-engineers. A similar division existed in the United States. Unlike their American counterparts, however, German engineers did not evolve from a "shop culture" dominated by respected but predominantly experimental and empirical entrepreneur-engineers to a "school culture" controlled by a strictly scientific and mathematical elite based in the universities. Rather, something close to the reverse was the case. The German pattern was one of initial predominance by a segment of engineering professors who sought to achieve the highest scientific standards in the shortest amount of time, with complete disregard for the needs of practical machine builders. In addition, these engineering scholars promoted a conception of engineering as pure science based on a foundation of classical secondary education and other quasi-aristocratic measures of social honor. The reasons for this development, which did not fully surface until the 1860s, as well as the embryonic formation of a countersegment of business-oriented engineers, are spelled out in Chapter 1.

Chapter 2 emphasizes those factors that made for occupational community in spite of the underlying reasons for divisiveness. A review of the founding period and early years of the Verein Deutscher Ingenieure, the largest and most important association of German engineers, shows how important the sense of common purpose, work involvement, and social marginality were for this first generation of engineers. Though the profession was indeed no more than a "loose amalgamation . . . more or less delicately held together . . . under a common name at a particular

23 Harry W. Lintsen, *Ingenieurs in Nederland in de Negentiende Eeuw: Hun Streven naar Erkenning en Macht* (Den Haag: Martinus Nijhoff, 1980); Monte Calvert, *The Mechanical Engineer in America, 1830–1910: Professional Cultures in Conflict* (Baltimore: Johns Hopkins University Press, 1967).

period in history," it is nonetheless clear that the forces uniting the engineers at that early stage were able to contain the pressures for segmentation and conflict.<sup>24</sup>

Chapter 3 reconstructs the process that led to the abrogation of occupational community in favor of a policy that promoted the interests and "sense of mission" of the professorial segment, as well as its control over the knowledge base of the occupation. These trends are analyzed with reference to the leadership structure and educational policies of the Verein Deutscher Ingenieure, as well as in terms of the evolution of Prussia's system of technical education until the mid-1870s.

Chapter 4 describes how the foregoing policies culminated in the founding of the *technische Hochschule* in Berlin. On the surface, the occupation's professorial segment had reached an important milestone in its struggle for educational certification and equality and amalgamation with Germany's traditional professional elites. At the same time, the events surrounding the educational reforms of the middle and late 1870s reveal a fundamental shift: a turning away from traditional definitions of professional knowledge, followed by acceptance "of the 'specialist type of man' [as opposed to] the older type of the 'cultivated man'" as the dominant self-image and model of professionalism for engineers.<sup>25</sup> Associated with the self-assertion of hitherto latent liberal and business segments in the engineering society, this change came to light in the debates over the *Oberrealschule*, a new type of nonclassical secondary school established at the same time as the *technische Hochschule*.

Beginning with Chapter 5, the focus of attention shifts to explain the rise to power of a managerial segment in the wake of the severe economic depression of 1873–9. The leaders of this industrial-capitalist faction consciously emulated and displayed many of the characteristics of an American "shop culture" that was just then entering its phase of decline. The interests and the mission of the members of this segment were first to destroy the remaining power of the professorial faction and then to recast engineering education and all that followed from it according to their own needs. To a large extent this succeeded, as standards of capitalist rationality and cost accounting replaced the economically irrational, technocratic policies and quasi-aristocratic ambitions of the occupation's first generation of leaders.

In Chapter 6, these changes are analyzed with reference to the formation and subsequent breakaway from the Verein Deutscher Ingenieure of various segments in response to client pressure and because of conflicts over the definition of the occupation's priorities. The focal point for many of

24 Bucher and Strauss, "Professions in Process," 325–6.

25 Max Weber, "Bureaucracy," in *From Max Weber: Essays in Sociology*, ed. H. H. Gerth and C. W. Mills (Oxford University Press, 1970; originally published 1946), 243.



these struggles was the editorial policy and the business policy of the engineering association's journal, which registered with striking clarity the changing of the guard. Chapter 6 also examines the consequences that the managerial segment's victory had for higher technical training and secondary education.

Chapters 7 and 8 focus on the reemergence of nonacademic engineering education that was part of the general reorientation of the 1870s. The new engineering schools and what they stood for became matters of contention between the Prussian state and the engineering profession's leadership, which used the conflict to acquire governmental policy-making powers. In the process, the last remnants of an all-encompassing occupational community of engineers were destroyed, making for exceptional degrees of factionalism, fragmentation, and frustrated social ambitions. Various gradations of academic engineers, themselves divided between managerial and professional types, confronted "uncultivated" upstarts from the newly formed nonacademic engineering schools, who often competed for the same positions in industry. Superimposed on this were the devastating consequences of an excess supply of engineers, brought on by the enthusiasm for technical schools of all sorts that seized Germany in the last decades of the nineteenth century. Because the Verein Deutscher Ingenieure proved unwilling and unable to deal with the social consequences of these developments, there came into being a great number of new organizations that catered to the specific interests of the various categories and ranks of engineers. The result was a state of bitter acrimony and latent civil war in the profession, with ominous consequences for the future. This development, which was accompanied by growing radicalization and anger toward the established elites, is discussed in Chapters 9 through 12.