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Local History and National Culture: Notions on Engineering Professionalism in America

BRUCE SINCLAIR

On the face of it, we know more about the engineering profession than practically any other large topic in the history of American technology. There are eight historical monographs explicitly concerned with the subject, half a dozen relevant biographies, and at least as many books that deal with the profession indirectly.¹ So it might seem fanciful to argue that we lack important details or that major questions remain to be addressed.

Yet those are just the claims I want to make. After a quarter-century of historical attention, we still know very little of the vast majority of American engineers. The actual case is that this extensive literature tells us mostly about the profession's central characters and the organizations those kinds of men established and perpetuated. The rank and file of any large group are always harder to apprehend than its

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¹The studies that deal particularly with the engineering profession in America are, in order of publication date: Daniel H. Calhoun, *The American Civil Engineer: Origins and Conflict* (Cambridge, Mass., 1960); Monte A. Calvert, *The Mechanical Engineer in America, 1830–1910: Professional Cultures in Conflict* (Baltimore, 1967); Raymond H. Merritt, *Engineering in American Society, 1850–1875* (Lexington, Ky., 1969); Edwin T. Layton, Jr., *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland, 1971 [and Baltimore, 1986]); David F. Noble, *America by Design: Science, Technology, and the Rise of Corporate Capitalism* (New York, 1977); Bruce Sinclair, *A Centennial History of the American Society of Mechanical Engineers* (Toronto, 1980); Terry S. Reynolds, *75 Years of Progress—a History of the American Institute of Chemical Engineers* (New York, 1983); and A. Michal McMahon, *The Making of a Profession: A Century of Electrical Engineering in America* (New York, 1984). A complete listing of works concerned to one degree or another with engineers and engineering would be very long indeed. But for an important and different set of arguments about the nature of technical work, see Eugene S. Ferguson, "The Mind's Eye: Nonverbal Thought in Technology," *Science* 197 (August 26, 1977): 827–36, and Brooke Hindle, *Emulation and Invention* (New York, 1981).

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leading figures, but in this well-studied profession the discrepancy is especially glaring. Nor do we know much of anything about what other Americans thought of these engineers. We claim that they symbolize technology, or reflect America's commitment to it, or in some other way provide insight into big issues like that. But, in fact, none of us has more than a slight grasp on the way the work and lives of engineers might illuminate the study of American culture.

Think about the paradoxes. More American men follow engineering than any other profession. Yet the vast majority—75–80 percent—of those identified with the principal branches of the field do not belong to their national societies and do not participate in the activities of those organizations. That was true in the past, and it is still so. Furthermore, those organizations—which ostensibly exist to serve their members—not only have no historical records of their memberships, they know surprisingly little about those who currently belong and nothing at all about the great numbers of engineers who might logically join.

If this state of affairs conjures up a mental picture of one of those buildings of the Old West, where there is more in front than there is behind, the difference between the claims engineers make for themselves and the way they appear to others is equally anomalous. Ever since John Alexander Law Waddell started telling engineering students to clean their fingernails and comb their hair, it has been easy to caricature the profession. Herbert Hoover's biographer said of the Great Engineer, for example, that he had all the emotions of "a slide rule."² Or, as the editor of *Toronto Life* recently described the grammar and punctuation programs of his word processor, "they seem to have been designed by engineers, not writers; they force your prose into a stuffy and predictable style."³ Instead of the portrait of a profession, what we have is a grab bag of stereotypical images and they picture a group that seems politically inflexible, socially awkward, culturally limited, and ethically inert.

In the late 1890s, the civil engineer George R. Morison argued that the coming potential for generating unlimited amounts of electrical energy would inaugurate a revolutionary stage in human development, unlike anything that had gone before, and that engineers would be the "priests of the new epoch."⁴ Why, then, didn't Theodore Dreiser

²A sampling of Waddell's ideas can be found in *Addresses to Engineering Students* (Kansas City, Mo.: Waddell & Harrington, 1912). The remark about Hoover comes from Robert S. McElvaine, "An Uncommon Man: The Triumph of Herbert Hoover," *New York Times*, *Book Review Section*, September 2, 1984, p. 4.

³*Toronto Life*, May 1984, p. 5.

⁴As quoted in Layton, *Revolt of the Engineers*, p. 59.

or Frank Norris or Sinclair Lewis write a novel about these powerful characters in the American drama? How is it that Eugene O'Neill's 1929 play, *Dynamo*, which so caught the spirit of that great transformation Morison had in mind, mentions engineers only to dismiss them as irrelevant? If technology really stands at the center of the American experience, if its history tells us something both novel and essential about the country's past, as Brooke Hindle has said, why are engineers so invisible in American culture?⁵ Is it because, after all, they are not synonymous with technology? Or is it that, in any event, elevated literature is the wrong place to look for them? And if existing historical scholarship does not answer these kinds of questions, what sort of an approach would?

Population biologists struggle with the problem that, in groups large enough to be statistically significant, individual complexities are lost, while aggregations small enough to make individuals significant become numerically irrelevant. Our difficulties with the existing literature are analogous. Edwin Layton and David Noble deal with essentially the same group of people, and, by making national engineering societies and corporate industry the principal settings for their stories, each implies a scale of historical action grand enough to describe important truths. However, they characterize this group in two quite different ways. Those engineers who for Layton are riven by ambivalence—pulled in opposite directions by science and business and consequently unable to realize either their professional aspirations or their economic ambitions—are for Noble a powerful and cohesive group, quick to identify their interests and to plot strategies that gain them their objectives. So it is apparently difficult simply to characterize the profession's leadership and the effect of occupational circumstance. But even if we could, we would still be talking about a small fraction of the total population and one in most respects unrepresentative. Nor does either analysis reflect that more individualistic, solitary, creative, and aesthetically satisfying side of engineering that Eugene Ferguson and Brooke Hindle talk about and that is presumably an important element of the engineer's self-image as well as of his work. Thus—and to overstate the case for the sake of argument—the existing literature not only fails the test of statistical validity; it yields an insufficient amount of information about individual variety.

There is another, more promising, avenue of attack open to us. I think the vital core of the profession might best be discovered at the level of local engineering associations. The membership, activities, and

⁵Brooke Hindle, ed., *Technology in Early America: Needs and Opportunities for Study* (Chapel Hill, N.C., 1966).

orientation of these groups are more representative of the profession than are the national societies. And it also strikes me that a study of them will most probably lead to a synthesis of our knowledge of this subject as well as to its integration into main themes of American culture. It may seem unpromising to seek in parochial associations the national dimensions of engineering professionalism, but there is where we will find most of the country's engineers, and there is where we are also more likely to get an enriched sense of their lives.

It is not, of course, that the concerns of national society leaders are irrelevant to the rank and file or that there is not an overlap in their interests, but rather that, besides the congruences, there are differences. For example, it has been clearly shown that the officers of national organizations are more conservative in their economic and social views than the membership. Conversely, city engineering societies in places like Cleveland, St. Louis, and Boston, institutions more likely to enroll those men who were not members of a national organization, were leading elements in the profession's reform movement of the early 20th century. The discourse in these local clubs is less self-conscious, too, and more likely to suggest what people feel as well as what they think.

There is to hand a neat case study to support the proposition. In 1930, when the American Society of Mechanical Engineers wanted to mark its fiftieth anniversary (and also to combat those critics of mechanization who blamed it for causing unemployment and dehumanized working conditions), the New York officers and staff planned an elaborate, week-long celebration carefully designed to publicize the claim that engineering was the basis of modern civilization. The festivities featured a gathering of prominent engineers from all over the world, a special banquet addressed by the president of the United States, and a unique theatrical production entitled *Control* that aimed to dramatize the connection between engineering and human progress.⁶ Besides the novel use of light, sound, and motion pictures, that pageant employed a cast of allegorical characters—Curiosity, Intelligence, and Beauty, among others—to illustrate engineering's professional and intellectual development. The proofs of that maturation, according to the pageant, were the readiness of engineers to assume a leading role in the solution of the world's economic and social problems and the ability of engineering to provide consumers with aesthetic satisfaction as well as material abundance.

Now, it happens that in 1930 the Engineers' Club of St. Louis also staged a play about the profession. Topical, funny, irreverent, and

⁶That pageant and the other ceremonials of the ASME's fiftieth anniversary celebration are described in my *Centennial History of the American Society of Mechanical Engineers*.

sardonic, it conveys a very different message than the pageant organized by ASME's elite, and thus we have the ingredients for an unusual comparison. Peter Gay, in his *Education of the Senses*, reminds us of Freud's argument that "institutions, whether of society or of the mind, at once control passions and satisfy human needs."⁷ In these two theatrical presentations, then, what can be discovered about the passions and needs of engineers?

The St. Louis engineers titled their production *Every Engineer: An Immorality Play*.⁸ It was, of course, to be a sort of *Pilgrim's Progress*, and it depicts the career of a naive young engineering graduate as he discovers what a professional life is really like. This play also has its allegorical characters—Youth, Ambition, and Ingenuity—who are Every Engineer's companions on his journey, as well as a cast of villains, called "robbers" on the program, which identifies them as St. Louis private utility corporations.

As the play opens, we learn two things about Every Engineer, that he is powerfully educated and enormously, indeed brashly, self-confident. Here is how he describes himself:

Building a bridge is merely childish play,
Electric theories are at my finger's ends
The methods of the laboratory, say:
I know how every beam of concrete bends!

Ambition echoes the extent of the engineer's learning with the observation, "All the professors passed him in their courses / *He* knows the laws which govern mass and forces." Nor is this the extent of his knowledge, as Youth advises us, "And he can juggle chemistry to boot / And as for handling men, that's his long suit." These lines may sound like one of Gilbert and Sullivan's patter songs, but it is not difficult to hear in them the language engineers of that era used when seriously describing themselves.

In *Every Engineer* this sense of commanding knowledge generates a considerable audacity, and he says,

Before me mighty work is all I see
Perhaps some trifling task to fill the hour
Until the ginks with money come to me
And give me a position of much power.

⁷Peter Gay, *The Bourgeois Experience—Victoria to Freud*, vol. 1, *Education of the Senses* (New York, 1983), p. 459.

⁸I am grateful to the Engineers' Club of St. Louis for a copy of the original typescript of the play.

So, full of himself, Engineer breezily approaches Corporation I, a private utility company of the city, for a job. The dialogue makes it plain, however, that these sorts of firms are put off by his independent cockiness, that they want experienced men, and that they want them cheaply, too. There is also, behind these lines, something of the painful knowledge of personal experience, of having learned the difference between school and the world, between mastery of knowledge and control over one's life.

Chastened by this rebuff, Every Engineer next approaches "Municipality" for a job and in that exchange is taught the realities of local politics. He is hired only because he knows someone and then discovers that, besides having to make a contribution to party funds out of his salary, he will be judged on his ability to win votes rather than on his technical skills.

After a brief piece of dialogue that satirizes the laziness and incompetence of city engineers, all the corporations reappear on stage, swaying gently to the "Flower Maiden" music from *Parsifal*. And now we come to the central confrontation. Attracted by Every Engineer's moral pliability, they introduce themselves one after another in a wonderfully scurrilous fashion:

Corporation II	We are bold Corporation The terror of this nation. In Jersey we incorporate But take our compensation From every man in this wide land Of high or lowly station.
Corporation III	Our stock on its own water Floats, though it shouldn't oughter, Our rights they are inviolate As Pharo's only daughter
Corporation IV	Precision such as yours, sir, Efficiency so sure, sir, We yearn to hire and consecrate To uses high and pure, sir; Come! find your ends in dividends.

As clearly ironic as their blandishments are, Every Engineer is easily persuaded. His acceptance speech reveals his awareness of the potent consequences in the combination of capital and technical skill, just as the corporations know that too, and they rejoice:

We are together now and will
Make the dear people foot the bill.

And by alchemic methods surer
Squeeze dividends from Aqua Pura.

Yet even as Every Engineer contemplates the bargain, he feels a sense of responsibility to his new employer, and his words reflect the profession's claim of ethical obligation to the client:

I hold a job, but bet your cash,
They'll get their money's worth.
No more on petty work
Have I a minute's leisure
No time to eat, no time to sleep,
No hour consigned to pleasure.

Youth joins the engineer in this commitment with the pledge, "I willingly will give my finest days / If for their wasting Corporation pays." His loyalty is met with scorn, however, as, *sotto voce*, the corporations mock Youth's poignant declaration with derisive laughter.

Oblivious to these portents, Every Engineer now calls on another allegorical familiar, Ingenuity, who with Youth and Ambition will raise him to success in his new job. Naturally, Ingenuity finds Every Engineer's situation appealing, and in a bit of stage business characteristic of this broad farce, slips an idea under his hat. When he sees it, Every Engineer exclaims:

Now will fat corporation
Be pleased with me. He'll pat me on the back,
And raise my pay: I should worry now!
Here's the stunt and it's a cracker-jack
A scheme to bring a joy to Jonny Hunter's heart,
A plan to use electric currents in plumb tarts!
T'll flatten out the peak, the hollows fill
And we'll get profits from every grocery bill!

But the corporation, in this case the United Electric Light and Power Company of St. Louis, has been looking over the young man's shoulder and snatches the idea from him. "Here, give me that you mutt," the corporation says, "I own the product of your festering nut." Youth and Ambition are pretty badly jolted by the experience, but Ingenuity slips another idea under the engineer's hat, with the advice, "Next time, my friend, make corporation *buy!*"

The second idea is directed toward one of the city's transit companies:

A plan to make the seats so darn unpleasant
 That no one, whether Lord or lowly peasant,
 Will stand for them, but *on* them, then you see
 They'll hold not two unfortunates, but three.

This corporation, too, has sneaked up on the engineer and says, "I'll take that stunt, so come across / You are my hireling and I am your boss." When the young man tries to hold it back, the corporation knocks him to the floor and takes the idea anyhow. In the struggle Youth has been struck down. Indeed, that is the end of him and, as the subsequent dialogue makes plain, of innocence besides.

Every Engineer is momentarily saddened by this turn of events, but Ambition cheers him on and Ingenuity gives him yet another idea, which this time, with a craftiness matching that of his adversaries, he hides for safekeeping. Boldly, then, he goes up to the local gas utility and tells the corporation, "This is a stunt, a peacherino true, / for multiplying all gas bills by two." As the others did, this corporation also grabs the engineer and searches him for the idea. When it isn't found, however, the corporations realize they must revise their tactics, and they invite the engineer to lunch where, after some bargaining, they agree to make him their consulting engineer. As one of them puts it, "My man, you've got a nifty little thinker / With all our properties we'll let you tinker."

The post of consulting engineer is the pinnacle of achievement for Every Engineer, and, in unison, the corporations sing with him a brief but deliciously ironic chorus that makes it seem as if he has acquired the position as a result of an arduous though honorable climb to the top. Then Municipality, politically reformed now, appears back on stage and joins in to say, "But talent such as yours I cannot buy," to which Every Engineer adds the refrain, "Can't buy." Municipality promises, however, in another of the play's topical references, that, if the new city charter is adopted, things will change for the better. Here again, the message—so reminiscent of Morris L. Cooke's anti-utility campaign two decades earlier—is obvious.

At that point the play's focus shifts as the last of the allegorical characters, Success, comes on stage, laurel wreath in hand. Every Engineer turns eagerly toward Success, casually leaving Ambition, his youthful companion, to depart the stage alone. As if it were not already clear, Success then describes the human costs of Every Engineer's achievement:

Few men attain my friendship without sin,
 My presence is no mark of purity

No guaranty of firm security,
The gaunt wolf "Want" may yet be heard
Outside your door.

In the 1930s these references to the unpredictable nature of economic life were real enough, and Success continues to mix harsh imagery with idealism. Indeed, Success's speech is a curious one. It ends the play and one might expect an upbeat, lighthearted tone. Instead, Success compares engineering with the other professions, to its detriment. The format is a familiar one in the contemporaneous engineering literature and in that context should have produced the old joke about doctors who bury their mistakes. But Success tells the engineers that they cannot hope to enjoy the status or financial rewards of the independent consultant, despite the learning and labor their profession demands. They have in their hands the "instruments that lay the *real* truth bare"; they can make "the poets' dreams" come true, he says. But few will value their achievement, and if they fail—an idea that consistently appears in these kinds of professional comparisons—they alone will bear the burden of it.

The play's authors meant by this astringent, Grail-like characterization of the engineering profession to close on an elevated, though somewhat elegiac, note. One could decide, despite those intentions, that this stark contrast with the funny and pointed material that came earlier was simply due to a failure of imagination. But there are other, more interesting ways to look at the play, the most obvious of which is that to some degree the production mirrors in both its humorous and serious modes the actual circumstances of St. Louis engineers during the 1930s. There is, for instance, an inescapably rueful undertone in the way they kidded themselves about their educations, employers, and careers. And in a similar fashion, the discontinuity between those jokes and the play's somber ending also suggests that, beneath the surface, there are attitudes and ideas worth exploring. But most of all, the play indicates how important such ephemeral, local sources can be in getting us closer to our subjects. And that possibility points toward another simple truth, namely, that the specifics of time and place are still the essential ingredients of the historian's work and that even such conventional tools are useful in the understanding of engineering professionalism.

It must be admitted, however, that in selecting this odd and fugitive document as case study, I also want to argue that the history of engineering professionalism is ripe for new adventures in analysis. One example of the different kind of interpretive modes that lie waiting for us is that book of Peter Gay's. The first of a projected multivolume

analysis of the bourgeoisie in the 19th century, *Education of the Senses* is full of ideas and approaches that seem valuable. Gay alerts us to the fact that documents like *Every Engineer* carry latent meanings, that people orient themselves by cultural signals, and that out of “varieties of experience,” the historian can construct “a recognizable family of desires and anxieties.”⁹ This approach encourages us to see the full nature of people; it helps correct the tendency to typecast engineers in the flat, one-dimensional terms we so often resort to; and it indicates how we might more successfully deal with the contradictions that currently hamper our efforts to describe the profession and its relation to American life.

Gay’s use of Freudian psychoanalytic concepts, particularly aggression, suddenly made me realize how much an engineer’s ordinary experience is dominated by adversarial relations of all sorts. And they are an accepted part of life; at one point in his speech, *Success tells Every Engineer*, “So I the men of all professions seek, / Saving the strong and grinding down the weak.” Aggression also encompasses the notion of mastery—I am reminded of Sally Hacker’s study of the function of the calculus in engineering education—and it includes domination over the environment.¹⁰ George Babcock, the founder of Babcock and Wilcox, provided a telling example of that kind of attitude when he claimed that engineering’s principal mission was to bring about the day “when every force in nature and every created thing shall be subject to the control of man.”¹¹

What Gay makes us realize, however, is that in these respects engineers do not stand apart from the rest of American culture. To the contrary, engineering professionalism is a cultural artifact, just as fashion, family life, or the language of the marketplace is, too. And if materialism and a certain difficulty with ideals are hallmarks of bourgeois culture, as Gay claims, then we can begin to recognize characteristics of the engineering population in terms that connect them directly to American history. The sense of impotence that *Every Engineer* expresses is not then a simple function of the terms of employment of engineers but a result besides of the pressures most Americans felt to get ahead and their fear of the consequences if they failed. Or, to put it somewhat differently, it was not simply corporate power or professional status that disturbed engineers but also the rapidly evol-

⁹Gay, p. 5.

¹⁰Sally Hacker, “Mathematization of Engineering: Limits on Women and the Field,” in *Machina ex Dea: Feminist Perspectives on Technology*, ed. Joan Rothschild (Elmsford, N.Y., 1983), pp. 38–58.

¹¹American Society of Mechanical Engineers, *Transactions* 9 (1888): 37.

ing nature of their work, and they felt themselves ground between the millstones of past and present—between an old mechanic arts tradition that spoke to enduring American values and the engineering science of the 20th century that promised insulation both from corporate cupidity and the condescension of aesthetes. So it is out of the processes of bourgeois culture that we get professionalism and specialization, but also, as the St. Louis play suggests, conflicting feelings of helplessness and confidence, of loyalty and isolation.

Thus, to insist on the complexity of human experience and on broad definitions of culture as our points of departure means, for the historian, access to a stock of emotional responses as well as political reactions or economic concerns. And that fuller kind of information yields, I think, better insight into the ways engineers and people like them tried to manage their lives during periods of great change.