# Advice to a New Academy

The Engineering Academy, founded on the same principles as the NAS, faces difficult, important tasks.

Julius A. Stratton

Just one hundred and two years ago—on 22 April 1863—the incorporating members of the National Academy of Sciences met for the first time in the chapel of New York University.

Frederick Seitz, president of the Academy, who has a fine sense of history, has reminded us on several occasions lately of events that led to that initial meeting. And he has suggested that there may still be lessons to learn from the formative years of this first of our national academies.

Indeed, the records of those early efforts make fascinating reading. The founders were dynamic individuals, men of enormous energy, with strong ties to the world of affairs as well as to the realm of science and scholarship. From the beginning it seems quite clear that the idea of a senior honorary society—of honor for honor's sake, after the pattern of some older European academies—played a very minor part in their plans. These were men who viewed the advancement of science as the mark of a progressive civilization. They cherished in common a desire to promote science and education on this new continent. Their one overriding motive—the central theme that runs through all their letters and documents—was expressed in a hope to bring the best of scientific knowledge to bear upon the solution of great national problems. And in this endeavor they won the full support of the Congress.

Frank Jewett once summed up the essence of the Academy's basic charter in these words:

> The Act of Incorporation is an astounding document. It is one of the most . . . sweeping delegations of power coupled with obligations of service to the Nation which the sovereign authority has ever made to a group of citizens completely outside the control of political government.
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> In less than forty words, the Act of Incorporation in effect created in the whole domain of science a Supreme Court of final advice beyond which there was no higher authority in the Nation and ensured that so far as was humanly possible its findings would be wholly in the public interest uninfluenced by any elements of personal, economic, or political force.

This is strong language. But it remains the charge to all of us who are gathered here this evening, for our new Academy of Engineering has been established under that identical charter.

We should remember, moreover, that in the context of the 19th century, "the whole domain of science" encompassed not only the pursuit of knowledge as an end in itself, but also useful knowledge in the tradition of Franklin and Jefferson. And for those of us who are disposed to think of the interplay among science, engineering, and government as a condition peculiar to our own times, it may be well to recall that nearly one-third of the original 50 members of the Academy of Sciences represented the army, the navy, or a federal establishment.

As I began to reflect upon how I might best express my thoughts on this subject, the idea came to me that I, too, might draw a little upon history.

My earliest predecessor as president of the Massachusetts Institute of Technology—indeed, the founder of that institution—was also the third president of the National Academy of Sciences, the immediate successor to Joseph Henry. William Barton Rogers was born a Virginian. He had been professor of geology and physics at the College of William and Mary, then Dean of the Faculty at the University of Virginia in Charlottesville. But the tensions were mounting in the 1850's, and with the growing frequency of student violence and disorder on that troubled campus, he finally despaired and removed to Boston.

Here was a man who had distinguished himself in the foremost ranks of science and had laid, moreover, new foundations for engineering education in the United States. I thought it most likely that even after the passage of one hundred years, some of his words, perhaps from his inaugural address to the Academy, might have special meaning for us.

It seems that when Rogers in Boston learned by telegraph of his election, he responded at once by taking the night train to Washington, arriving early in the morning of the last day of the session, almost exhausted by lack of sleep and fatigue. You know that the rigors of a journey on the Federal Express can hardly be overstated; and many of us, I am sure, have known sleepless nights on that identical railway car.

Nonetheless, he proceeded directly to the Academy. We have only the recollections of former members as to what then took place. It appears that, after gracefully returning thanks for the honor conferred upon him, Rogers, without notes of any kind, delivered an address "of such depth of thought and feeling, with such elegance and brilliance of expression" that his audience—including the Home Secretary—was held spellbound. No record whatsoever remains in the archives to tell us what he said.

Fortunately, in Cambridge I have access to the papers of President Rogers. The inaugural address of 1879 is missing, but there I did discover—in a long, handwritten memorandum—a most illuminating account of the first meeting of the founders of the Academy in the chapel of New York University. While there is little in this old document to guide us toward a more fruitful union of science and government, it does indeed offer another perspective upon our own history, and demonstrates once again how little the human heart and human interests are affected by the advances of science and technology.

To convey the spirit of Roger's

The author is president of the Massachusetts Institute of Technology, Cambridge. This article was originally an address delivered at the annual dinner of the National Academy of Sciences, of which he was then vice president, on 27 April 1965.

rather acid comments, I quote a few extracts from his memorandum of 1863, freely abbreviated and slightly expurgated. He begins as follows:

My first information that Congress had incorporated such an Academy, and that my name was on the list of 50 corporators came from Professor Gilliss of Washington, who while on a business visit to Boston called at my office and asked me how I liked the new Academy, thinking of course that my Cambridge neighbors had acquainted me with the scheme which they were so active in setting up. He showed great surprise at my ignorance of the matter, and gave such particulars as he knew about the plan, mentioning many of the names of the corporators, with the further statement that among the distinguished names not on the list was that of George Bond, the astronomer of Cambridge. I need not record the indignant surprise with which I heard of this.

Some time after, I received a Lithograph Circular from Senator Wilson [the senior senator from Massachusetts who had introduced the original bill] announcing the action of Congress and requesting a time to be named for holding a preliminary meeting of the corporators for the purpose of organization. Knowing really nothing of the purpose of the scheme, and very little of the names embodied in it, I felt so little care to connect myself with it that I delayed replying to Mr. Wilson's Circular for some weeks. I had only hearsay reports, and from what I could gather as to who were included in the list and who left out, the Organization seemed little more than an enlargement of the old Cambridge-Washington Clique.

Finally, but still in a rather indignant mood, Rogers decided to attend the first meeting, and he goes on as follows:

Some days before leaving for New York —and while I was hesitating as to my course—a friend mentioned in confidence a piece of news he had just heard. At the time I thought it a misconception, but it has been so confirmed by subsequent events that I now believe it to be true. The story is that a Cambridge Professor mentioned that *my name* was not on the list as furnished to Senator Wilson, by those who cooked it up, and that he had exclaimed against the omission and averred that he would have nothing to do with the bill until my name was added. Such was the extent of my knowledge of these mysterious plans and proceedings when I entered the Hall of the University of New York in the morning of April 22.

And now one final passage. Toward the end of the meeting, Professor Alexander Agassiz of Harvard invited those present to express whatever views they might have as to the principles which should guide in organizing the Academy and as to the objects to be promoted. Whereupon Rogers rose and, after expressing thanks to Senator Wilson for the patriotic earnestness with which he had labored in the cause of human progress, he took occasion to declare—in his words—

. . . My deep regret and mortification to find missing from the list of Corporators the names of Bond and Draper and Baird and Loomis, and others distinguished for their scientific labors. Is it not a sad mistake, if not a grievous wrong, that in a society selected to represent the active sciences of the Country these brethren and co-workers of ours should have no place? I feel that *I* have no right to be here when they are excluded, and you gentlemen, you must feel in your hearts that *you* have no claim to be here on such conditions.

Some perhaps were unpleasantly *startled* by what I said, many showed an earnest sympathy. No one ventured to gainsay or take offense. Some attempt was made to avert the blow by talking of the rashness of men of science who attempt to judge of the merits of those with whose department of study they are not familiar. This led only to desultory talk about the danger of attempting too large a field and the necessity of concentrating the powers on special objects of investigation.

Thereupon the meeting adjourned for lunch, to return later in the afternoon and become embroiled in the discussion of a proper length of term for the president of the Academy.

These few excerpts foreshadow the trying times that were to follow. It was Joseph Henry who, perhaps more than any other one man, provided wise and steady guidance during that first critical period. You recall that Henry, professor of physics at Princeton and subsequently Secretary of the Smithsonian, had laid the foundations of much of modern electrical engineering. As the second president of the Academy, he established its tone, style, and goals. He believed simply that only by an unswerving insistence upon the very highest standards of scientific achievement might this small body of men serve effectively the causes both of science itself and of the national welfare.

## The Academy of Engineering

The convening of the first annual meeting of the National Academy of Engineering, on 28 April 1965, marks the successful outcome of great efforts over a number of years, of many discussions, of some thoughtful misgivings, and a final resolution of major obstacles.

The central idea that brought this whole movement into being is again that of service to the nation. It does reflect the desire to enhance the quality and standing of the engineering profession, and it has already begun to identify preeminent figures in the many fields of engineering and to honor their achievements. But the new Academy has been created primarily in the hope that, through this means, the highest resources of the profession may be added to the attack upon the great technological problems that confront modern society.

I cannot conceive how it might be possible to gather together any group more perfectly qualified than those who have taken part in the foundation of the Academy to comprehend the inherent nature and character of science and of engineering—to understand how these two domains of human activity are distinguished fundamentally one from the other by goals and by methods, yet how they share common ground, and how their interests by the very nature of things are completely interwoven.

At the outset of the discussions which led to the foundation of the Academy of Engineering, there appeared to be no striking unanimity on the part of either the scientists or the engineers as to how the desired ends might best be accomplished. Two extreme courses lay open: to expand the present engineering section of the Academy of Sciences, or to establish a new and wholly independent academy under a separate congressional charter. The first alternative appeared impractical on the grounds of sheer numbers. The second, wisely, was rejected. For, on one point, there has been a complete consensus from the beginning. There could be no greater disservice to the cause of science and engineering than to set one against the other, and thus cause a cleavage between the two.

In the end we found recourse in that remarkable document of which I have spoken earlier, the charter of 1863. In a few paragraphs it embraces the common goals of the two academies. Under the provisions of that charter, without unduly impairing the freedom of action on the part of either, the bonds between the two may be maintained for all time.

But now that the formal steps of organization have been completed, we come to the acid test. The actions of the coming months and years must demonstrate beyond a doubt that this

whole concept of an Academy of Engineering is indeed valid, and that we have in fact created an effective instrument in the service of our country.

The difficulties that are inherent in this plan have been clear to the founders from the outset; the solutions have yet to be evolved. There are three factors in particular that distinguish the organization of engineering from that of science. They will influence profoundly all the developments that lie ahead.

The first emerges out of the present diffuse, rather amorphous character of engineering itself. In both its diversity and in profusion of activities, it differs greatly from medicine, law, or science. The range of occupations that today go by the name of engineering—from the highly specialized areas of research through design, development, production, construction, management, sales, and service—fuse with no clear boundary into the domain of the technician; all these taken together claim the interests of a substantial fraction of the total working population of the country.

The new Academy is not designed to duplicate the function of the innumerable technical societies representing special fields, nor, I believe, to offer direct representation to the whole array of occupations that I have just described. I suggest, therefore, that one of the first tasks to be undertaken is a clear definition of an appropriate constituency. For many years past, the engineering societies have been diligent in their efforts to formulate codes of professional ethics. But there is a need that goes beyond—the need to establish for engineering the nature of the professional estate, its obligations, and its responsibilities. In such an effort a national academy must take the lead.

Second, I want to touch upon a fundamental difficulty in establishing the criteria for membership.

I spoke a few moments ago of Joseph Henry and the standards he set for scientific scholarship. Pure science today finds its home principally in the academic world, and the published papers of the scientist provide almost invariably an accurate measure of the quality of his achievements.

A great engineer, like a great scientist, is identified by his works. Sometimes these will appear in the form of brilliant, analytical studies, such as were produced so often by the late Theodore von Karman. Certainly, a share of the membership of the new Academy will be found in the schools of engineering and in the research laboratories of industry.

But, more often, the works of an engineer are tangible constructions. We honor Othmar Ammann for his bridges and Clarence Johnson for his imaginative design of airplanes. It is important to remember, however, that by the nature of modern industry, great engineering triumphs today are increasingly the product of a team, of many minds and wills working in unison—the collective accomplishment of individuals whose separate contributions cannot easily be singled out. Nevertheless, it is for me a matter of faith that, despite the massiveness of modern enterprise, there is in every great and successful undertaking a creative force of intellectual leadership. Granted, that the task of identifying the particular individual engineering genius may be by no means so easy as in times past. It remains, nonetheless, the responsibility of the Academy to search it out. And that search must be unremitting, thorough, and utterly detached from any shred of vested interest.

Third, we must recognize that the very deep penetration of engineering into the entire world of affairs will make it all the more difficult to create and maintain that "Supreme Court of final advice." The voice of the Academy must be spoken from neutral ground. The integrity of its findings must be unimpeachable—wholly in the public interest and, in Jewett's own words, "uninfluenced by any elements of personal, economic, or political force."

In this idea of a detached, distinguished, supremely competent forum of discussion and source of help and advice lies the uniqueness of our American concept of a national academy. In the fulfillment of that purpose is our challenge and opportunity.