A CENTENNIAL HISTORY OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, 1880–1980

Alexander Lyman Holley (1832–1882)
A man of great charm and ability, his brilliant career was cut short by an early death.
Holley seemed to his own and later generations the ideal of
engineering professionalism.

BRUCE SINCLAIR
with the assistance
of James P. Hull

A Centennial History of The American Society of Mechanical Engineers

1880–1980

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FOR ALAN DOUGLAS SINCLAIR
1957–1980

I shared my ambitions for this book with my son Alan,
and I knew something of his dreams. But when he began
his punishing struggle with cancer, we became
partners in another kind of hope. A teacher myself,
I learned from him a deeply affecting lesson in courage
and that the most important thing in life is its quality,
not quantity.

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Preface

Americans have believed for a long time that democracy depends on an informed electorate. Yet it is practically impossible for the ordinary citizen to play much of a role in making political decisions about sophisticated technology, whether the questions involve energy policies, environmental considerations, or industrial safety standards. These kinds of problems have usually been left to the 'experts,' professional engineers with specialized knowledge who have also claimed to act in the public interest. Because Americans generally shared with engineers the same ideas about technical advance and industrial progress, in a sense they delegated their authority in such matters to these professionals, who devised codes of ethics as a promise of faithful performance. Of course, it was also in the self-interest of engineers to have that authority and one might say it was as much a case of taking as it was of giving, but in an age of technological innocence the compact seemed fair enough.

Today, the bargain is under serious challenge. A solid phalanx of critics asserts that much industrial output bears scant relation to the public interest, that unsafe products, wanton use of limited resources, and a disdain for the consequences of industry's effluent wastes call for consumer action and governmental intervention. Engineers themselves are certainly conscious of changing attitudes towards technology and of the need for a different approach by the profession to contemporary problems. Donald E. Marlowe, a past president of the American Society of Mechanical Engineers, characterized that awareness in a set of remarks before a joint committee of the United States Congress in 1974. It had long been assumed in America, he said, 'that technological advance was inevitable and that it was always good and that it was limitless. Now we know none of these statements are true.'

Despite such a sensitive appreciation of the changed world in which mechanical engineers find themselves, the situation of their own professional society today reflects the charges technology's critics have so harshly leveled. ASME's tax status as a learned society is under review by the Internal Revenue Service, while in the courts an anti-trust action claims that the organization's boiler code, a technical activity long celebrated for objectivity and held up as a model of public service, has been used for private gain. These events clearly raise questions about the control of specialized knowledge in a democracy and, since the Society has always been fundamentally concerned with generating and diffusing technical information, also about the relation of the public to the work of institutions such as ASME.

The role of history is crucial in any attempt to deal with such problems, another truth Marlowe understood. The Society has been one of the country's most important agencies in the creation of industrial standards, for example, in such vital areas as nuclear power generation, petroleum refining, and machine manufacturing. Thus, its work over the years, as one of a number of collaborating organizations that frame standards, provides a valuable way to study the methods by which the private sector sought to integrate self-interest with larger national concerns. Scientific management was also spawned under ASME's roof and among professional societies it has played a leading role in efforts to apply engineering skills in the solution of a broad array of economic and social problems. Perhaps most significant of all, the Society's history helps to reveal the outlines and consequences of a complex technological information-processing system. It is an article of faith that Americans are an inventive people. But besides machines, they also created a welter of interrelated institutions to translate technical knowledge into industrial practice, and that may have been one of the country's most successful inventions.

My own interest in the relation between technical knowledge and industrial development emerged while writing a study of Philadelphia's Franklin Institute. Founded in 1824, its early history laid the groundwork for many of the activities ASME subsequently pursued. Thus, when members of the Society's Centennial Steering Committee asked me to write its history as part of the anniversary observance, I was glad of the opportunity to continue this line of investigation. I am happy to say that, while ASME commissioned the work, no one ever attempted in any way to influence what historical materials I saw or the conclusions I drew from them. That may be a useful insight for those who automatically think of engineers as only economic men, or simply as the technicians of industrial capitalism.

This book, then, is entirely of my own devising. It necessarily reflects my ideas about institutional history and my conviction that writing about the past is more of an art than a science. For instance, even though the occasion might seem to call for a work of record – a detailed survey of all the different activities the organization has carried on over the past century and a register of the names of all those who have been involved in them – I have instead tried to catch the essential qualities of the Society's existence. My ambition was to identify the well-springs of sentiment and action, as if I were analysing a human life, and it appears to me that, as with personal history, an institution is characterized by enduring themes, most of which are present from the beginning.

Yet no matter how much the actual writing of a book is a matter of individual judgment, it is still a co-operative venture depending upon libraries, colleagues, and family. In that respect, I am pleased to be able to acknowledge the generous assistance of librarians and archivists at Case Western Reserve University, Columbia University, Massachusetts Institute of Technology, Purdue University, Rensselaer Polytechnic Institute, the Franklin D. Roosevelt Library, Stevens Institute of Technology, the University of Toronto, Toronto Public Library, the Library of the United Engineering Center in New York; and also the Secretary of the Engineering Societies of Milwaukee.

Four prominent members of ASME, Dr Richard Folsom, Dr Serge Gratch, Dudley Ott, and Louis Rowley were kind enough to make their own records available to me. I also benefitted from personal conversation with them and with a great many other members whose long involvement in the Society and willingness to speak candidly to an outsider gave me a kind of understanding that documents rarely provide. Dr Henry Black, Dr Donald Marlowe, and Louis Rowley, of the Centennial Steering Committee, proved excellent counselors and their sensitivity in a time of personal trouble has put me much in their debt. ASME staff members, in New York and in the field offices, were always generous with their aid and in a friendly way made my work pleasant and easier. I am especially grateful to Carron Garvin-Donohue and her spirited band of co-workers in Public Relations.

Two old friends, Carroll W. Pursell jr and Michal MacMahon, read and criticized portions of the manuscript and their suggestions improved it. R.I.K. Davidson and John Parry of University of Toronto Press were splendid editors. My colleagues in the Institute for the History and Philosophy of Science and Technology at the University of Toronto also became collaborators in this enterprise, although perhaps not entirely of their own free will. They carried my administrative burdens cheerfully, successfully, and longer

than they could reasonably have been asked to do. The contribution of my graduate student James P. Hull, is, I think, accurately stated on the title page. One of my Institute colleagues, Professor Mary P. Winsor, is also my wife and I could not have written the book without her unwavering loyalty.

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A Sense of History

The American Society of Mechanical Engineers reached the fiftieth anniversary of its founding in 1930. This kind of institutional milestone usually calls for special observance to celebrate an organization's continuity and define its place in history. But besides the conventional impulses for that sort of exercise, the Society's leaders were men with a taste for ceremony and a conviction that their profession deserved a prominent part in the story of human progress. ASME's anniversary festivities thus promised to be rich in the self-congratulation customary on such occasions.

Yet, there could hardly have been a time when mechanical engineers had less to celebrate. Ever since the First World War, science and its applications had come under increasingly critical attack and by 1930 the indictment against 'Machine Civilization' encompassed poison gas, worker alienation, and debased culture. By that time, too, as the 1929 stock market crash settled into economic depression and widespread unemployment, engineers got the blame for the social consequences of over-production, as well as for the ecological and resource implications of their work. America's vaunted industrial capability, the world's most complete expression of modern technology, was on trial and, since they claimed responsibility for it, so were mechanical engineers.

The phrase Machine Civilization came to be widely used in a growing literature during the 1920s and expressed not only the general elements of the debate, but its mood as well.[1] Europeans worried about the Americanization of their continent were most concerned about the aesthetic and cultural

1 For an introduction to the Machine Civilization debate, see Charles A. Beard ed *Whither Mankind* (New York: Longmans, Green 1928), and Stuart Chase *Men and Machines* (New York: Macmillan 1929).

implications of mass production materialism, a position exemplified by Oswald Spengler's book *The Decline of the West*. To other critics, Machine Civilization had come to mean monotonous jobs and bored workers. Instead of freedom from drudgery, machine-tending led to the loss of mental and physical vitality, and threatened a supine work-force more liable to manipulation by demagogues. American engineers, who had always equated technical advance with political freedom and the vigorous culture of the New World, felt challenged by these criticisms, particularly since they tended to come from literary pundits, an intellectual quarter that often looked down on engineering work. But the critique was not simply a matter of aesthetic snobbery. As the Lynds' 1925 sociological analysis of Muncie, Indiana, made clear, mechanization had all but eliminated complex craft skills and the social status which went with them. 'It's "high speed steel" and specialization and Ford cars that's hit the machinist's union,' one older craftsman reported. This observation had special point for an engineering society which had so applauded Frederick Winslow Taylor's careful analysis of cutting tool steels and speeds.[2]

The feeling that things had gone too far, too fast, was also behind the idea of a halt to scientific research and development. That suggestion came from the Bishop of Ripon at the 1927 meeting of the British Association for the Advancement of Science and immediately stirred up a strong reaction from scientists and engineers on both sides of the Atlantic. No public figure seriously argued for the bishop's proposal, however, until the Great Depression suddenly gave new currency to the sense that there was a disturbing gap between technical advance and society's ability to absorb it.[3] To the critics of mechanization, economic calamity seemed the inevitable result of overproduction, magnified by technological unemployment, and much of the responsibility for it was laid at engineering's doorstep. That charge threatened to undermine one of the central justifications of modern industrial technology – the provision of abundance. At a time when millions were out of work, it was much more difficult to persuade people that the chief result of engineering progress was an increased standard of living for the mass of society. On the contrary, Henry Wallace and other New Deal reformers often claimed the social sciences stood a better chance of solving America's problems than the applied sciences, and that argument proved doubly uncom-

2 As quoted in C.W. Thomas ed *Essays in Contemporary Civilization* (New York: Macmillan 1931) 30

3 Carroll W. Pursell has described the controversy in his '"A Savage Struck by Lightning": The Idea of a Research Moratorium' *Lex et Scientia* 10 (1974) 146–61.

fortable for engineers, since it frequently implied the need for an alteration in the country's social and economic system.

But even before the depression gave a new sharpness to the Machine Civilization debate, when planning for the fiftieth anniversary was first underway, the Society's leaders had already felt the sting of criticism keenly and they determined to make the occasion a powerful argument for the importance of engineers and their work. From the beginning, therefore, the celebration was charged with more than rhetorical importance. The nature of the event guaranteed that it would employ certain conventional forms, but the pressure on mechanical engineers to defend themselves also insured that its content would be directly connected to the defense of mechanization. That was clear from the very first report of the Committee on Meetings and Program to the Council on 9 March 1928. The anniversary should be used, it claimed, to demonstrate 'the advancement of industry and civilization as a result of engineering contributions.' To counter the attacks of modern technology's critics, the committee meant to establish the engineer as the primary agent in the upward course of human progress, and its report also imagined the celebration as an opportunity 'for projecting into the future an evaluation of the place of the engineer in industry, in public life and in government.'[4] Subsequent reports to the Council continued to stress the committee's central ambition, to create a program 'on a plane that would not only mark a dramatic pause in the development of the profession but point the way for an ever broadening and deepening influence upon the growth of our civilization.'[5]

The committee proposed to achieve that elevated and expansive kind of celebration through a week-long series of events in April 1930. The main feature was to be a three-day program in Washington, DC, that would include reports by foreign experts on the progress of engineering all over the globe, sessions to visualize the future of engineering, and special fiftieth anniversary awards to the world's outstanding engineers. The committee's objective was to stage an affair so international in flavor and so crowded with distinguished guests that the contributions of engineering to human civilization would be inescapably obvious. It remained only to give the idea a name, although when it came to that, the committee simply selected the most obvious title for the Washington phase of the celebration by calling it 'The Influence of Engineering Upon Civilization.'

The choice of Washington rather than New York, where the Society had its headquarters and traditionally held its major meetings, was another deli-

4 ASME Council Minutes 9 March 1928
5 Ibid 19 Oct. 1929

berate decision. No engineering society was oblivious of the fact that an engineer occupied the White House, and ASME's planners wanted to include President Hoover in their celebration. But the Washington segment of the anniversary commemoration was also the part most explicitly addressed to the Machine Civilization debate, the one most calculated to win public notice, and the committee meant to give it a national setting.

That campaign, however, was only one facet of the fiftieth anniversary planning. It is in the nature of such occasions that they fulfill several functions and the other major part of the celebration, to take place in the New York area, was designed to serve an array of essentially traditional and what might be called internal purposes. For instance, the unveiling at the United Engineering Building in New York of a large bronze plaque, especially created for the fiftieth anniversary, provided a formal beginning for the week-long celebration and newspaper copy suitable to the occasion. The sculpture depicted the forward-looking spirit of engineering in the form of a thoughtful but muscular male figure and it also conveyed an uplifting slogan, 'What is not yet may be,' that its framers hoped would continue to inspire members and visitors to ASME's headquarters long afterwards.

There were other elements of the New York ceremonies that also served sentimental and mythological purposes. All professions have their myths – anecdotal fragments of the past that have less to do with describing historical reality than they do with creating an image of the profession and its practitioners – and the mechanical engineers were no exception. Knowledge of the actual details of the Society's founding, for instance, died with those who had been directly involved, and it is likely each of them saw it differently. But by 1930, a well-rehearsed set of stories about what were seen as the crucial events leading to ASME's establishment had evolved and it was inevitable they would be told again in some form for the anniversary celebrations. The meeting in the *American Machinist*'s editorial offices in February 1880 that first brought together the founders was one such legend. They immediately recognized the need for an association, according to the story, but some dissension among those individualists of strong opinion threatened to destroy the enterprise until, at a dinner thoughtfully provided by the magazine's editor and accompanied by fine wines, good fellowship and co-operation prevailed. The event became an accepted part of the Society's history not so much to explain the organization's creation as to establish for mythological purposes the personal qualities of the founders. It was also just the sort of myth which lent itself to re-creation as a historical pageant and, indeed, the McGraw-Hill Publishing Company presented it that way on the first day of the anniversary celebrations.

But it was not just sentiment that insured the presence of this mythological episode in ASME's fiftieth anniversary celebrations. In fact, the story also reflected a set of relations that in 1930 were real and important. *American Machinist* was but one of many technical journals published by McGraw-Hill. Mechanical engineers were the prime customers for it, for *Factory*, and for *Power*; this market by itself would probably have warranted sponsorship of the entertainment and luncheon McGraw-Hill presented to the delegates on 5 April. Beyond business interests, however, there was still another important connection between the Society and the world of technical journalism. Senior editors filled leading posts in the Society and, together with staff members of the large engineering and technical organizations based in the city, were part of an 'invisible college' dedicated to the promotion of engineering in America and of New York as its center.

A relation very much like that between ASME and McGraw-Hill also existed between the Society and New York area engineering schools, particularly Stevens Institute of Technology, across the Hudson River in Hoboken, New Jersey. The organizational meeting in April 1880 had taken place in the school's auditorium, and like that editorial office gathering had taken on mythic qualities. But in a similar fashion, too, the connection between institutions had significant practical side to it as well. The Society's first president, Robert H. Thurston, was a Stevens faculty member; Alexander C. Humphreys, president of Stevens from 1902 to 1927, was also president of the Society, as was his successor at Stevens, Harvey N. Davis; David S. Jacobus from Stevens was also president, and others filled highly important committee positions in ASME for long periods of time. Thus there existed a vigorous and mutually rewarding set of relations between the two institutions. The Society depended heavily on nearby members for leadership in certain crucial activities and Stevens faculty members took on many of those tasks. Their efforts, in return, enhanced their professional standing and the reputation of the Institute to the benefit of its enrollment and endowment. It was for these kinds of practical reasons, as well as sentimental attachment, that the Stevens Board of Trustees pledged $10,000 toward the production of another fiftieth anniversary pageant which would link mechanical engineering, ASME's history, and the progressive development of civilization.[6]

That was a substantial amount of money, even in the bull market optimism of the spring of 1929, and the school's board of trustees must have expected some sort of return on their investment. Furthermore, it deter-

6 Minutes of the Board of Trustees, Stevens Institute of Technology, 3 April 1929; Stevens Institute, Hoboken, NJ

mined to have the best pageant money could buy. To write and produce it, the board commissioned George Pierce Baker, chairman of the drama department at Yale, who had achieved great popular fame in America for his pageant at Plymouth, Massachusetts, to commemorate the 300th anniversary of the Pilgrims' landing.[7] Baker called his production for Stevens *Control: A Pageant of Engineering Progress.* The first part of the title was not meant to be ominous, but to suggest Thomas Telford's eighteenth-century definition of engineering as 'control over the forces of nature for the benefit of mankind.' Far, indeed, from any dark implications, the pageant aimed at a triumphal portrayal of engineering progress, an approach that perfectly complemented the sober theme of the Washington lectures, 'The Influence of Engineering Upon Civilization.' The theatrical form was just right, too. Traditionally suited for historic occasions, pageants were familiar and emotionally rewarding. But *Control* went far beyond the normal reach of such affairs. To a remarkable degree, the pageant at Stevens Institute dramatized the fondest images engineers had of their profession and it captured their hearts as practically nothing else during the remainder of the week.

Control was the last of Baker's pageants, but it mixed together ideas and elements characteristic of his work from the beginning. His pageants were dominated by symbolism and allegory, yet they also depended heavily on historical texts for the spoken word. And despite the fact that he imagined the pageant as an ideal theatrical form for small communities – a sort of democratic vehicle with which to celebrate local history and strengthen local pride, costly special effects were also the hallmark of his work.

Set on the beach behind the famed rock, the Plymouth pageant had been Baker's most spectacular. Expensive, grand in conception, and technologically elaborate, it aimed to link the spirit motivating the Pilgrim emigration to America with broadly patriotic themes. The concluding scene epitomized Baker's style: the *Mayflower* now rode securely at anchor in Plymouth harbor and a hidden choir sang Robert Frost's 'The Return of the Pilgrims,' while a procession of young women bearing the flags of the forty-eight states came into the amphitheater to join the cast on stage. As the choir's last notes died away, specially devised spotlights came up full on the *Mayflower* and searchlights swept the skies. Then the lighting dropped away until only the ship stood in a single spotlight and from a loudspeaker near the famed stepping stone, the 'Spirit of the Rock' spoke for the final time: 'With malice toward none and charity for all it is for us to resolve that this nation under

7 Wisner Kinne *George Pierce Baker and the American Theatre* (Cambridge: Harvard University Press 1954)

God shall have a new Birth of Freedom,' and then the last spotlight slowly faded out on the Mayflower.[8]

Control seemed to offer no such scenic possibilities. Instead, the limitations placed on Baker read like a set of technical specifications. The pageant was to be held indoors and was restricted to a small stage in the auditorium of Stevens Institute, it could last only an hour, and all performances had to be on the same day. Baker turned these limitations to advantage: 'Throughout, this Pageant will differ greatly from any Pageant heretofore given, in that it will depend as little as possible on acting and as much as possible on recent inventions. Throughout, accompanying music, to be carefully selected, will be from the Electrola or Radiola. No band or orchestra.'[9] He subsequently added motion pictures and the projection of slides to round out the idea that a pageant about engineering ought to feature the latest technology. It was 'quite an amazing conceit,' assistant stage manager Edward Cole recalled, and one that worked remarkably well in practice.[10] Others who were connected with the pageant also remembered it long afterwards for the novel special effects Baker achieved with sound and film.

There was much in the pageant, however, that depended on concepts he had worked out previously. Allegorical figures, a favorite Baker device, were used to link historical episodes, just as in the Plymouth and earlier pageants. Thus, *Control* opens with films of landscapes and seascapes, then rivers and waterfalls, storms, geysers, and volcanoes. As primitive peoples, who are gathered on each side of the stage, react with fear and religious awe to these violent natural phenomena, the shrouded symbolic figure Mystery 'appears on stage gropingly' from among a group of people worshipping about a totem pole. 'I, Mystery, the Mole of Nature,' the figure says, 'grope blindly and helpless; seen, wondered at, unknown, unsolved. Who shall master me, revealing my secrets?'[11]

As Mystery crouches at center stage, fully covered with his robes, another allegorical figure, Curiosity, emerges from one of the groups of primitive people, followed by Intelligence and then Imagination. Each in turn speaks a few lines to explain his nature and the three then join hands to circle around Mystery and bring 'from beneath the folds of his robe the figure of Control as a child of ten or twelve,' who comes in front of Mystery to say: 'Thus

8 Ibid 225–6

9 George P. Baker to James Creese, 5 Aug. 1929; Stevens Institute Archives

10 Personal conversation

11 All the descriptions and quotations from the pageant are taken from the published version, George Pierce Baker *Control A Pageant of Engineering Progress* (New York: The American Society of Mechanical Engineers 1930).

Mystery, searched by Curiosity, Growing Intelligence, flashing Imagination, is stripped of all its mystery, revealing me, Control – a child as yet.' 'Child Control' represented the early stages of engineering, and in another of the pageant's conceits, the role was played by a descendant of John Stevens, for whom the institute was named.

The first historical scene then depicted James Watt, in his workshop, soon joined by Matthew Boulton. Watt is in despair for lack of funds with which to develop his steam engine. 'How I long for you as an understanding partner,' he says to Boulton, 'fully able to make all I need possible.' As the scene unfolds, the audience learns that Boulton's wish to help his friend is frustrated by John Roebuck's prior interest in the steam engine. But when Roebuck fails, the means are at hand for Boulton to take over, which he quickly does, promising Watt all the facilities of a first-class Birmingham workshop, in a speech that ends with a version of that famous remark 'we will sell what all the world desires to have – POWER.'

The central message of this first historical episode was that invention was helpless without capital, and a sort of allegorical entr'acte recapitulated it. Youth Control, now grown to a young man 'fine and strong in figure, particularly intelligent in looks,' is joined by Finance, who says 'and so Control wins to his aid Finance. Each of us apart – inept and ineffective; together – trained, unconquerable.' Youth Control eagerly accepts Finance to the company of Intelligence and Imagination:

> All Nature shall be mine to conquer – all! Growing Intelligence, richer Imagination urging me on, Finance supporting me. So march we four to marvels unpredictable *(Mystery now flees in terror)*
>
> Ours first to conquer
> Incredulity and prejudice
> In men more willing to trust
> What is and has been
> Than to understand our dreams of what may be ...

The last phase was calculated to strike a responsive chord, reminding the audience of the inscription on the fiftieth anniversary plaque, 'what is not yet may be.'

The distinction between those mired in the past and those looking to the future also served to introduce the next historical scene, in which George Stephenson appears before a House of Commons committee to testify in favor of his proposed railway between Liverpool and Manchester. He is told the line would threaten the interests of coachmen, innkeepers, and harness

makers; that the speed and noise of his machines would disturb the peace of the countryside; and, in the kind of jokes on history engineers liked to hear, that the construction of rolling stock would exhaust the country's iron resources while the speed of twelve miles an hour was beyond human capabilities. Stephenson is taunted for his lack of formal education, but the dialogue makes clear that besides indomitable conviction, experience has provided him with substantial technical knowledge. And the morality of his undertaking is defended with the prediction 'the time is coming when it will be cheaper for a working man to travel upon a railway than to walk on foot.'

As the curtain falls, the allegorical figures return. Youth Control points out that Stephenson succeeded in his ambitions, and Finance reports that the railway came in under estimate, while Intelligence and Imagination look for new fields to conquer. 'Yes,' Finance says, 'with my aid, the lightning's flash shall yield to you, revealing all the mysteries of the air.'

The pageant then moves to the Ashmolean Museum and Faraday's successful demonstration of electromagnetic induction. The issue of this episode is simple; against all urging, Faraday refuses to pursue both the obvious financial wealth that his discovery would bring and the honors that would be heaped upon him. Instead, he claims, 'My business is to discover unhindered and uncomplicated, and then to defend,' an argument he repeats, in the only dark reference of the pageant, when it is suggested his discovery puts 'new arms into the hands of the incendiary.' Against that threat, the allegorical figures proclaim the benefits of telegraph and telephone, radio, and, in the presence of a new symbolic figure, Conversion, of electric power.

Conversion represented both the use of steam power to generate electricity and the historical emergence of a new level of technical sophistication, and to make the last point plain, Baker utilized flag-bearers again, this time with the banners of America's technical schools, brought in procession down each side aisle to the stage. However, as Imagination explains, schools did not supply the need for the exchange of information among practitioners and for their fellowship in 'common service for science.' Thus, the audience was provided with a connection to the next historical episode, depicting the first regular meeting of the American Society of Mechanical Engineers which had been held in the same Stevens Institute auditorium fifty years earlier. Drawn from Frederick Remsen Hutton's 1915 history of the Society, the scene is meant to portray the good companionship and sound judgment of the founders in framing membership and election policies.[12]

12 Frederick Remsen Hutton *A History of the American Society of Mechanical Engineers from 1880 to 1915* (New York: ASME 1915) 19

As the curtains close on the firm establishment of the Society, Youth Control is replaced, 'if possible unnoticed,' by Mature Control. 'Steady of figure and clear of eye,' Mature Control symbolizes both the technical and the professional coming of age of engineers and his speech indicates still new arenas calling for such skills: 'All reveals that in every age engineering in some form has been one of the fundamental means by which civilization has advanced. Engineers are becoming a controlling force in culture, politics, commerce, industry, finance, education, and national defense.'

The final historical sequence suggested the still unfolding potential of systematic engineering thought, as well as its awesome potential. The scene centers on Edison's demonstration of electric lighting. A crowd gathers before a building Edison has announced will be lighted by electricity at a given hour. Their initial scepticism turns to wonder as the lights come on, and the stage directions indicate they should assume poses like those of the primitive people at the pageant's beginning, when they were confronted by natural forces beyond their understanding. This gulf between their knowledge and Edison's is underscored by a sequence in which a bumptious reporter who questions Edison would trivialize the accomplishment because of his own ignorance. The mood then turns serious and one of the bystanders asks Edison what he considers his real work. Reiterating the idea behind the pageant's title, Edison answers, 'Why – why – bringing out the secrets of Nature and applying them for the happiness of man.'

As Edison hurries back to his laboratory, the crowd is left to marvel at the implications of this new technology, the curtains close, and the symbolic figures return to the front of the stage. They chant a chorus of engineering accomplishments in a litany that increasingly emphasizes the words 'power' and 'beauty,' while films are shown of automobiles, trains, steamships, and skyscrapers. Then, in a splendidly fantastic conclusion, and 'in a great glow of light and color,' Beauty, the last of the allegorical figures, emerges. She, it turns out, is the child of Control and Imagination, and it is she who has the last prophetic line: 'I beckon ever into greater heights and flights.' A grand march brings all the players on stage, and in a fine Baker climax, President Hoover appears on the movie screen with a personal message for the occasion, fading out to 'America the Beautiful' which the entire cast joins in singing, while 'colored lights flash and whirl over all, dying as the curtains slowly close and the pageant ends.'

Control was a great success. Baker had brought into the production practically the entire Yale drama department, the leading department in the country. Stanley McCandless was already famous as a lighting expert, Fred Bevan would go on to Broadway success as a costume designer, and the music and

scene design jobs were handled by people of equal stature in the field. Even Harold Burris-Meyers, a new member of the Stevens faculty who worked on the sound effects, discovered a subsequent career in the use of acoustical techniques to modify behavior that led him to a vice presidency of Musak. The institute gave him a $250 bonus for his extra work on the production. As 'Master of the Pageant,' Baker's fee was $5,000 while Edward Cole, his assistant at Yale, joined the troupe as assistant stage manager at a figure well beyond his expectations. McCandless's lighting plans also required extensive modifications to the Stevens theater. And the crew lived well, spending their evenings at a German restaurant in Hoboken that continued to serve good beer throughout Prohibition.[13]

Much of the impact of *Control* came from the crew's skill in devising new and imaginative combinations of lighting, sound, and film. The musical passages were carefully selected and perfectly synchronized, while the films had a particularly stirring effect on the audience. One strip of footage, showing the new steam-turbine ocean liner *Europa*, was especially exciting since the ship had just broken the transatlantic speed record and the pageant's films of it were the first shown in America. But there was still more to it than that. Baker always claimed that pageants had to have their 'own particular core of meaning,' and for *Control* he found it in the vision engineers had of their history.

Baker had taken two of his sketches directly from Frederick Hutton's history of ASME and depended on it also for general background and tone. He worked closely with James Creese, vice president of Stevens, on the rough draft for the pageant as well as on subsequent revisions of it, and it is easy to imagine that Creese supplied Baker with other elements of engineering history. The dramatist, however, also had his own perception of America's mission to the world, amply expressed in previous pageants, and it blended nicely with the view engineers had of their historic role in the development of civilization. The pageant therefore gave its audience of engineers the rare chance to see their own images of the profession fully articulated. And Baker's skillful dramatization of the Society's most familiar mythic elements, set against the background of mankind's progress from superstition to science, made them all seem real.

Most of those who sat in the audience were successful engineers and prominent members of ASME and that may have made it easier for them to believe that what they saw had a vital nucleus of truth to it. Their own careers proved that foresight and determination were rewarded, that the

13 These details come from conversations with Harold Burris-Meyers and Edward Cole.

combination of capital and technical skills was powerful, and that the Society was led by men of vision and good fellowship. They could see themselves in Control's sure growth from lusty youth to vigorous manhood, just as they could see their Society's evolution to a plane of statesmanlike professionalism. Baker's pageant made all those ideas suddenly alive; ASME's history was their own history and it was splendid to have it portrayed so compellingly.

The Washington ceremony, which began on Monday, 7 April 1930, presented an equally unusual opportunity to see demonstrated the dignity and prestige of the profession. The planning committee's basic idea was to have the major geographical divisions of the world represented by an outstanding engineer, who would speak briefly about the influence of engineering on the development of his country. Each delegate would be introduced by his country's diplomatic representative in Washington and, to add extra color to the occasion, would present his country's greetings in the form of an engrossed scroll. And each foreign delegate, for his own outstanding contributions to engineering, would be awarded one of the Society's specially struck fiftieth anniversary gold medals. Beyond that remarkable array of expertise and diplomatic pomp, the Committee on Meetings and Program had secured Robert A. Milliken, 1923 Nobel laureate in physics, as the after-dinner speaker at the anniversary banquet. And best of all, a new gold medal for outstanding public service by a member of the engineering profession was to be presented that same night. The funds for it had been provided by Conrad Lauer, a Vice President of ASME, but in a generous gesture befitting the occasion, it was to be awarded in the name of all four of the country's major engineering societies. Called the Hoover Medal, it would be presented the first time to President Hoover himself.

Each element of the ceremony met the committee's keenest hopes. The format imposed on the foreign delegates might easily have produced a stultifying series of generalizations. Instead, the talks were full of variety, interest, and even candor. The Austrian delegate pointed out the relation between his country's great loss of territory as a result of the war and the kind of engineering projects that consequence dictated. Belgium's delegate laid most emphasis on his country's programs of industrial health and safety. Conrad Matchoss, technological historian, the distinguished director of the *Verein deutscher Ingenieure*, and a person already known to many in ASME, addressed himself directly to the human problems of mechanization. He claimed that 'in spite of the injurious effects of the so-called machine age, there could be no turning back therefrom.'[14] In high-voltage transmission lines, he saw the 'con-

14 As quoted in *Mechanical Engineering* 52 (1930) 518

structive spirit of engineering progress' flowing without hindrance across national boundaries, but that kind of progress had an inevitable quality about it and Matchoss predicted adaptation to that new world as mankind's only hope.

Loughnan St L. Pendred, editor of *Engineer* and president of Britain's Institution of Mechanical Engineers, was also known to many in the audience and he also spoke to the Machine Civilization issue. In a way that only a person of his standing and accent could do, Pendred expressed engineering's grandest ideas for solving the human problems of modern society. The influence of mechanical engineering had not always been a positive one, he admitted, particularly in its effects on home life. But he called upon his fellow engineers to dedicate themselves to a 'new and greater service' than the satisfaction simply of material needs. They, and they alone, had 'the power to make war or preserve peace;' through their technical skills, applied to land, sea, and air, engineers could 'knit the whole world into a single unit,' provide the abundance to eliminate envy, and the leisure to fructify the arts.[15]

Even given their eminence, Pendred's audience scarcely had the power to bring about the political and cultural revolutions he urged on them. Yet, throughout the celebration, engineers were encouraged to think of themselves as the agents of major change in human affairs – true revolutionaries instead of those who only talked about reform. Robert Milliken struck the same note in his address at the fiftieth anniversary banquet. Scientists and engineers were uniquely responsible for the upward curve of mankind's history, he argued, and the special training and method that had so successfully harnessed the forces of nature were now required for social and political leadership. Milliken's message may have sounded much as others before it, but it had particular value and importance to the engineers who heard it. Unlike many scientists known for their theoretical contributions, Milliken actively promoted industrial research and the practical applications of science. Besides, he was a staunch supporter of the existing economic order.[16] In any event his ideas would have been warmly received, but on this special occasion they came wrapped in the prestige of America's premier physicist.

The culmination of the banquet was, of course, the presentation of the Hoover Medal. Dexter S. Kimball, a past president of ASME, described how the award had come about. At the beginning of the twentieth century the engineer had been regarded by the general public simply as a technician, a person inappropriate to deal with 'matters pertaining to civic welfare and

15 Ibid 519

16 Daniel J. Kevles 'Robert A. Milliken' *Scientific American* 240 (1979) 124

public service.' But Kimball claimed that a great change had taken place over the past thirty years and he noted that, just as Milliken had pointed out before him, 'a chance for service equal to that of any of the great learned professions' was now open to engineers.[17] To mark that important change and because there had been no awards particularly to honor distinguished public service, the Hoover Medal had been created. In the seriatum style of introduction favored on such occasions, Kimball then presented J.V.W. Reynders, a past president of the American Institute of Mining and Metallurgical Engineers, Hoover's own professional society, that he might introduce the President.

Reynders cast his introduction in an interesting form. He set current problems and issues against the time fifty years later when ASME would be celebrating its one hundredth anniversary. Would America's population, he wondered, still have its Anglo-Saxon characteristics? Would the country's social structure have equitably satisfied its citizens' reasonable ambitions? Would it to any serious degree have felt the effects 'of the diminishing reserves of our unexampled natural resources, of oil, of copper, of lead?'[18] Fifty years from now, Reynders said, the nation's leadership would face other problems and it was difficult to imagine what they might be. Nonetheless, he claimed, with President Hoover's example before them, engineers could be counted on to play a role of increasing importance in the resolution of those difficulties.

Hoover's remarks were brief and appropriately modest, but directly upon the theme of the past four days. America's technical capability – 'our great national tools' as he put it – had brought manifold benefits to the country, but also made it necessary for government to insure that the control of technology was not misused to diminish equality of opportunity or to restrict freedom. Modern development had created a host of what Hoover called 'public relationships' to industry that required technical knowledge to solve them. Hoover saw these new problems of government as essentially technical in nature, however, not political. It was a matter, just as in engineering practice, of determining the facts, setting them in perspective, and applying practical experience. Unlike engineering problems, these public relationships involved 'emotions, that confused the data and excited controversy,' Hoover said, but that was just why the cool rationality of the engineering method was so much needed. Not only did engineers have an important

17 Stenographic transcript, Fiftieth Anniversary Banquet, 8 April 1930; ASME, New York, NY

18 As quoted in *Mechanical Engineering* 52 (1930) 527

contribution to make in the public's welfare, Hoover concluded, but they also 'have an obligation to give that contribution.'[19]

Those who were there described the evening as 'an almost perfect affair,' or, less equivocally, as that 'perfect Anniversary Dinner.' And so it should have been. Held in the grand ballroom of the Mayflower Hotel, with 800 delegates, ambassadors, ASME members, their wives and guests, all in full evening dress, the banquet had begun with trumpet flourishes and the Marine Band playing 'Hail to the Chief' as the President and Mrs Hoover took their places at the head table. William F. Durand, a past president of the Society whose biography of Robert H. Thurston, its first president, had appeared the year before, proved an excellent toast-master, urbanely striking just the right balance between good humor and the kind of rhetorical fulsomeness his task called for. Besides the Society's distinguished guests, the head table also included old and familiar figures such as Calvin W. Rice, ASME Secretary since 1904 and closely associated with major changes inside the organization, but also widely known abroad for his efforts on behalf of engineering internationalism. And through the efforts of Rice's assistant, Clarence E. Davies, the dinner was also characterized by the high degree of organization that had been evident throughout the fiftieth anniversary celebration. In a profession where foresight and systematic planning are cardinal virtues, those responsible for the details worked hard to insure that the occasion measured up.

Everything about the enterprise, in fact, was calculated to make it noteworthy. Each person in attendance received an individually numbered, leatherbound, pocket-sized guide and program to the fiftieth anniversary events plus a special anniversary edition of *Mechanical Engineering*. There were special buses in New York, special trains to Washington, and special tours. Tickets were arranged, luggage looked after, and two extra rooms were set aside at the Mayflower as the 'Ladies Headquarters.' Even the White House, the day after the banquet, was opened for a special reception. The physical arrangements, in fact, mirrored one of the central messages of the anniversary, that in the judgment of history mechanical engineers rightfully occupied a place of crucial importance in modern society.

There is nothing in the Society's official records to suggest that the planning committee approached the anniversary with an explicit set of public relations objectives. They had a general approach in mind and some sense of the level at which they wanted things carried out. But other than the theme 'The Influence of Engineering upon Civilization' there were no directives

19 Ibid 528