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The Past and Future Activities of the Society of Motion Picture Engineers

By Donald E. Hyndman and John A. Maurer

The Society of Motion Picture Engineers is an international engineering organization composed of a group of individuals associated in a general partnership to conduct a business, paying no salaries to officers or members, but operating on a nonmonetary principle to recommend engineering procedures; to guide, to some extent, research and development; to encourage improvement; and to lead standardization within the motion picture industry. It enjoys all the normal legal privileges of a nonprofit organization.

The Society was organized in 1916 by a group of engineers under the leadership of C. Francis Jenkins, of Washington, D.C., who became its first president. The founders of the Society had three objectives in view: (1) the advancement of motion picture engineering and the allied arts and sciences; (2) the standardization of mechanisms and practices employed in the motion picture industry; and (3) the dissemination of scientific knowledge through publication.

Since its organization the Society has held semiannual conventions at which engineering papers were presented and general discussion invited. These papers and discussions have been published in the *Transactions* of the Society, which were issued first semiannually and later quarterly from 1916 through 1929, and in the *Journal,* which has been published monthly since the beginning of 1930. No other source of information about the scientific and technical side of the motion picture industry is comparable in scope, in completeness, or in continuity to the accumulated *Transactions* and *Journal* of the Society of Motion Picture Engineers. The knowledge contained in these publications and in the separate reprints and reports issued by the Society is of incalculable value to the industry, and represents an actual cost, for research work, of many millions of dollars.

The present membership of the Society comprises approximately 2300 engineers and technicians who are employed either directly or indirectly within the international motion picture industry and allied industries.

Because of the mutual understanding and close co-operation of these men, who know the problems in the related fields of production, distribution, and exhibition, it has been possible for the Society to bring about engineering advances that might otherwise have remained dormant for many years. These engineering advances originate in studios, research and engineering laboratories, and companies manufacturing film, equipment, and accessories. Discussion of these new techniques and products at the conventions of the Society, and publication in the *Journal* of papers describing them, leads to their prompt acceptance by the industry, and has often resulted in major improvements in the efficiency of its operations in all departments.

When a program of continuous activity has been carried on over a period of many years, it would be an unfair misrepresentation to select certain steps in that program and say that they are outstanding accomplishments, thereby implying that the rest were routine and unimportant. A dynamo in a power plant is not less important because it emits only a steady hum instead of showers of sparks. The power and light that it furnishes are made visible in other places. Similarly, the value of the Society of Motion Picture Engineers to the motion picture industry has been in its continuous program of collecting and disseminating information, evaluating practices, recommending improved methods, and promoting standardization rather than in any isolated spectacular accomplishments, though the latter have not been lacking. The high technical quality of the motion pictures shown in theaters and the efficient operation of the equipment in studios, film exchanges, and motion picture processing laboratories all over the world give evidence that the Society has performed its functions well.

At its first meeting the Society organized four engineering committees. The names of these committees are sufficient to demonstrate the seriousness with which the Society attacked its stated objectives of advancement of the theory and practice of motion picture engineering and the allied arts and sciences, the standardization of the mechanisms and practices employed therein, and the maintenance of a high professional standing among its members. These four committees were (1) Committee on Cameras and Perforations, (2) Committee on Motion Picture Electrical Devices, (3) Committee on Motion Picture Theater Equipment, and (4) Committee on Optics.

From this beginning the committee work of the Society has been continuously carried on and expanded until today there are sixteen regular engineering committees on (1) Cinematography, (2) Color, (3) Exchange Practice, (4) Film Projection Practice, (5) Laboratory Practice, (6)

Reprint of article that originially appeared in the *Journal of the SMPE, 47*:212-224, September 1946. This paper had been presented before a joint meeting of The Royal Photographic Society of Great Britain and the British Kinematograph Society in London on April 10, 1946. At the time the paper was published, Donald E. Hyndman was the President and John A. Maurer was the Engineering Vice-President of the SMPE.

Preservation of Film, (7) Process Photography, (8) Screen Brightness, (9) 16-mm and 8-mm Motion Pictures, (10) Sound, (11) Standards, (12) Studio Lighting, (13) Television, (14) Television Projection Practice, (15) Test Film Quality, and (16) Theater Engineering, Construction, and Operation. These committees have truly studied all phases of "motion picture engineering and the allied arts and sciences."

At its first meeting, in October 1916, the Society began its work of standardization by considering the dimensions of film perforations. The record shows that up to that time many difficulties in the production and editing of motion pictures had resulted from the lack of one generally recognized standard for film perforations. At the same time many prints were being damaged in projection because the dimensions of the film perforations and of the projector sprockets were not in the proper relationship. As the author of one paper on standardization expressed it, "Fellow members, upon your decisions at this and coming meetings rest the savings of untold amounts of unnecessary waste in time, money and material." Standardization of film dimensions by the SMPE caused these difficulties rapidly to disappear, and today the industry has almost forgotten that they ever existed — a most happy state of affairs.

Other fundamental problems which the Society considered at its early meetings were the principles of operation of the lens systems used in the projector and the choice of proper equipment for operating the projection arc lamp with direct instead of alternating current. A correct understanding of the lens system led to the selection of more efficient condenser lens combinations, which made possible larger and brighter pictures, suitable for larger theaters. The arc lamp was the subject of the first committee report to be published in the *Transactions*, by the Committee on Electrical Devices. This report contains an admirably clear analysis of the causes of the unsteady and flickering screen illumination often obtained with the then generally used alternating-current arcs, together with a convincing exposition of the inherent superiority of the direct-current arc lamp. This authoritative statement undoubtedly did much to speed the general adoption of the superior direct-current equipment, which gave brighter pictures free from flicker.

Another important activity which began in the first year of the Society's existence was the creation of an accurately defined motion picture nomenclature. This work has been carried forward continuously by the Committee on Standards and Nomenclature (known today simply as the Committee on Standards) and is being promoted actively at the present time. Commonly accepted terms and definitions avoid confusion, dispute, and waste.

Any reasonably adequate review of the work done by the SMPE during the 30 years of its existence would require a book rather than a brief account such as is being given here. The indexes alone, covering the engineering papers and committee reports published in the *Transactions* and *Journal,* fill 369 pages of small type. Reports by engineering committees, not counting the reports of the Historical Committee and the Progress Committee, totaled 244. These figures give impressive evidence of the continuity of the Society's work and of its success in stimulating research and the exchange of engineering information. They fail to show the thoroughness with which all phases of motion picture technique have been studied by the authors and committees represented. The work of the Society has been a perpetual backlog of valuable information on which industry success has been built.

Many of these committee publications concerned standards. Collected editions of standards were published in 1920, 1928, 1930, 1934, 1938, 1941, 1944, and will be published again this year, 1946. The standards adopted by the Society have been recognized and followed by manufacturers all over the world. They eventually became official American Standards, and today they provide a secure basis for international standardization of all dimensions pertaining to motion picture film and the machinery used with it.

An outstanding accomplishment of the Society was the preparation, by the Committee on Projection Practice, of comprehensive plans and safety specifications for projection rooms in theaters. These plans have been followed in the great majority of theaters constructed since they were first published in 1931, and they have been officially recognized by being incorporated in the building codes of several states, including the State of New York. The advantage of having reasonable and practical safety standards thus formulated by the motion picture industry itself, instead of having them imposed by less well-informed outside authorities, hardly needs to be emphasized.

Since the formation of the Research Council of the Academy of Motion Picture Arts and Sciences in 1934, the SMPE has at all times co-operated with the Research Council to the fullest extent, as it did, for example, in adopting and publishing the Academy's Standard Electrical Characteristics for Theater Sound Reproducing Systems. It has kept the Research Council informed of the engineering work being carried on by its committees, and has sought the advice of the Council on all projects of motion picture standardization. The Society and the Research Council look forward to increasingly close co-operation in the immediate future, when both will be studying the engineering and industrial problems of television and its relation to the motion picture industry.

As good a criterion as any of the strength of an organization is its ability to meet emergencies and deal with them successfully. Several times in recent years the Society of Motion Picture Engineers has met and passed this test. In 1935 a serious problem arose when the German standardizing body adopted a set of standards of 16-mm sound film which would have made their projectors and film noninterchangeable with those made in America. During that year and 1936, the SMPE steadily sought to achieve world standardization in this then comparatively new industry. These efforts were supported by Great Britain which, early in 1936, adopted the SMPE standards for 16-mm sound film. Representatives of the SMPE

were sent to Europe, and by the end of 1936 full international standardization was achieved, involving only one minor change from the earlier SMPE standards.

A more comprehensive test was presented in the latter part of 1943 when representatives of the Armed Forces requested the SMPE to undertake an extensive program of war standardization. First the Standards Committee and then the Board of Governors of the Society gave prompt consideration to this request, and the Engineering Vice-President, who has general charge of all engineering committees, was authorized to proceed with the necessary work of organization. It was decided that the work should be carried on directly under the auspices of the American Standards Association, but that the personnel of the committees on motion pictures should he supplied by the SMPE and by the Research Council of the Academy. The subcommittees thus organized to work with the War Committee on Photography and Cinematography Z52, of the ASA, began their work promptly and within six months had completed the major tasks assigned to them. These included the development of specifications for 16-mm Sound Motion Picture Projectors especially suited to the needs of the Armed Services, a specification for 16-mm Motion Picture Release Prints, Methods of Determining Resolving Power of Lenses, and specifications for eight test films for checking and measuring the performance of 16-mm projectors.

Later work by these committees included specifications and dimensions for screens, for 16-mm projector reels, specifications for tests required for quality control, standardization of sound records and scanning area for 35-mm sound motion picture release prints, and standardization of synchronization marks for release print negatives. Many of the Society's members have also served on other committees which have arrived at war standards for the field of still photography.

It is important to note that the rapid rate of progress in this war standardization work resulted from the fact that most of the problems presented were closely related to ones that had been studied by the committees of the SMPE. For example, Subcommittee D of the War Standards Committee, which prepared specifications for the Service Model 16-mm Sound Projector, was able to begin its work with a draft based on specifications for projectors for educational use contained in a report of the Committee on Nontheatrical Equipment published only two years earlier, and this material was found to be so complete that only three meetings of the war standardization sub-committee were necessary to arrive at a satisfactory specification. Similarly the specifications for lens testing and for test films were based on previous studies by the Society. No organization which participated in any of the several war standardization programs initiated by the Army and Navy has more right to be proud of the promptness with which it was able to meet the needs of the Armed Services.

An important aspect of this wartime work is that it forms a basis for new peacetime standards and specifications of great value to the industry.

A more recent example of the ability of the Society to act in an emergency is the part it has played in securing frequency allocations by the Federal Communications Commission of the United States Government for the needs of theater television. When the Television Committee of the Society of Motion Picture Engineers, at its meeting on September 18, 1944, studied the recommendations of the Radio Technical Planning Board on frequency allocations for experimental television, it was considered that these recommendations did not explicitly incorporate the needs of the motion picture industry. It was decided that the Committee should take steps to insure adequate protection of the future requirements of theater television by making specific requests for the necessary channels at the Federal Communications Commission hearings in October 1944.

Accordingly, a delegate was appointed by the Committee to present the frequency allocation needs of theater television before the Commission.

Later in the hearings before the Federal Communications Commission, the Columbia Broadcasting System, Inc. filed a brief in part of which it opposed the granting of frequency allocations for theater television. The Society, through its representative, Paul J. Larsen, promptly presented a rebuttal which must be judged to have been effective, inasmuch as the Commission on May 25, 1945, issued a report in which it granted substantially the allocations requested by the Society. Thus the alertness and energetic action of the SMPE have safeguarded an opportunity for what is likely to prove to be a major development in the motion picture theater field. Not stopping with this, however, the Society has begun to work for the realization of this important development by setting up a new committee, the Committee on Television Projection Practice, to study the special problems of installing and operating television equipment in the theater. As usual, the Society remains in the forefront of progress.

Earlier in this paper an example was given of how the standardizing activities of the SMPE eliminated waste in the production and exhibition of motion pictures. Lack of space made it necessary to omit mention of many other instances of this kind, among which a series of committee reports on wartime conservation is noteworthy. One such activity that is going on at the present time will be described because it illustrates the importance of services that the Society is continually rendering to the motion picture industry.

It has been known to a number of engineers for several years that improved characteristics of the film stock being manufactured today make possible a more nearly ideal choice of the diameter of the intermittent sprocket of a theater projector than the diameter which has been in general use. Projector manufacturers and theaters have been reluctant to make such a change, however, until the facts were proved by a sufficiently long series of practical tests.

Accordingly, in 1943 the Standards Committee of the Society set up a Subcommittee on 35-mm Projector Intermittent Sprockets, and this Subcommittee arranged to carry out a comprehensive series of practical tests with sprockets of different diameters

in theaters in New York City and in Rochester, N.Y. A report on these tests was presented at the 57th Semiannual Technical Conference of the SMPE in Hollywood, California, on May 16, 1945. This report showed that no trouble was experienced with the larger sprockets, while it was proved that a general change from the currently used diameter of 0.935 in. to the recommended diameter of 0.943 in. would double the number of projection runs obtainable with any given release print. The Society has proposed to the American Standards Association that this new diameter (0.943 in.) be adopted as an American Standard, and is taking steps to give proper publicity to the results of its tests so that the entire industry may be made aware of this opportunity to conserve film.

Nonengineering Activities of SMPE Committees. — Much work of importance to the motion picture industry is accomplished by nonengineering committees and groups of the Society. There are some 14 such committees, among which the Papers Committee is outstanding. This committee is responsible for obtaining material on engineering developments in the industry for presentation at the conventions of the Society. The Technical News Committee gathers items of current interest to the industry for publication in the *Journal*. The Historical and Museum Committee collects and assembles data on early motion picture equipment.

The technical achievements of industry pioneers are reviewed and considered by the Progress Medal Award Committee, and those deemed worthy of such recognition are awarded the Society's gold medal.

These and many other nontechnical groups within the Society contribute in large measure to the technical literature made available to the industry and to the public.

Journal. — Perhaps of greatest importance to the industry is the *Journal* of the Society which is published monthly. Over 2500 papers, exclusive of committee reports, have been published in the *Journal* on standardization and other industry engineering subjects.

The contents of the *Journal* have been referred to and praised by leading engineers and technicians throughout the world, who regard it as the only complete source for motion picture knowledge.

The Society also publishes booklets on standardization, committee reports, and recommended procedures.

Engineering Conventions. — Since 1916 the Society has held 59 conventions attended by engineers, technicians, executives, and other representatives of the motion picture and allied industries. These semiannual meetings give opportunity for members to exchange new developments and to discuss processes and equipment used by the industry. Papers are presented which are later published in the *Journal*. By attendance at these group discussions industry representatives are kept informed on subjects of mutual benefit.

Regional Sections. — Between general engineering convention monthly meetings are held by the Atlantic Coast Section in New York, the Midwest Section in Chicago, and the Pacific Coast Section in Hollywood, at which similar discussions of industry engineering subjects are conducted. Thus, the motion picture engineer has frequent opportunities to exchange views and obtain information on problems confronting him.

Engineering Information Service. — The Society is continually called upon to supply engineering and technical information to all branches of the motion picture industry. Letters, telephone calls, and telegrams are received from studios, exchange branches, and theater circuits requesting data on a wide variety of subjects. Although the Society cannot at present meet all demands for such information because of insufficient facilities, it has contributed (as far as possible) in the general distribution of engineering knowledge for the mutual benefit of the entire industry.

Proposed Projects. — For several years it has been apparent to the Board of Governors and Officers of the SMPE that certain activities ought to be undertaken and others carried on at an accelerated rate in order to meet properly the present and future needs of the motion picture industry. Much of this additional work could not be undertaken in the past because sufficient finances and adequate personnel were not available.

With additional financing now available and with an increased secretarial staff, the SMPE is now carrying on group engineering at a much accelerated rate on problems and projects related to production, distribution, exhibition, films, equipment, and accessories.

It also has under way the most ambitious standardization program in its history. Virtually all the motion picture standards in existence before the war as well as the numerous emergency standards adopted during the war have been or are being reviewed by a number of subcommittees of the Standards Committee, and many useful facts have already become apparent as a result of this study. Many standards, of course, have been found entirely satisfactory. Others, while not changed in substance, have been improved in accuracy and clearness of presentation. In some cases it has been found that changed conditions in the industry make definite changes in standards desirable. In still other cases the need for better techniques than those known at present has been revealed by this searching study. A number of important technical papers, discussing problems which have come to light in the course of this review of motion picture standards, are to be presented at coming meetings of the Society and will be published in the *Journal*.

All standardization work of the Society is done in close co-operation with the American Standards Association. The Sectional Committee on Motion Pictures Z22, of the ASA, is sponsored by the Society, and many of its members are also members of the Committee on Standards of the SMPE.

Detailed studies of the inter-relations of the television art and the entertainment field of motion pictures have been under way for the past year. This work involves such specific projects as studies of frequency allocation and bandwidth requirements of television in relation to screen definition, private addressee systems, study of the problems of installing and operating television equipment in theaters, and

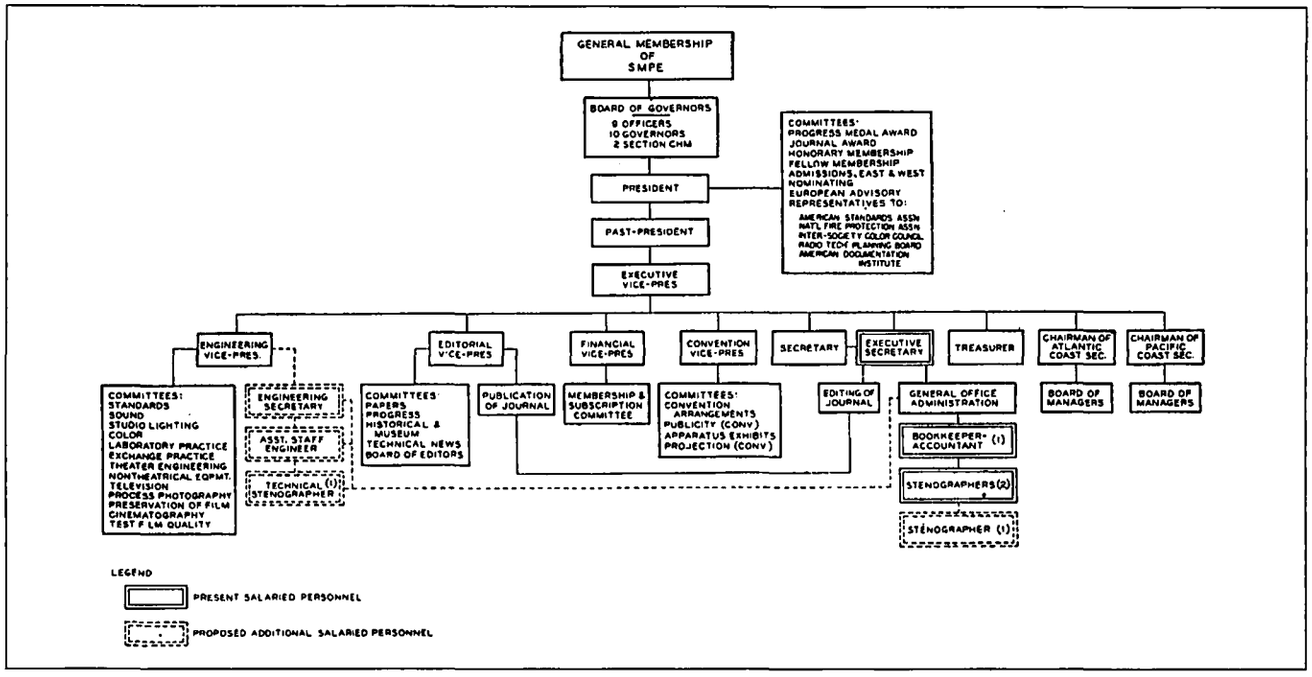

Figure 1. Present and proposed organization of the Society of Motion Picture Engineers.

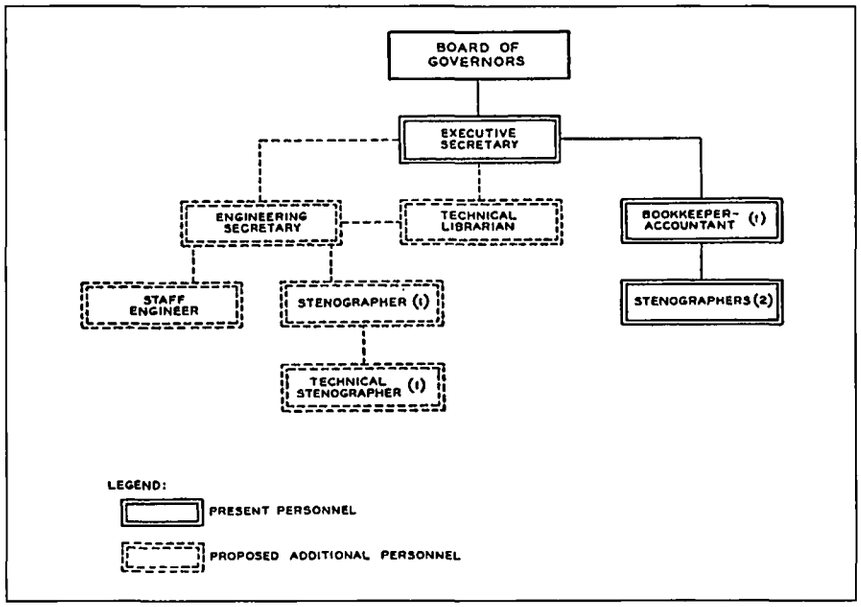

Figure 2. Present and proposed organization of SMPE executive office.

correlation of the technical terms used in television with those used in photographic technology.

Past issues of the *Journal* and *Transactions* of the Society contain many papers of fundamental importance relating to such subjects as cinematography, sound recording and reproduction, motion picture laboratory practice, the optics of projection systems, etc. The usefulness of much of this information, however, is impaired because of the lack of correlation of the work of the various authors and because some of the material is out of date. One of the most important projects being undertaken by the Society is the correlating, assembling, editing, and preparation of original material where needed for engineering reference books and reports on the above mentioned subjects and on film exchange practice, motion picture process photography, motion picture theater engineering, preservation of film, and for a motion picture projectionist's handbook. These books are urgently needed not only in the industry but also as text books for the teaching of courses on motion pictures in colleges and universities. Such courses are now proposed in answer to numerous requests from members of the Armed Forces as well as from civilians who, in past years, have often asked the Society to recommend institutions giving courses in motion picture production, distribution, and exhibition.

Performing these tasks with an adequately staffed executive office the Society, in co-operation with the Research Council of the Academy of Motion Picture Arts and Sciences, will be able to bring about improvement in engineering practices that will increase economy, advance public relations, increase the entertainment value of motion picture productions, and in general raise the stature of the motion picture industry.

The organizational increases required to carry out this work are shown in Figs. 1 and 2.