STANDARDIZATION

ADDRESS BY HENRY D. HUBBARD, SECRETARY, U. S. NATIONAL BUREAU OE STANDARDS, BEFORE THE SOCIETY OF MOTION PICTURE ENGINEERS, AT ITS WASHING-TON MEETING, MONDAY, JULY 24, 1916

Your appreciation of standardization is evident since you give it first place on your program. Standardization is too big a theme to be lightly regarded, and its possibilities have already aroused an enduring interest among engineers everywhere. For fifteen years your National Bureau of Standards has seen the rapid rise of this subject in so many lines that a list would be too long to read here. I may here touch only upon a few thoughts of appreciation of your work and the application of the theme to the motion picture field,—a subject which stimulates our imagination and kindles our enthusiasm.

Standardization is a big word, almost as broad as civilization, for our manners and customs are merely accepted standards of conduct, our laws aim to standardize human relations, and daily life is governed by standards approved by common consent. Standardization is more than a passing fancy of efficiency experts. It thrives everywhere, often against efforts to prevent. Our daily life has its time schedule. Work and recreation are run by the clock, and if we would be efficient we must fit nicely into the standardized time schedules. Diet experts standardize the food requirement for proper growth, activity, and repair of our body. We may judge by comparison with normal body size and weight whether we need development, and from our respiration, heart beat, and temperature whether vitality is normal. These things are so standardized that they are the foundation of physical diagnosis.

Coinage, weights and measures, and time are standard. Business organization is being standardized. So, too, is transportation, manufacturing, and machinery. The motions of the workers are being studied in order to standardize his movements along the lines of least effort. In this personal motion economy with its possibilities for human welfare the motion picture is the indispensable means of research.

Everywhere we feel the urge for standardization. It calls for normal regime, normal equipment, normal efficiency. Our clothing is standardized, and though no law prevents, we would not care, for example, to come here this morning without a necktie, for society enforces its standardization by social pressure stronger than law. Our every garment is standard in size and cut, and we must fit into the staple sizes or pay made-to-order prices. Our streets, houses, and rooms are of standard types, as are our furniture, utensils,

books, magazines, and newspapers. Staple sizes, standard grades, set routine are all part of the big machine process into which human activity and equipment are being fitted, with happily increasing emphasis on the health, comfort, and happiness of the individual. Each profession aims to standardize its training, its terminology, its equipment, its data, both numerical and descriptive, its code of ethics, and to fix standards of quality and performance,—showing that standardization has a breadth commensurate with human activity.

A simple example of standardization is the orchestra. The instruments are of standard size and form, and when played together they must be standard as to performance, that is, tuned to a definite pitch, say 435 vibrations per second for alto A. If the pitch is standard, instruments shipped to any part of the world will harmonize with local instruments tuned to standard pitch. Here standardization is simple—a single number and the unit of time.

Measurement is the heart and soul of standardization. The optician with his standards can adapt the measured curvature of the lens to correct the measured defect of the eye. In a structure measured strength must fit measured stress, as a glove fits the hand. We now measure not the size alone but the quality as well, for quality is as truly a test of fitness as size. Each property must be of right magnitude and the group of properties must be proportioned and combined to fit the uses to be served as the contour of a key is shaped to fit the recesses of the lock. For quality is not a vague intangible property. It consists of a group of definite properties, each having a distinctive magnitude. The combination fixes the specific quality and may be specified in terms of measurement. If each property in the material is given a numerical magnitude in terms of units of measure, we have set a standard for the material and are enabled to measure its quality. The pertinent properties are separately measureable and this gives us the means to control quality.

Standardization must be built upon the solid rock of science, for science is standardized knowledge. Noble examples of standardization are found in history, but only recently has it come into flower in a manner that is transforming our standards of progress. Standardization is not, however, a transitory stage to be passed through. Far from it. It is to be a continuous enterprise. Its function is nothing less than the conscious control of mechanical evolution. Chance has hitherto played such a role that a new era is reached when we unite to standardize progress. Standardization must imply progress. As long as progress is possible, standardization must be free to grow apace with science. If it means fixity we should avoid it, for fixity in a progressing civilization is an anachronism. Steady progress through standardization is the true aim. Such standardization should unite two elements—the tendency to conserve progress and the pressure for new progress. These two tendencies do not conflict if we avoid the usual tendency to let the good become the enemy of the best. No value is lost if we keep the good only until

the better way is shown. Standardization of this kind is the steady harvesting of progress.

Interchangeability of parts is an important principle of standardization, but more important is this implication that a true standardization is the consensus of the best as far as that is practically attainable. To bring things to a dead level of uniformity at an arbitrarily fixed value is not standardization at all. Standardization means and implies an ideal to be realized. Ideal standards therefore involve searching investigations so that they may be based upon scientific principles rather than on empirical judgment. In many cases, even yet, tentative standards alone are possible. Standardization is at its best only when each magnitude of property or dimension is found by theory and test to be the most fit for its use. Such standardization is a continuous development, not a thing to begin with but to arrive at. Like the bark of a tree, standardization may bound progress but must not limit growth. Inflexible standards are liable to retard progress so that we must keep before us the ideal that at any time the standards must be the consensus of the best, scientifically formulated.

Motion picture engineering presents a splendid field for standardization. The need is obvious, for your machines and films travel to all parts of the world, and the demands of human safety, human vision, and comfort are common to all men in all lands. An ideal picture presentation for one is an ideal for others, since human nature is much the same the world over, and since mother nature standardized the human eye ages ago.

Cooperation is implied in the fact that you are organized. Stable standardization is that in which all concerned are represented and their interests regarded—engineer, maker, and user. To overlook any factor is to vitiate the standardization as time will show. It is the business of the engineer to bridge the gap between the maker and user. The user, however, is the final dictator in standardization and his satisfaction is a practical test of quality. It is wise to recognize this fact at the outset and secure the continued cooperation of the engineer, maker, and user.

Much has been done in planning place, equipment, and process in your field, but as elsewhere much remains for scientific research to determine by experiment the best principles of design and operation. Where the best is not scientifically known and where interchangeability or large scale production are not controlling factors, then standardization should be freer—the performance standard being set to allow play to individual design and trial in service.

Some of your standardization problems are pressing, others look to the future. Several examples may be given. You have the problem, for instance, of seating for comfort, for space economy, and for effective seeing. This standardization would, perhaps, fix the best form and size of seats, their location, the minimal seating distance from the screen, and the minimal angle of the observer's line of sight with the plane of the screen. Seating thus involves

comfort and good seeing—factors which affect the patronage. These are obvious examples, but they should be handled as scientific problems and not settled by personal opinion. Science alone can give the needed impersonal basis for such standards.

Your nomenclature is an important subject for standardization. New machines, new processes, new materials appear, to which new names are given, some of them apt and striking. They are real contributions to our language and should have standard definition. So, too, all the terms of the industry should be clearly named, and officially defined in the interest of definiteness and to avoid misunderstandings. The dictionary must follow usage and cannot really standardize. It is rather a dragnet for all usages and meanings. The standardization of terminology should be by the primary users of the terms employed and will greatly facilitate definite thought and discussion.

Optical standardization would include light sources in the studio and the theater—their quality, steadiness, brightness, and distribution; also the optical systems of lenses, reflectors, screens, and the question of eye comfort. For example a standard studio light might be specified and perhaps scientifically planned to eliminate glare by absorbing screens while retaining a standard photochemical action. Clearly the film sensitivity, the studio light, and the projection lantern must be standardized upon the same basis if the outcome is to be successful. The best exposure and projection time of unit picture in relation to light intensity and retinal persistence is a matter for physical and psychological experiment. Among the most obvious items to be standardized are the width, length, and thickness of the film; the form, size, and location of the perforations, and such standardization to be stable must be on a world basis, for science is international and scientific standardization must be the same.

Looking more to the future, an ideal we are approaching slowly, and in which engineers should take a deep interest, is that of an ideal atmosphere within the theater. It is a problem of hygiene to ascertain numerically the factors needed by the engineer to provide such a standard ideal atmosphere. It may eventually include the best temperature, abundant fresh air, and also the cooling and drying of the air when required, making it dust free, circulating it, and possibly giving it a healthful trace of ozone, and the fragrance of the woods. This may be looking a long way ahead, but vision is required in such matters. When we speak of a standard indoor climate, we may recall that practically all of these elements have been separately realized in actual service and need but the unifying hand of the engineer to realize in combination. What this standard atmosphere will mean for public health, comfort, and enjoyment can hardly be overestimated.

Your motion picture industry touches many arts—photography, architecture, illumination, the drama—and it would be needless to suggest how varied are the subjects which involve standardization.

I am sure you appreciate that standardization stands not for fixation, but for steady progress, step by step, at such time intervals as may be found most efficient. In your work, as in that of other societies of engineers, you may count upon the cooperation of the National Bureau of Standards. On behalf of Dr. Stratton, the Director of the Bureau, I may say that the facilities of the Bureau as far as practicable will be extended to any committee you may appoint to deal with standardization.

In conclusion, may I express my deep appreciation of your work and the art it serves. To me the motion picture is the wonder of the world in its effects and possibilities. Its uses in education, science, recreation, industry, engineering, and social movements make it vie in interest and power with the printing press itself. It speaks the universal language of action. It is the magic carpet of Bagdad to take us to all lands, under sea and under land, among the clouds, to fairyland, and into the world's markets, laboratories, hospitals, and factories. In portraying the flight of a bullet it magnifies time, in recording the unfolding of a flower from the bud it compresses days into seconds. It is not making the world a little neighborhood, it is rather making of each neighborhood a little world. It intensifies life by broadening its contact with all life—for it is your business to bring into the experience of each the experience of all. Through the motion picture, in fact, we may create new experience, for nowhere has the magic of the miraculous been so tangibly realized as on the screen. The quickening effect of this wonderful art upon social evolution is beyond estimate. To say that as an art it is in its infancy is to state the obvious. Its possibilities are limited only by the power of the creative imagination and the technical powers of the engineer. Its success depends not upon subject alone but upon the factors of economy, efficiency, safety, comfort, and interest, which in turn depend upon scientific standardization. May your work have a success commensurate with its interest and importance, and through your organization may you, in the words of Washington, "raise a standard to which the wise and the honest can repair."