these men gave of their time, energy and experience in a manner which will not soon be forgotten.

The chairman of this advisory committee whose reports have been to us, guide, philosopher and friend, has been good enough to be with us this afternoon. To men such as he, men who conduct large affairs, men who make decisions fraught with great consequences, it is needless for me to point out that it is sometimes impossible to carry out all the details of even a well designed plan. I want to assure him and his committee, however, that the department of exhibits in this exposition has but one object in view, and that is to follow the spirit of these reports. We are here, indeed, this afternoon not only to dedicate this beautiful creation of the mind and imagination of Mr. Cret, but also to dedicate ourselves to the spirit of this report and to the original theme of the fair.

The distinguished physicist, engineer and lovable man who will address you is no stranger to Chicago. Born and educated on the Pacific Coast in what since has become an outstanding intellectual center, he came at once to Chicago, where he added lustre to the already famous Ryerson Laboratory, presided over by the scintillating genius of Michelson. His years of service have been spent mostly on the Atlantic Coast, where fine judgment, executive ability, and a kindly attitude of mind have won him friends without number.

Ladies and gentlemen, I have the joy of introducing to you this good friend of ours, Dr. Frank B. Jewett, who will deliver the dedicatory address.

THE SOCIAL EFFECTS OF MODERN SCIENCE

By Dr. F. B. JEWETT

BELL TELEPHONE LABORATORIES, AMERICAN TELEPHONE AND TELEGRAPH COMPANY

Mr. Dawes and Distinguished Guests:

IN these strenuous and troublesome times most of us who are asked to speak on formal public occasions are frequently not much concerned with the subject-matter of what our speeches might be. What most concerns us is the problem of presenting reasons for declining which will be effective but which will not at the same time be likely to give undue offense. With such a condition so generally prevalent the opening remark by a speaker that he is "pleased" or "gratified" or "honored" to be present is likely to cause one's tongue to slip slyly into one's cheek.

Having thus fully apprized you that I am cognizant of the facts viewed both from the standpoint of the speaker's rostrum and from the point of view of the audience, I am now going to use all three of the words just mentioned. When I have finished with the remarks which Mr. Dawes has asked me to make I hope you will agree that this time at least I am sincere. I trust you will agree also that there is merit in the case I shall attempt to make.

I am "pleased" to be here and to take part in the ceremony of dedication of this building which a year hence is to be the Hall of Science, and so the home of the central theme exhibits of the Century of Progress. I am "gratified" that opportunity is offered a year in advance of the official opening of the exposition to set another monument still further to fix and mark the aim and object of the exposition. Finally, I feel "honored" to be asked to state again in your presence, and in the shadow of this tangible evidence of adherence to an ideal, just what it is hoped most the Century of Progress will accomplish.

The underlying plan and aim of the exposition have been stated many times by Mr. Dawes and others of the trustees and officers far more familiar than I with the details of this gigantic undertaking. None, however, have until to-day had so completely the background of a fact accomplished against which to set their words. None have been able to say that here in this completed structure are to be shown those fundamental things of science on which so much of progress during the past one hundred years is based and on whose properly continued employment so much of human happiness and well-being depend.

If I looked upon the Century of Progress as merely a grandiose exposition of the material marvels which have evolved from scientific research and its practical applications, I should not only not be here to-day, but I can assure you that I would have lost little time in thinking up plausible excuses for declining. I am very little interested in those expositions of science which have for their object mere stimulation of interest in the weird and bizarre. Further, I have very little interest in expositions or fairs or shows designed simply to provide a host of varied amusements on a lavish scale. What I am interested in particularly, at this time, is any sincere effort that can be made better to acquaint people with the possibilities and limitations of science as they enter into our common daily life.

Any intelligent thoughtful person can hardly help being impressed with the facts, first, that during this past century, which marks the corporate life of the city of Chicago, science more than any other single factor has influenced human affairs; second, that

while the material changes resulting from the common use of the things of science have been incredibly vast and in many directions of unquestioned advantage to an increased pleasure and comfort in living, the results are not wholly on one side of the ledger; and third, that despite the avidity with which we have seized upon the material things of science, and the ingenuity we have displayed in applying them for gainful purposes or to bring about an improvement or revolution in some established way of doing things, we have lagged egregiously in the development of our understanding and exercise of the social factors which these new things have introduced into human living.

Starting more than thirty years ago as a young man completely obsessed with the apparently illimitable field of opportunity offered to those who wished to make science a life work, I saw nothing very much in the social problems. In this my point of view at the time was not different from that of the vast majority of older and wiser people. In fact, I doubt whether at the time of the great Columbian Exposition in Jackson Park more than a baker's dozen or so of people in all the world had any real clear conception of what was likely to evolve. Even such wise men as did exist were probably looked upon mainly as cranks or carping critics whose warped point of view prevented their seeing the unending and easily obtained benefits which the new order was introducing.

With increasing years and a greater knowledge of what science can and can not do and, I think, a clearer picture of the forces which a wide-spread use of applied science has suddenly released at the very center of human life, my point of view has undergone a gradual progressive change.

In using the word "suddenly" as I have just done, I have employed the term advisedly. To us as individuals a hundred years is of course a long time. In the progress of man's development and in the evolution of what we are wont to call civilization it is, however, but a fleeting second. Nevertheless, in this particular fleeting second science has released forces more powerful, for good or evil, than have ever been released before in much longer periods, save possibly only those deep spiritual forces which culminated in the lives of Christ, Mahomet and Buddha.

Being almost explosive in their intensity and in their effect on society, and for the most part being of a character to intrigue the imagination of the individual, it is not surprising that our appreciation of the far-reaching social effects and of the new problems which these effects create should have been slow in coming. As a matter of fact multiple experience and the convictions arising from such experience had necessarily to precede any intelligent and successfully constructive attempt properly to relate the new forces to the old order and the old order to the new forces.

During the past fifty years, and particularly during the past twenty-five years, knowledge both in the fields of fundamental and applied science has increased at an astounding rate. Likewise, our experiences with the effects of science applied in wholesale fashion to the common concerns of life have multiplied amazingly. Where a few decades ago only a limited number of men and women with a philosophical turn of mind saw the future dimly, now thousands of intelligent people, most of whom would disclaim being philosophers, have a fairly clear conception of what is ahead of us. True, most of them as yet realize merely that there are serious problems which must be taken in hand and solved. As to how this is to be done or what form the solutions are likely to take, they are for the most part still ignorant.

In the main this state of affairs results from uncertainty and lack of understanding on the part of the intelligent laity as to just what are the fundamental factors of science that must be taken into account. Now that the existence of a real problem is coming to be understood, intelligent education is the thing most to be desired. No one at all conversant with the facts is of course foolish enough to think that such an educational process can be accomplished in a day, or that there is any single royal road to the answer. Every powerful instrument of education—whether it be the conversation, writing or speeches of informed people, the articles and editorials of an intelligent press, the conscious endeavors of museums of science and industry like the one which is being created in Jackson Park, or the far-reaching influences of things like this forthcoming Century of Progress—is to be welcomed.

In some quarters a senseless fear of science seems to have taken hold. We hear the cry that there should be a holiday in scientific research and in the new applications of science, or that there should be a forced stoppage in the extension of old usages by mandatory legislation. To my way of thinking both points of view are as foolish as they are vain. We might by edict retard the speed with which discoveries in science are made. Possibly even some retardation might be desirable, if any one were wise enough to know just where the brakes should be applied. We might even for a time retard the spread of applications which would cheapen cost, enlarge the sphere of easy transport and communication, or add to the pleasure and comfort of living. What we can not do is to curb completely man's curiosity about the unknown, nor can we stop for long the introduction of things which men believe to be valuable additions to social life. That any one of intelligence should seek

artificially to shirk the problems presented by the things which science has introduced into our midst is tantamount to saying that the human mind which has been capable of extracting these new things out of Nature's storehouse of the unknown is incapable of adapting them to beneficent purposes.

Any attempt to stop or permanently deflect into artificial channels the widest possible employment of the things of science would be doomed to failure by the mass results of individual self-interest. This would be so even if many of the things of science did not themselves involve irresistible forces destined to bring about that wide-spread correlation of operation which we have come to designate as monopoly.

From every point of view therefore science has during the past hundred years injected into human life a multitude of factors with which our forebears did not have to deal but which we and our children and their children can not escape. The sooner we set about understanding what these factors are and dealing with them intelligently in a forward-looking rather than a reactionary manner, the better off we will be.

There is no gainsaying that in the past and at the present much that is harmful from a social or political point of view has developed out of the things of science. In the main such abuses have arisen because of the conception, implied if not specifically advanced, that the new thing was merely a better way of doing an old service and could be introduced without modifying appreciably the relation of that old service for the general welfare. In the case of entirely new kinds of service, the same general arguments were held to apply. Admission of these obvious defects of past and present results does not, however, imply that they must necessarily continue, nor does it imply that the only way out of the difficulty is to abandon completely the fundamental conceptions of private initiative, on which for centuries past we have built up our national life. What it does mean is that we must recognize and understand these new factors to the point of knowing how to weave them equitably into our social structure so that we and not the things of our creation shall be master of our destinies.

To this end real understanding of a limited number of fundamental things is all important. With such understanding attained, every bit of new scientific knowledge acquired is an addition to the strength of the social structure and not a revolutionary threat to the existing order. Nor should those of us whose lives are devoted specifically to fundamental or applied science be any less concerned than others about the proper handling of the social consequences of our work. We of all people should be most active in helping to bring about that real understanding which seems to me so necessary. Just in measure as the public generally thoroughly understands the place and influence of scientific progress, so in that measure are we given assurance of continued support of the quest for new knowledge and new things.

Having given you now a bit of the point of view to which I have attained, I should like to connect it up with this particular occasion and with the gratification which the occasion affords me of participating in the dedication of this great building.

When some years ago I first heard that Mr. Dawes and those interested with him in devising a suitable ceremony to celebrate the one hundredth anniversary of the city of Chicago were considering the idea of a centennial exposition which would carry with it something of the lessons of the past ten decades, I was gratified by the knowledge that here in this great metropolis there was true realization of matters not appearing on the surface of an active daily life. Later on when matters took on more tangible form in discussion with the National Research Council as to whether such an exposition as the trustees had in mind could be produced, I was impressed by the deep understanding which these gentlemen had of the work which our generation has to do as its part of the problem of national development. Later on still, as chairman of the science advisory committee appointed to cooperate with the trustees in the formulation of a fundamental plan for the Century of Progress, I was confirmed in my belief and strengthened in my assurance of their sincerity and of their desire to adhere steadfastly to the aim which they thought worthy of the effort they were expending.

While unfortunately time and circumstance have intervened to modify radically some of the early conceptions of the Century of Progress as it will appear in 1933, there has never, so far as I have been able to ascertain, been any thought of deviating from the originally agreed upon basic theme for it.

No matter what curtailments and alterations of plan and desire have been forced on the trustees by the inexorable operation of the forces of a wide-spread economic depression, the principal aim and purpose of the exposition have been adhered to. At all times it has been recognized that it would fall far short of its objective if on the day its doors closed it had not made a substantial addition to the national understanding of the real place of science in the social structure and of those factors which have their roots in science, and which must influence the course of our social controls in the years ahead. Real education above everything else has been the goal of all who have taken part in this great adventure. This Hall of Science, the exhibits which it is to contain and the lessons and understanding which are to be

drawn from them were and still are the center of the picture. Every one who has given serious consideration to the problems involved is satisfied that the things which this building is to house can be made to convey the desired educational story and at the same time to convey it in a manner which will be strikingly interesting and widely informative.

Further than this, all are convinced that the major part of the exhibits which make up the great bulk of the exposition will in large measure be influenced by the underlying theme which typifies this building and its contents, will give point to that theme and will be enhanced in interest thereby. That much of what is presented for those of the visitors who crave only amusement or transient pleasure will have no substantial connection with the underlying theme, and that much else will have only a remote apparent connection is no derogation of the main purpose of the trustees. It is merely the result of those practical necessities which can not in the very nature of things be divorced from an undertaking of this kind.

Certainly, unless we are all completely in error as to what the Century of Progress can accomplish, every thoughtful and intelligent person who spends time within its gates will return home not only with a better understanding of the problems which confront the nation as a result of what science is bringing into the world, but likewise with a better understanding of how to go about the solution of these problems.

When a few years hence the Century of Progress is but a memory and these buildings have been razed and the grounds on which they stand have been restored to their permanent condition, I am confident that all who have had a part in the undertaking will be satisfied that they helped to provide Chicago with a dignified and fitting centennial celebration. I am confident also that they will feel it was done in a manner calculated constructively to advance the development of our national life and to evidence the keen appreciation which the citizens of this great city have of the problems which confront the country.

It is this deep-seated belief in the educational value of the Century of Progress and in the integrity of those who are its sponsors which gives me those feelings of pleasure, gratification and honor at being permitted to take part in this prenatal ceremony of dedication. In thus closing my part of the dedicatory exercises I would not wish to leave you with the thought that full understanding and appreciation of the problems which arise out of wide-spread utilization of the things of science constitute in my mind the sole or even the major problems with which society must struggle in its slow upward course. No amount of such understanding can even remotely touch the elements of human greed, avarice and misuse of public trust which frequently bulk so large in our community life. All that I do claim is that a real understanding of the underlying forces which have been released by science will very greatly simplify the solution of many problems. These solutions, reached as a result of real understanding, must likewise tend to limit the evil effects of the human factors just mentioned which might otherwise be augmented. To me the forthcoming Century of Progress offers a unique opportunity for service.

OBITUARY

LEONARD THOMPSON TROLAND

THE tragic death of Dr. Leonard Thompson Troland removes a man from the active scientific world who will be equally missed in several fields of human endeavor. He had scarcely passed his forty-second birthday when he fell to his death on May 27 down into a rocky canyon from the summit of Mount Wilson, California, just as he was about to be photographed by an associate.

Dr. Troland, who had been suffering from a nervous collapse as a result of overwork and mental strain, had climbed the mountain for recreation. For some time he had been staying in Hollywood, where he was directing the research of the Technicolor Motion Picture Corporation, of which he was the vice-president and inventive genius.

Although still only a young man, Troland had already established a reputation not only in psychology, which was his major field, but ranked high as a physicist through his book (with the collaboration of Dr. Daniel Comstock), "The Nature of Matter and Electricity"; was well grounded in chemistry and biology, in which branches he wrote scientific papers, receiving the Bowdoin prize for a dissertation in chemistry at Harvard; earned an enviable reputation for himself in the field of optics, and at the time of the world war was assigned to the task of developing acoustic devices for detecting approaching submarines, served as chief engineer for the Technicolor Motion Picture Corporation, in which capacity he elaborated not only the process of exhibiting colored moving pictures but developed methods to promote the manufacture of the film. In October, 1931, the U. S. Government issued to him a patent embracing 234 claims covering the production of pictures in color and acquiring rights claimed by many contestants since 1921. As if this were not a sufficient range for a single mind, he was also interested in metaphysics and ethical theory.