Physics and Human Welfare

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To the layman the name "physics" means either nothing or something vaguely disagreeable. The man of physics, the physicist, is widely heralded by the modern newspaper as somewhat of a magician and referred to as an atom splitter. As soon as he stops splitting atoms and does something useful he becomes an engineer.

The chief value of much of the knowledge of the science of physics is in what might be termed the "scientific method". This term is applied more and more to all the various forms of human endeavor. If the politician would use more scientific method, and less selfishness, the science of government would be building a much more permanent foundation.

It has been stated that the United States is doing nearly half of the world's work. This means that the output of energy in this country equals half of the world's total. This is due to our large sources of water power, coal, petroleum, and natural gas. These natural resources are harnessed by means of the principles of physics. Nature has favored our country with great natural resources and our industrial position is influenced by these resources. The inherent potentialities of America may be attained when discovery and research are closely coordinated with social planning. Social scientists as well as physical scientists have each worked independently of the other. If greater cooperation existed, greater results would be produced.

The medical profession has long realized the importance of physics to the progress of medicine. In an extremely crowded curriculum, the course in general physics is still considered an important background course for all medical students. The importance of the physicist as an assistant in medical research is greatly realized. It must be kept in mind that a mastery of physics by the medical student cannot be expected, but it is hoped that a working knowledge of the subject may be attained. Dr. Compton illustrates the importance of physics in medicine in the following way: "When some one is ill the doctor is called by telephone, visits his patient by automobile, measures his temperature with a thermometer, his pulse with a watch, examines his heart and lungs with a stethoscope, and his throat with a light reflector. Every one of these operations uses a tool and technique supplied by the physicist."

Let me point out a physical principle applied to modern medicine. There is a characteristic temperature above which a certain organism cannot live. It has been determined that this temperature is lower for the organism that produces distemper in dogs than it is for the dogs themselves. Hence dogs may be cured of the distemper by producing fever which raises the temperature above the limit for the organism while safely below the danger limit for the dog. This treatment has been used to cure cases of syphilis in monkeys, but cannot be used in these cases in man, since the threshold temperatures are too close together.

Training in applied physics is especially valuable in the electrical, optical, chemical, textile, paper, aircraft, automobile industries, as well as oil production and refining, geology, geophysics, acoustics, and metallurgy.

Physical principles, for example, will enter into the development of air conditioning, economical railway trains, prefabricated homes, preservation of foods, processing of plastics which include glass, rubber, paint, and composition, moulding materials, color photography, and television.

Architecture, music, and painting take their raw materials directly from the world of physics, and a number of the minor arts involving physics such as the use of color and illustration, are rapidly rising in prominence. Artificial color effects are fast approaching the importance of man made musical effects. The physical basis of color and the physical basis of music are important physical principles having many common applications. At present there is greater emphasis on the treatment of the physical basis of music, perhaps due to the fact that nearly every community has its brass band, its orchestra, its striving musicians, and radio listeners. The enjoyment of color has been widespread in a general way, people have been strangely unobservant in any refined or critical sense of the world of colors about them. Art galleries where good paintings may be seen are not numerous, and the colored chromo was considered vulgar by our grandparents. This leads to the thought that the physical basis of color may find its place beside that of music when television is perfected. Hence we see that there is cultural value of physics applied to music and art.

Physics can be of use to agriculture in some of the following ways: Increasing agricultural production, both as to quality and quantity, by studying the effects of radiation on plant growth, devising new sources of radiation, electrical methods of growth stimulation, and by providing new physical methods for the control of biological processes. In developing electrical, mechanical, and other physical methods of controlling insect pests, yields will be more certain. In developing engines, motors, and new methods of power distribution, marketing will be simplified. There would be greater benefits to agriculture if it were economically feasible to preserve crops without deterioration over a period of years. This is a challenge to the research physicist. Other benefits will come to agriculture by the development of new products which will serve as outlets for agricultural materials. Perhaps physics will not be as useful here as chemistry, but the physicist can assist the chemist in much of this type of research. As an illustration of this, let me mention that motor design is important in the selection of motor fuel. Agricultural products may be used for insulating materials, filters, and structural parts used in air conditioning which is a physical process.

I hope it is not out of order to mention the relation between scientific advance and social progress. Recently certain economic writers have placed the burden of unemployment at the feet of the scientist. This is a fallacy which can be proved by facts and figures. For example, 50,000 additional telephone girls and a 100% increase of linemen took place during the ten years that the dial system was being installed; five times as many printers are employed today, in spite of the fact that the linotype can set five times as fast; 50% of the theatre musicians have been displaced by sound motion pictures, but musicians and teachers have been increased by 35,000, actors by 17,000, ushers by 7,000, and radio employees by 5,000; typewriters, adding machines, and other office mechanical equipment have increased the typists by 32%, bookkeepers and accountants increased by 27%, although the population increase during this twenty-year period was only 16%. There was about 100% increase in ice dealers because mechanical refrigeration popularized all refrigeration. There never was an important invention which

did not cause the ultimate employment of a far greater number of men than it threw out of work. When the automobile replaced the horse, the street cleaner was out of a job, but today there are three times as many street cleaners as there were in the horse-and-buggy days, since there are more streets.

The importance of research cannot be over emphasized, for it is through research that new truths are discovered and new industries are developed. Through research the electron was discovered, and from this lone discovery great industrial organizations have been developed. There is every reason to believe that a continuation of the process of discovery of new ideas, the development of new processes, and the control of new forces will continue. The Federal Government can well afford to make larger appropriations for the work of research and thereby increase the efficiency of the overworked, undermanned National Bureau of Standards.

There is a trend in university curricula to take cognizance of the tremendously technical aspect of modern civilization by a realignment of emphasis on the major subjects in favor of the physical sciences. This same idea should be extended to the high school. The high school student should learn his science, keeping in mind the viewpoint of its needs, its scope, and its place in civilization, more than for the benefit of its logical discipline. I believe this will increase the appeal of science to the student. Then we will have writers, executives, legislators, etc., who though chosen without regard to their views on science, will have a greater appreciation and understanding of science. They will be much more "science minded" and they will render more loyal support for the things which science needs. In brief, people can be "science minded" most effectively through education. When this state of training is reached, men of science will no longer need to worry over politics, so long as general order prevails, and there is the abundant development of natural resources.