

1942

Science in a Changing World - Paper Presented at the Fifty-Sixth Annual Meeting

Roy A. Nelson
Cornell College

Copyright © Copyright 1942 by the Iowa Academy of Science, Inc.
Follow this and additional works at: <https://scholarworks.uni.edu/pias>

Recommended Citation

Nelson, Roy A. (1942) "Science in a Changing World - Paper Presented at the Fifty-Sixth Annual Meeting," *Proceedings of the Iowa Academy of Science*: Vol. 49: No. 1 , Article 7.
Available at: <https://scholarworks.uni.edu/pias/vol49/iss1/7>

This Research is brought to you for free and open access by UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

SCIENCE IN A CHANGING WORLD

ROY A. NELSON

This year Iowa Wesleyan College celebrates the Centennial Anniversary of its founding and the Iowa Academy of Science pays tribute to that institution by holding its Fifty-sixth Annual meeting here in Mount Pleasant. Scarcely a decade after the first permanent settlers had taken up their abode in what later became the state of Iowa, this institution had its beginnings. It ranks among the oldest institutions of higher learning west of the Mississippi River.

As the early settlers extended the frontiers westward and developed the natural resources of these fertile prairies, equally courageous and farseeing pioneers established institutions of higher learning where the children of these early settlers could receive training so that they could take their places among the leaders in the development of this country.

In the field of science, Iowa has made contributions equalled by very few states in the Union. In a study of Iowa's Contribution to American Men of Science, presented before this Academy in 1939, Zabel found from a study of the birth places and the institutions where scientists received their training, that two out of every twenty-one North American scientists are or were Iowans. His concluding statement emphasizes this fact. "Iowa, long proud of her tall corn, her fertile rolling prairies and her well-managed farms has been overlooking what may well be an object of state-wide pride, as it is a most important contribution to our times, the work of her scientists."¹

In the field of science Iowa Wesleyan has made significant contributions through the century of its existence. This institution and other small colleges of the state have made their greatest contribution to the development of science in this country, in the young men and women they have prepared for the graduate schools by giving them their basic training in the sciences as an important part of their liberal arts education.

As the representative of the Iowa Academy of Science, I want to extend to Iowa Wesleyan College the best wishes of this Academy on the occasion of your Centennial Anniversary.

¹ Zabel, H. E. 1939. Iowa's Contribution to American Men of Science. Proc. Iowa. Acad. Sci. 46:71-87.

This, the fifty-sixth annual meeting of the Iowa Academy of Science, is being held in one of the most critical periods of American history. It is well for us to consider what influence the sciences have had in the development of our civilization and also what contributions science will or may make in the future. I do not mean that we can predict what new discoveries will be made but rather how scientific reasoning and the application of scientific knowledge may be used to the fullest extent.

During the time this organization has been in existence, greater progress has been made in the application of scientific principles than in any similar period of human history. In the development of the airplane, the automobile, high speed trains and fast steamships, we have means of transportation undreamed of fifty years ago. To cross this continent now is just a matter of hours instead of days. Even the remotest parts of the world may be reached in a comparatively short time. The developments in communication have been even more significant. Until the development of the telegraph, the telephone and the radio, communication could be no faster than the means of transportation. Now messages, news and music may be sent around the world in a fraction of a second. The great strides made in these two fields should have tied the peoples of the earth closer together. Instead, during the period in which these developments were taking place, we have had the two most devastating wars of all history. These two developments that have come from science along with the others are the nucleus about which modern armies are organized. Is it any wonder, then, that some people question the value of science to society and even suggest that the destruction wrought in a "scientific war" may outweigh the good that comes from science during times of peace? During a struggle such as we are now engaged in, the scientists have several important functions. They are doing essential research on one hand to make our offensive forces more effective and on the other hand to develop defensive methods that make the enemies' offensive less effective. The scientists are called upon to do many other important jobs, such as solve problems that have to do with production of war equipment, problems of health of our armed forces, treatment and care of the injured, the development of synthetic and substitute products where the supply from natural sources is not adequate or no longer available. Another important function the teachers of science have been called upon to perform is to help train the personnel needed to effectively operate the complicated machines used in a modern war.

Not only do the armed forces need technically trained men but there is need for scores of thousands of young men who have had sufficient training in basic mathematics and science, so that the army and navy can give them technical instruction. This has forced upon us a realization of one of the deficiencies of the educational system, the inadequacy of basic training in science and mathematics. We live in a country where the developments of science have been available to a larger proportion of our people than in any other country and yet, as the uses of science for the benefit of mankind have increased, we have decreased the training given in basic science in our educational system. It has taken a serious situation such as we now face to impress this fact upon us.

Most of the information we have obtained about atoms and molecules has come from a study of their reactions in what the physicist calls the "excited state". It is only when atoms are in this excited state under the influence of electric fields or high temperature that the spectrum, characteristic of the particular atom, is emitted. From a study of wave lengths of the light produced when hydrogen is in the excited state Bohr developed his theory of the atom. Perhaps in a somewhat similar way the "excited state" of the world today may show some fundamental deficiencies in our institutions, such as the educational systems, that are not evident during more normal conditions.

Science which has given the world the submarine, the airplane, and the motorized equipment which are being used so effectively in modern war, has also given us synthetic rubber, synthetic fuels, plastics and fertilizers which should remove some of the causes of wars—the needs for natural resources, the pressure of population and shortage of foods. The applications of science should make it possible to establish a just and lasting peace if the same effort were to be applied that is found to be necessary in promoting a war. We must recognize the fact that the scientific idea has been a very significant factor in influencing the trend of world affairs for the last century and will be of still more importance in the years to come. In the sciences we have a body of knowledge that is unique in several respects. It is the only large body of knowledge that is both sequential and cumulative. It is universal and knows no national boundaries. A nation may establish its own social order of religion, different from that of other countries, but if any advances are made in science in that country they will be a contribution to a larger body of knowledge. In the fine arts, masterpieces are of no greater merit than those pro-

duced centuries ago. Science, on the other hand, moves in only one direction—that is, to make progress. The rate of progress may be accelerated or slowed down but there can be no regression. Scientific thought is a dominating force that must be taken into account. It, in itself, may be neither for good nor evil, its ultimate value to humanity may depend only in the way it is directed. We who live in a democracy have the privilege of choosing our own destiny. We may not choose wisely but we still have the right to make the choice.

When science is viewed in its larger aspect, it is not only its applications, important and far reaching as they are, that must be considered, but also the very nature of science itself must be the underlying basis for evaluation of its advancement. Why is it that this greatest achievement of human thought has been able to advance so rapidly in the last three centuries while the advances in the other fields have been so limited in comparison? To find an answer to this question one must consider both the nature of science itself and the methods used in this field to extend its frontiers further into the unknown.

In trying to understand nature, the scientist is continually searching for reality, to use facts to determine the validity of theories. What reality is may be a philosophic question and perhaps the formulation of the meaning of the term should be left to the philosopher. From a scientist's point of view we may consider reality, as that which is subject to experimental observation and verification. Scientific thought and knowledge must be subject to mathematical formulation. Not all branches of science are subject to the same degree of mathematical formulation at the present time. However, the possibility of such a formulation is an inherent characteristic of scientific reasoning. Mathematics has been characterized as the queen of the sciences. This is certainly true in the sense that it provides the method of reasoning that must be used to understand scientific thought, or that must be followed to make advances in any of the sciences.

Freedom of expression is the essence of science as well as democracy. A nation may so control the education of the youth of that country that their thought processes will be directed toward certain social and religious doctrines desired by their leaders. Such regimentation is impossible in science training. The only control possible in this field of learning would be to eliminate it or limit the amount of science taught in the schools. Such a na-

tion would soon decay in competition with other nations in a world in which all modern livelihood and contemporary life depends upon a knowledge of nature acquired through science. One country may develop its religion, culture or social order more or less independently of what may be taking place in other lands but no one group or nation can develop its own science system.

If our civilization is to endure and free people are to remain free, then the utmost use must be made of the developments in the field of science to bring about a successful end to the struggle that now involves nearly all people of this earth. Scientists will face an equally important task after the war in making use of their training and knowledge in the reconstruction period. To make use of the applications of science for the betterment of mankind will not be sufficient if we are to have an enduring peace. The logical reasoning that is inherent in science must be used to solve problems that face a troubled world. In establishing a social and political order that will permit an unfettered development of civilized life will require that men and women trained in science take an active part in shaping the future of human institutions. They are the only group schooled in the methods of science and are best qualified to evaluate the significance of the scientific idea as a great force in directing man's destiny.

Many people believed that the battle for independent thought and freedom of growth and expression had been won at the close of the First World War. We now realize that this was just an illusion and that the idealistic attempts to solve world problems end in failure unless that idealism is tempered with realism. New discoveries will open new potentialities for good or evil depending on how they are directed. Their proper use demands an understanding of their implications and how they may best serve society.

We should insist that the youth of this country be given more basic training in the sciences as a part of our educational system. It is only through education which includes science training that we can have an enlightened nation which will see to it that freedom of thought and interchange of knowledge and opinions will not cease to be one of man's greatest privileges.

CORNELL COLLEGE
MOUNT VERNON, IOWA