

THE VIRGINIA ACADEMY OF SCIENCE OUR FIFTH ESTATE¹

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The lords temporal, the lords spiritual and the people have long been recognized in England as the "Three Estates." An editorial in the New York Times of August 22, 1926, refers to the act of Edmund Burke in calling the public press the "Fourth Estate" as he pointed to the reporters' gallery and remarked that it was far more important than the other three estates. The editorial continues:

"But since the days of Burke there has risen a group of men and women scattered among all the civilized nations who have deserved, as one of their number, Dr. Arthur D. Little, said at the centenary celebration of the founding of the Franklin Institute, to be ranked as the Fifth Estate—the world's men and women of science. Their meetings in the last year, and especially the last few weeks, in several world centres of culture, have, with the assistance of the Fourth Estate, brought their service to a wider notice than it has had heretofore.

"Numerically this Fifth Estate has always been 'feeble and insignificant,' but not more so than the Fourth Estate was when Burke made his gesture toward the reporters' gallery—not more in number than 100,000 persons in all the world, it is estimated. Its political influence is nil and yet it has 'recast civilization' through its study and application of the fundamental facts and laws of Nature. When its members sit in Congress, as they do rarely, 'they sit in the gallery,' not even as members of the Fourth Estate with some interpretative function but as mere onlookers. And yet this Estate possesses qualities of incalculable advantage to the public if only utilized. * * *

"This Fifth Estate * * * is in the way to helping man to get a clearer view of what his destiny should be now that he has come nearer to controlling his own destiny. And its obligation and privilege as most aspiringly and inspiringly defined by its protagonist are to bring home to every man the wonders, the significance and the underlying harmony of the world in which we live to the end that all undertakings may be better ordered, all lives enriched, all spirits fortified."

When in May, 1923, a small band of scientific workers assembled at Williamsburg to organize the Virginia Academy of Science, even they probably did not fully realize the great potentialities of this Society for service to the people of Virginia and to humanity. The value of scientific work and of research in pure science is becoming increasingly important, and no scientific association has any excuse for existence unless it be some stimulant to research. It would appear to be belaboring the obvious to attempt to discuss before a body of scientists the benefits and the advantages of

1 Presidential Address before the Virginia Academy of Science, May 6, 1927

research. Unfortunately, however, these things are not fully appreciated by the people of the State, and one of the greatest opportunities Virginia has—that of developing the best intellects among its citizens for the State itself—is sometimes lost because of lack of encouragement to workers in research. The statement has been made that there are more ex-natives of Virginia in "Who's Who in America" than ex-natives of any other State, in proportion to population. This means a loss of the most important asset of the State and occurs not so much from lack of fields of endeavor, for Virginia is physically bountifully endowed with mineral deposits, with rich soil for agriculture, with fisheries, and with potentialities for factories and hydroelectric plants. Progress in developing these things, however, depends directly or indirectly upon scientific research as much as it does upon the expenditure of capital. When our people begin to realize these things more fully the scientific worker will receive better support and instead of an exodus from our State of many of our best minds, there may be inducements for others to come here. Doubtless this desirable state of affairs is far into the future, but it need not be, if sufficient encouragement is given to scientific research in Virginia.

The recent beginning at Hopewell of a \$125,000,000 plant, in which the nitrogen of the air will be combined with hydrogen from water to form ammonia, is a striking example of the commercial advantages of research. There is no important factory in Virginia that could operate efficiently without the aid of its chemists or its engineers. That the health of the people is largely dependent upon biological and chemical research is obvious. The numerous biochemical products, such as serums for the cure of diphtheria and scarlet fever, and the recent toxin-antitoxin by which diphtheria may be eliminated forever, are striking illustrations of this. New drugs and physiotherapy, including the scientific uses of radiation and diathermy, have brought great relief of suffering. Researches in bacteriology and studies in pathology usually have a clinical bearing.

No one can tell when a discovery in pure science will begin to have utilitarian effects and if it be insisted that all research must have this in view it will be strangled at birth. The study of the development of the embryo, for instance, often gives light upon the pathology of defects and of various types of tumors. Research in the structure of the atom may make the alchemists's dream of the transmutation of elements come true, or it may result in the utilization of some sources of energy now unknown.

The discovery of helium about thirty years ago was the result of the observation of a band in the spectroscope of the corona of the sun in eclipse, which had no spectroscopic counterpart in the substances of the earth then known. Stimulated by this observation, Ramsey finally discovered helium which produced this spectroscopic band. Helium, a noninflammable light gas, is proving valuable in the inflation of balloons and dirigibles.

So practical a man as Hoover, Secretary of Commerce, said in an address before The American Association for the Advancement of Science at its last meeting in Philadelphia (The Nation and Science, Science, Jan. 14, 1927, Vol. LXV, pp. 26-29): "A host of men, great equipment, long patient, scientific experiment to build up the structure of knowledge, not stone by stone but grain by grain, is now our only sure road of discovery and invention. We do have the genius in science; he is the most precious of all our citizens. We can not invent him; we can, however, give him a chance to serve. And the more one observes the more clearly does he see that it is in the soil of pure science that are found the origins of all our modern industry and commerce. In

fact our civilization and our large populations are wholly builded upon our scientific discoveries."

From the same cabinet, Jardine, the Secretary of Agriculture (Jardine, W. M., *Agriculture and Modern Science*, Science, April 8, 1927, Vol. LXV, pp. 333-338), says: "It is no exaggeration to say that through the research accomplishments of recent years the average farmer today knows more of the science on which his industry rests and brings it into constant application than the scientist knew fifty years ago. Yet there remains much to be done. The agricultural field is full of problems, a large proportion of which depend for their solution on the effectiveness with which underlying problems in pure science are dealt. American science, I am convinced, needs to concern itself more with fundamental research than it has done heretofore. No country in the world has made such progress in applied science. but our record in pure science is not so flattering.

* * * This is the situation despite the fact that we have vastly more students in colleges and universities in proportion to the population than has any other country in the world. The difficulty seems to me twofold: We are not laying enough emphasis on pure science in proportion to our emphasis on the applications of science; and we are not stimulating and training an adequate personnel in scientific research."

These quotations are from men with scientific training, but who are also practical though long-visioned business men. With such an unqualified endorsement of the need of research in pure science, and when encouragement of the pure science worker comes from such sources, it behooves the people of Virginia to note this advice and admonition, else we cannot hope for real progress.

Dr. Charles H. Herby, a Southerner by birth and raising, in an address at the dedication of the new chemistry building at the University of Richmond April 11, 1927, observed that the thirteen Southern States, and Virginia particularly, were woefully deficient in their contribution to original chemical research as compared with the rest of the United States.

That America, however, has not been without research workers of the first importance in pure science has been demonstrated, even though their products are not so numerous as those of Europe. The epoch making discoveries of Matthew Fontaine Maury, a Virginian, gave accurate and orderly knowledge of the currents of the ocean—a research that proved a boon to navigation. The work of Joseph Henry, a former professor of physics and natural history at Princeton, is comparatively unknown except among scientific men and yet he discovered the principle of the electric telegraph and anticipated Faraday by a year in his findings that a magnet produces electricity, although he did not publish this in sufficient time to get credit for his work. Alexander Graham Bell said that the successful conclusion of his own research on the telephone was due to the encouragement and advice given him by Henry. It is such men as Maury in physical geography and Henry in physics who by the discovery of great principles and of new facts lay the foundation for a more spectacular adaptation of these things to commercial uses. Though the application of these discoveries may catch the public eye it is the patient worker who uncovers these principles to whom the chief glory should go.

Besides all this, even disregarding the great significance and value of the discovery of a new principle or a new method, we must consider the highly beneficial effect of the intellectual training on him who does real research. The so-called research

undertaken by the incompetent or the untrained with sloppy and inaccurate methods, is probably not intellectually helpful. Of such are the illogical schemes for perpetual motion or the usual announcement of cancer "cure's" in the Sunday newspapers. If, however, a person with intellect and training has a problem and considers it in a serious way, no matter how humble the problem, it should be considered and the work encouraged. If the Virginia Academy of Science will function in this way there is no greater service it can render the people of Virginia.

One of the greatest advantages of research, and one that is often overlooked, is the effect training in research produces on the intellect and on the character. In an address before Section N of the American Association for the Advancement of Science, Professor A. J. Carlson, of the University of Chicago, has well elaborated this theory (Carlson, A. J., *Research as a Method of Education*. Science, Feb. 4, 1927, Vol. LXV, pp. 125-128). He thinks that in every college some research work should be assigned the student—not with the idea of making him a profound research worker, but to give an insight into scientific methods and to develop his intellect so he can without restrictions or shackles seek for truth. That such work should not only benefit the intellect but the character of the individual as well seems obvious. That it does not always do this is equally certain, but according to Carlson some men have watertight compartments in their brains permitting them to think logically upon some subjects but to throw this method to the wind when other things are concerned. He says, "An 'educated' man is supposed to have a certain fund of information plus a certain controlled behavior or disciplined emotions. He is supposed to have acquired a certain degree of critical judgment as a matter of automatic cerebration; a certain method of arriving at conclusions by analysis. He is supposed to weight evidence, to keep an open mind in regard to the unknown.

When we survey the behavior of humans today, it is very obvious that critical judgment, except in matters of immediate practical interest to the individual, is largely conspicuous by its absence. The scientific method has not yet become a tool in every day human behavior. We know more facts than ever before, but, on the whole, we do not seem to be much wiser, more sane and more just than our more ignorant ancestors. This applies to the so-called educated members of society as well as to those who have come in the least contact with the formal educational processes of today. * * *

The very name science is being perverted to serve superstition, fakery and fraud. The results of scientific research may fill the bystander with awe, just as primitive man stood in awe before the eclipse, the earthquake, the lightning, the rainbow and the phosphorescent sea, but awe does not kindle the cool light of reason."

Last year following the report of your Committee on Research the Virginia Academy of Science adopted its recommendation and the retiring president, Professor R. E. Loving, of the University of Richmond, and I, acting upon the instructions of the Virginia Academy of Science, appointed a Committee on Research consisting of:

- Robert E. Loving, Professor of Physics, University of Richmond;
- C. P. Olivier, Associate Professor of Astronomy, University of Virginia;
- Donald W. Davis, Professor of Biology, College of William and Mary;
- L. R. Geissler, Professor of Psychology, Randolph-Macon Woman's College;
- Robert F. McCrackan, Professor of Chemistry, Medical College of Virginia.

This Committee has been organized and has adopted rules for its procedure. Its function is to encourage research in Virginia in every way it can. There will be offered at this meeting a prize of fifty dollars in gold for some particularly meritorious paper read at this session of the Academy and based upon research. Among its other duties this Committee has general supervision of the awarding of this prize.

With the consent and support of the Council of the Academy of Science I have undertaken to raise an endowment fund for the Academy. It is hoped that this endowment will soon reach at least \$25,000. At present \$8,275.00 has been subscribed. It was stipulated in securing the subscriptions to this fund that it is to be used as a trust fund, the principle not to be expended, but that the annual income will be divided into three parts,—not necessarily equal parts: (1) For a reward for a particularly meritorious paper based upon research read at the annual meeting of the Virginia Academy of Science; (2) a portion of the income is to go to the Committee on Research to pay its expenses; and (3), a portion is to be used as a grant to help research work that in the judgment of this Committee on Research is worthy and needs financial assistance. In this way there will be a perpetual fund, small though it be at first, at the command of the Committee on Research and it is hoped that this fund will be enlarged until the annual income will be sufficient to increase the amount allotted to these three objects and probably to distribute some of it along other lines that may in the future suggest themselves.

As the Academy of Science is not endowed, most of these subscriptions were taken with the promise that they would be paid in four semi-annual installments beginning October, 1927. In this way the interest on some of this amount will begin from the date of the first payment. A small amount has been paid in cash and this has been turned over to the First and Merchants National Bank to be kept in trust until the other subscriptions are due.

In order that the Academy may receive subscriptions for its endowment fund and manage this fund legally and without embarrassment, the Virginia Academy of Science should be incorporated. I recommend that a resolution authorizing incorporation be passed at this session, giving the power to the Council, with the addition of the president and secretary, to attend to the immediate incorporation of the Academy.

In raising this endowment fund Richmond men have aided enthusiastically. I particularly wish to acknowledge the helpfulness of Mr. John Stewart Bryan and of Mr. John M. Miller, Jr., both of whom not only made large personal contributions but were fully sympathetic with the objects of this endowment and gave freely of their time and thought. A list of other contributors with the amounts subscribed accompanies this address. We are deeply grateful to each of them.

While the total amount is not large it should give a net income of about \$400 a year, and this divided in the manner suggested will be stimulating and helpful.

Governor Byrd, of Virginia, has given encouragement to the idea that our Committee on Research may act somewhat as an unofficial privy council to the administration of the State, so that subjects pertaining to the sciences as biology, chemistry, geology in connection with agriculture or the industries can be referred to this Committee for an opinion in order that proper legislation and regulations may be adopted. In such a way the State of California has been greatly benefitted, and a service of this kind coming as it will without any additional expense to the State unless special work has to be done,

will give the State the advice of scientific men upon problems with which they are most competent to deal.

We must look forward to the growth of the Academy of Science, not only by an increase in members and in the attendance upon the Sections, but by an increase in the number of Sections. Arbitrary establishment of a Section without an adequate demand would be unfortunate. The four Sections at present are a Section of Astronomy, Mathematics and Physics, a Section of Biology, a Section of Physiology and Education, and the Virginia Section of the American Chemical Society. It would seem wise to establish a fifth Section and call it a Section on Miscellaneous Topics. Here could be assigned each year any group which wishes to discuss a branch of science not included in the existing Sections. For instance, it has been suggested that the establishment of a Section on Geology might be advisable. In order to see whether this Section would be worth while, an experiment could be made of trying out for two years a group of men interested in geology and having their papers read in the Section on Miscellaneous Topics. If the interest wanes and the attendance does not justify a new Section, no harm would be done and the subject could be dropped. If, however, interest in the subject continued, a Section on Geology could be established and the Section on Miscellaneous Topics would remain in order to try out some other scientific group. As the attendance and the work increases, some of the loosely allied sciences that are now grouped in one Section may be temporarily separated and tried out in the Section on Miscellaneous Topics to demonstrate whether it would be worth while to establish a new section. The establishment of a new Section means increased work and involves a certain amount of responsibility, and should not be undertaken lightly.

Finally, may I express my confident faith in the future success of the Virginia Academy of Science and in the abundant service that it will render not only to science and to Virginia, but to all mankind.