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THE PLACE OF STATE ACADEMIES OF SCIENCE AMONG SCIENTIFIC ORGANIZATIONS[1]

DURING the early part and the middle of the last century, when the means of transportation were less abundant than at present, when science was not so highly differentiated and scientific men were not so thoroughly organized, the state academies were at the apex of their influence. Those citizens in the most populous centers of the more progressive states that were interested in science banded together to talk about the new books that were being published abroad, to share with each other their various discoveries, to lend each other specimens, to show each other their collections and to discuss in general the scientific news brought to their attention by travellers. They were—most of them—amateurs whose vocations were along business lines and whose pastime was science. The telescope and the microscope were their instruments of pleasure rather than golf sticks, and the objects of their interest were the minute or the distant, rather than their scores. Scientific knowledge was by them regarded as cultural—to be acquired deliberately and to be dispensed with dignity. They were the chosen among the intellectuals. They were possessors of information that was unattainable to the common herd and he who reached the heights of publication became the elect of the elect. New theories were scanned with awesome wonder and new terms were caressed by the tongue as delightful morsels and the more complex they were the more appetizing they became. Discussions of new views were carried on with warmth and sometimes with heat. Often open meetings were held, when the members explained the mysteries of science to the uninitiated in the subject and incidentally acquired fame. As

[1] Abstract of address delivered before the Wisconsin Academy of Sciences, Arts and Letters and the Wisconsin Archeological Society, at Beloit, Wisconsin, April 6, 1923.

the fashion of speech in those days was oratorical there was much in the explanations that the listeners did not understand, but that contributed all the more to the reputation of the speakers—and they and their confreres in the academy were regarded as the "aristocracy of learning."

There were then no professional scientists to commercialize their wisdom, unless we except the few teachers of natural history in the eastern universities and the few government geologists whose travels to and fro among the industrious farmers were looked upon as the wanderings of the unbalanced. The salaries of these men, moreover, were so small that they were never regarded as making their living by science and so were not thought of as following a profession.

The state geologist of North Carolina, for example—the man for whom the loftiest peak in the Appalachians was named—was allowed by the state the munificent sum of $200 for his year's work among the mountains, on condition that he furnish and maintain his own horse. Is it any wonder then that the professional scientist was not regarded as debasing his love for paltry cash! Indeed no scientist in those days exchanged knowledge for money: they were all amateurs in the sense defined by the athletes.

In spite of the fact that the members of the State Academies constituted a caste apart, the societies nevertheless were doing a good work. They were keeping alive the tiny spark of scientific flame that had all but been quenched in the turmoil and stress that attended the making of a nation. There was little time for contemplating nature; most of it was employed in wresting from her the wherewithal to live. Had it not been for the enthusiasts in the academies the populace would have lost all touch with scientific thought.

As the conditions of life became easier and the demand for scientifically trained men arose, the professional scientist developed. At the same time science became more complex and its differentiation into branches followed. Science became technical. It was no longer possible to become familiar with all its ramifications. The demands on the mind were so urgent that few minds were able to accede to those of more than a single branch. The new generation was compelled to specialize. It was not content with the general knowledge of its fathers and as a result the old science groups began to disintegrate. The professional scientists, finding little in the state academies that was thought worthy of their attention, did not fill the places of the older men who were gradually dropping out because of increased age. Thus many of the state academies ceased to function as active bodies. The professional men, as they increased in numbers, formed their own organizations and state academies were neglected. Those that contained a few enthusiasts continued to exist, but rather as social clubs than as scientific groups. Others that had acquired a little collection during their more prosperous days maintained a small museum. A few in the larger states became publishing bodies. But most of them simply became comatose. A few years ago Professor Whitney sent inquiries to all the state academies for the purpose of learning something about their activities. Only twenty-four replied to his questions and of these only eight reported vigorous life; twelve were dormant and four were reported dead.

The question arises, therefore, as to the desirability of maintaining organizations that appear to present so little purpose in their existence. Shall they be allowed to die, or should they be resuscitated with the hope that they may accomplish some work that is not now being undertaken by other agencies?

They can not serve successfully as local technical societies except in the largest states, because their membership is comparatively small and is too divided in interests to furnish groups for discussion and their programs are consequently too dilute to attract many serious students. The interests of science workers are best served by branches of the national societies where there are enough persons of kindred interests to insure free discussion. In some states and in groups of neighboring states we already see the mathematicians and other specialists attending their own meetings and neglecting those of the state academies and with an increase in the density in population this tendency to "flock together" will be intensified. The result of this tendency is that the meetings of the

academies are becoming labored, with the younger academicians refusing to contribute to the program because of modesty, since they can not hope to add much to the general store of knowledge, and the older members saving their best efforts for their technical societies. The state academies can not successfully become little "National Societies" for the reason given, nor should they try to do so because that would mean a duplication of work and consequently a waste of energy.

We often hear the wish expressed that the state academies might serve the purpose of bringing together in a single meeting scientists with varied interests to discuss matters of general interest to all scientists. In my own opinion this is impossible. Science is now too specialized to furnish many subjects of general conversation. Though we may earnestly wish to become acquainted with the advanced thought in other branches of science than our own, the wish, it seems to me, is impossible of accomplishment because most men are not furnished with the proper mental digestive apparatus for its assimilation.

If, then, the state academies should not attempt to function as little technical societies, how may they function? Is there any place they can occupy to the benefit of science?

In reply to this question there are several suggestions that offer themselves.

(1) They may serve as agencies to encourage the study of local science, *i.e.*, of science applied to the local problems and for the publication of the results of such study.

There are many subjects of local interest that ought to be studied, if for no other purpose than to be recorded, since conditions are changing rapidly. The facts of common knowledge to-day may be forgotten to-morrow. If it is not some one's business to record them, they may be lost forever. Many valuable observations may be made in one's own neighborhood. If the observer is careful and accurate, observations that appear at the time to be trivial may be of fundamental importance to an investigator who may later be engaged in the study of a general problem. The ecological botanist of to-day would welcome results of a careful study of the native prairie flora that had been made at widely separated places at a time before imported plants had become widely spread. Such a study would furnish him with a standard by which he could measure the rate of spread of an introduced flora, or might enable him to determine the influence of a changed environment upon the original plant assemblage. It would have been a comparatively simple piece of work that would not have been beyond the powers of a comparative novice in botany, but it might have supplied data which can not now be obtained. Again, the continuous observation of the action of a little stream in modifying its channel is not a difficult task, but the results obtained might well be of service in helping to explain the action of a big river and might furnish a hint that would aid us in understanding some of the difficulties in the interpretation of erosion processes.

In other words, the careful study of simple phenomena may, in many cases, contribute to the understanding of much more complex ones and the state academies may well charge themselves with the encouragement of such studies. The field is all around us. But the laborers are comparatively few. They might be increased to almost any extent, for

> On every thorn delightful wisdom grows;
> In every rill a sweet instruction flows.

The state academies will justify themselves if they can originate any plan that will enlarge their number.

Although this objective phase of local science study is highly important, the subjective phase is even more important. The influence of any intensive observational study on the mind of the student sharpens his eyes and brightens his wits. His judgment is matured by comparison of his conclusions with those of others observing similar phenomena. This is education and it is this kind of education that differentiates the science student from the students in many other lines. Without it he is destined to be a failure as a scientist, even though fully equipped with book knowledge; with it he may be efficient even though his book knowledge is scanty. Good observers are needed and the best training for accurate observation is through the exercise of the observing faculty. If the state academies can keep the young observer investigating they will be doing much to supply the state with dependable men and women

who can be called upon for service when service of this kind is demanded for the welfare of the community. And the state academies can do a great deal toward this end if they will encourage the young worker to do what he can with the material at hand, will show an appreciation of his attempt to do some little thing in a worth-while way and will welcome his contribution to the general fund of scientific knowledge. If he is accepted as one of the serious workers in his field there will result a reaction in his mind that cannot help but be of benefit to him as a man but also as a scientist.

Perhaps in no other way can the appreciation of a man's work be shown better than by publishing his results. For this reason alone, if for no other, it is important that the academy should publish its proceedings. The appearance of the results of a man's labor in print is in some measure a guerdon of the approbation of his associates—and with the favor of his associates secured, his pride in his work will be increased and his enthusiasm for further work will be assured. Another convert to the religion of work will have been gained.

But the publications of the state academy have another function which they can exercise in such a way as to supplement the activities of the national societies without in the least duplicating effort.

There are many facts of local interest that for their own value are worthy of presentation at meetings of scientific men and many details connected with local scientific discoveries that are worthy of preservation, but which can not be printed in the proceedings of national societies because of lack of space. Some of them at the time of presentation may appear trivial, but trivialities have a habit occasionally of growing into significancies—like the falling apple which Newton is supposed to have noted. An observation may not be profound, but if it is not known to have been made before it is part of wisdom to place it on record. It may fill a gap in a line of reasoning.

Details are often tiresome, but the accumulation of details is necessary to the development of a generalization and the state academy may serve a good purpose to science by placing them also in the record. Thus, by recording facts of local interest and the details of observations, the state academies of science might serve a purpose similar to that served by local historical societies.

On the other hand, it seems desirable to many of us that the practice of printing in the academy transactions lists of species or descriptions of varieties of animals or plants of little interest to any but specialists should be abandoned. It may be of value to know exactly the number and names of the different kinds of moulds that have been discovered on the willows of southern Wisconsin, but the proper place for such a publication is a bulletin of some natural history survey, or perhaps the pages of some technical journal. Not only is it unfair to the members of the academy to expend their contributions on a matter of interest to so few persons, when so many other articles of more general interest are awaiting publication, but it is also unfair to the workers along the line of the publication to encourage the burial of a paper of this type in the midst of a mass of material of such different character. The literature of any branch of science is already so widely scattered that it is a serious undertaking to follow it through all its ramifications. If the academy is to serve science it should discourage every practice that will make more difficult the searching of the literature for highly technical articles and should avoid every tendency to waste the investigator's time. If we could confine the printing of material to the publications in which it is naturally sought, the chances of the scientist to occupy a comfortable berth in the distant future would be greatly increased. It might be well to have it distinctly understood that no paper will be published in the academy proceedings which should not be read before an audience at the general meeting. If the academy succeeds in preventing the appearance on the pages of its proceedings of a valuable article that ought to appear elsewhere it will have done a service to science of no little value.

(2) The state academies may further justify their existence by functioning as educational agencies. The non-scientific citizen gets little accurate knowledge of what science means from the newspapers and little more from the popular magazines. He may become acquainted with

a few facts, but he learns almost nothing of the teachings of science or of its tendencies. The state academies might well attempt to give a sane view of science to the man who is not technically trained and especially to convince him that scientific theories are based on a careful and painstaking search for the truth.

If the majority of the citizens of Oklahoma were convinced that scientific conclusions are not biased and that they are never final, but are constantly being tested as to their correctness, the legislature of the state would never have considered seriously the law forbidding the use in the schools of any text-book suggesting the possible truth of the theory of evolution. If the church membership of Minnesota were a scientifically educated membership its representatives would never have passed the resolutions that gave Van Loon a text from which to write a good-natured comment on their sophistry.

"The histories of H. G. Wells and Hendrik Willem van Loon," say the Minnesota resolutions, "are unworthy of a place in a university class room and unfit for our public schools because they introduce an element of mere speculation as to the origin of man and call it history and use this theory in manifest endeavor to destroy the faith of the students in their creator, God, and their supernatural redeemer."

"Being convinced that such teachings will eventuate in anarchy of government, we citizens urge for immediate assurance that atheistic, rationalistic and materialistic textbooks and teachers shall not be continued in our public schools," etc.

"Everywhere," retorts van Loon in the Baltimore *Sun*, "is the same dispute, based firmly upon ignorance and prejudice.

"Everywhere it is the same story of ill-paid, honest, hard-working scientists threatened with the loss of their livelihood by the illustrious companion of the cat that eats cucumbers and the Seminole saxophone sextet."

It is only by discussion that the truth is made evident. The state academy may perform a great service to the community if it will so arrange its program that a part is annually devoted to a frank statement of the condition of mind of science with reference to some great theory, or some subject of general popular interest. This year the Illinois Academy will devote its entire morning session to a statement of what the "Theory of evolution" is and why it appears to be well founded.

The state academies can do work of this kind better than the technical societies because, being less technical, they can reach a larger audience and, because they always meet in the same general community, they can work the field more thoroughly. Moreover, the speakers at the academy meetings are usually more familiarly known to the citizens of the community than those speaking at the meetings of the national societies. They are fellow citizens whose lives are known to be upright and whose thoughts are known to be normal and who, therefore, are listened to with more sympathy and patience than are the visitors from foreign states, who fill the greater part of the programs at the national society meetings. Moreover, since the audiences at the academy meetings are known to be composed largely of persons who are not technically trained, the speakers are more apt to use in their talks fewer technical terms than is likely to be the case when addressing members of local technical societies. Consequently the state academies occupy a position which, in this respect, is quite different from that of the technical societies and any effort they may exert in educating the public in scientific matters is not a duplication of the efforts of any other agency in the field.

(3) But the state academies may not only serve as educational agencies. They may serve also in a very direct way as training schools for young science teachers and indirectly for their pupils. The academies may by such service greatly advance science.

The future of science depends upon the coming generation and the training of the new generation is entrusted to the young men and women of the present generation. It is important, therefore, that the young teachers be encouraged, not only to impart the proper kind of knowledge to the students under their charge, but also to implant in their minds the means of acquiring new knowledge and to help them to reason on the foundation of facts observed. The teachers should therefore be urged to observe and infer, to experiment and

speculate, in order that they may be the better prepared to lead their pupils along the proper paths.

There are many instructors in our colleges, high schools and normal schools who might contribute a mite to the sum total of scientific knowledge if they felt it worth the effort to do so and at the same time might indirectly instil into the mind of some bright student the desire to do likewise. If they can be persuaded to do the work necessary to learn a new fact or to obtain a new point of view the experience accumulated in the effort will be of immense value to them not only as independent investigators but also as interpreters of the results of other investigators. They will become more interesting teachers, because they will speak with a greater understanding of the significance of the statements made in the textbooks and will often be able to illustrate them with references to their own discoveries. The pupils will consequently be apt to feel that they have a wide-awake teacher who is interested in his subject, rather than one whose interest is mainly in his salary. Impressed with the thought that things worth looking into are actually happening in his vicinity and that there are interesting facts to be discovered about objects that hitherto may have seemed commonplace to him, the normal boy or girl, impelled by his natural curiosity, will want to learn about them. Of course, many will soon tire of this kind of exploration, but some will find it fascinating—and a new scientist will be started on his career.

Certainly a teacher who is not himself a student of nature will never inspire his pupils to become scientific workers—and no teacher can possibly be a student of nature who doesn't study his environment.

I believe the most important function of the state academy is to prevent the science graduate who goes into teaching from becoming a penny-in-the-slot machine for retailing little scraps of knowledge recurrently at the ringing of an electric bell. It is our business as members of the academies to do what we can to prevent dry-rot in our science graduates before they make even an attempt at blooming. Of course, we know that most graduates in science have written theses based on research. But we also know that in most cases the impulse that originated the researches and the impetus that kept them going were not products of the writers' cerebration. It should be our business to help the young scientist one step farther by encouraging him to undertake a little piece of work on his own initiative and to carry it through by his own effort. The academy will serve a good purpose if it emphasizes the value of such work by urging the young man or woman to contribute to the program at a general meeting where results of the study may be discussed. If his offering meets with a sympathetic reception and his paper appears in print his self-respect will be increased and his standing in the community will be raised and as a natural reaction his mental processes will become vigorous and he will, in consequence, become a more and more valuable teacher of his science and a far better leader of his students. In order to accomplish this end, I believe it is necessary to assign a large part of the program at the annual meeting to the young scientists. The older ones have their national technical societies in which to make their flights, but the younger ones, who are not in large cities, have no place in which to try their wings unless it is furnished them by the state academies.

But experience teaches that the normal young man or woman will not willingly appear on a program if he feels that most of the papers are to be by seasoned investigators, because of the fear that his contribution will seem too trivial by contrast. Consequently, I repeat, the program must be left largely to the beginners in research. It may be desirable to flavor the program with a few papers by the older men, but it should be distinctly understood that the success of the meeting is mainly in the hands of the younger men. I have confidence that if the young scientists of the state are convinced that the academy meetings are for them, they will accept the responsibility for making them of value and will work earnestly to that end. I believe the most important function of the state academy is to encourage the young science teacher and that if it can do this successfully it will warrant the work and the effort expended in keeping it alive.

This year the Illinois Academy is experimenting to learn whether the views that have been expressed are justified or not. Not only are the young instructors of the preparatory schools

and colleges being urged to share largely in the coming meeting, but also the senior students in the colleges. The sectional meetings have been placed under the control of the younger instructors in universities, colleges and high schools and they have been asked to secure as many papers as possible from persons who have never before been on the program. As the result of a vigorous campaign there have already been submitted to the committee on the program the titles of ninety-one papers, of which only twenty-one are offered by university instructors of the higher grades. Men representing state departments of science have offered fourteen papers, college instructors and associates and assistants in the universities twenty-six papers and students and unattached scientists thirteen. The remaining seventeen papers are in the sections devoted to public health, psychology and education in which the contributions must naturally be highly technical.

But we are trying this year to do even more than simply interest young men and women in continuing their scientific training. We are attempting also to encourage the boys and girls of the high schools to employ proper methods in scientific work. We are not yet sure how this may best be done but we are making a start at solving the problem. Our first step was to affiliate with the academy the science clubs already organized in the high schools. Our next step will be to try to organize clubs in those schools in which now no such clubs exist. We are organizing a special section which will be devoted to subjects that appeal to boys and girls of high school age and at the coming meeting in May they will have a section controlled by themselves. The students of Knox and Lombard Colleges and of the high school at Galesburg will act as hosts and the subjects for discussion will be radio, taxidermy, bird study and home chemistry.

The coming annual meeting will not be of the same high technical value as last year's meeting at Rockford, but a much larger number of persons will participate in it—and a much larger share of the papers will be presented by young persons. Most of the articles will be short, but many of them will represent the first attempts at individual work on the part of their authors. The general meetings have been arranged mainly for educational effects. The morning program will comprise three talks on evolution in which the reasons for the acceptance of the doctrine as a working hypothesis will be given in a popular way by a botanist, a zoologist and a paleontologist. The evening program will be a little more technical but it also will be educational in purpose. The morning meeting will be mainly for the public in general and the evening meeting for the academy members and that portion of the public that is scientifically inclined.

It is hoped that the general and scientific meetings between them will accomplish the three functions that seem most natural to a local scientific organization without duplicating any of the activities of the national societies.

W. S. BAYLEY

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE SAFEGUARDING OF NATIONAL PARKS[1]

WHEREAS, by repeated action by Congress for more than half a century, widely approved by scientific and other societies and by the public generally, the National Parks of the United States have been completely conserved from industrial uses so as to constitute a system of National Museums of Native America, and

WHEREAS, one of the national parks of Canada is similarly completely conserved, and

WHEREAS, the combined National Parks System of both countries, covering geological, biological and geographical examples from the Alaskan Range, through the Canadian Rockies, to the Grand Canyon of Arizona, if preserved untouched, will constitute a unique Continental Exposition of inestimable value to science and to the popular education of future generations; and

[1] A resolution favoring the complete safeguarding in perpetuity of all national parks in the United States and Canada against every economic or commercial use of whatever kind, adopted in principle by the executive committee of the council of the American Association for the Advancement of Science at the regular fall meeting of the committee, October 21, 1922, and issued from the Washington office of the association, April 25, 1923.