

THE STICKS REMAINED UNBROKEN¹

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An interesting tale comes down to us from the early history of the American Indian. Seven tribes there were whose leaders came together and decided that they would live as neighbors in peace. For a long time, happiness and contentment reigned throughout the lands occupied by those tribes. Then, there came a day when pestilence, famine, and death visited the homes of the people. In their hour of trial, they forgot their vows to live in peace and warfare soon spread among the tribes. The countryside was lighted by the fires of the burning villages and many were the braves who died. After months of destruction and death, a great council was called and the leaders of the tribes were invited to attend. From far and near the great chiefs came and sat about the council fire talking and arguing. One evening as the shadows began to gather and the painted bronzed faces were lighted by the flames of the council fire, there arose from near the back of the circle of chiefs an old man. He was old and gray and wise. He walked to the center of the circle and stood in the firelight where all could see him. He stooped and picked up from the ground a single stick. He stood erect, tall and straight, holding the ends of the stick tightly grasped in his hands. Then—he broke the stick into pieces and tossed the pieces into the fire. Again he stooped and picked up a stick, broke it, and tossed it into the fire. Again and again he picked up from the ground a single stick, broke it into pieces, and threw the pieces into the fire. He then paused for a moment, stooped, and gathered a number of sticks together in a tight bundle. Once again he stood erect, his fingers clasped tightly about the bundle of sticks. His muscles tightened and strained. He took fresh hold and exerted all his strength in an effort to break the bundle of sticks. He tried again and again—but the sticks remained unbroken. He loosened his grasp, the sticks fell to the ground and, his message delivered without a spoken word, the old chief turned and walked back into the darkness.

The Tennessee Academy of Science is composed of individuals with varied scientific interests. There are physicists, astronomers, mathematicians, medical men, chemists, psychologists, conservationists, botanists, zoologists, anthropologists, and naturalists to mention a few of the more easily classified groups and not mention others whose interest in science, though none the less real, simply does not lend itself to any particular classification. Many of the members of the Tennessee Academy of Science represent, also, various organizations in the specialized sciences, such as the American Physical Society, the American Chemical Society, the American Society of Zoologists, and a host of others. The individual scientist, whatever his

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interest and the organization which represents his field of specialization, can, of course, make a contribution to the advancement of science in Tennessee. However, it is my sincere belief that a more inclusive organization, an organization which brings together the best talent in all of the sciences within the state, can make a far greater contribution. The Tennessee Academy of Science is such an organization. Remember the lesson of the old Indian chief. We, as individuals or as the representatives of organizations in specialized fields, are like the single sticks. We are weak. We can be broken. The Tennessee Academy of Science, which represents no individual or group but all of science, can be compared to the bundle of sticks. It is strong. It cannot be broken.

It has long been my belief that the Tennessee Academy of Science needs a carefully considered long-range program. This organization has already accomplished a great deal since it was founded some thirty-eight years ago. It arranges meetings, such as this, where the results of original research of both local and general interest may be presented. It provides an opportunity for us to become acquainted with our fellow scientists at other institutions in the state. It gives us a scientific organization in which our graduate students may take part and gain experience impossible to receive in the large national societies. It sponsors a Junior Academy of Science which helps develop and maintain the interest of young people in things scientific. It operates the Reelfoot Lake Biological Station from which have come important contributions to science. It administers the grants-in-aid of research of the American Association for the Advancement of Science and, as funds will allow, supplements those research grants to Tennessee scientists. As an affiliated society, it has a representative on the Council of the American Association for the Advancement of Science and gives us a voice in the affairs of that organization. It publishes a journal which is generally recognized to be among the best of the publications of state academies of science. Of these things we are proud but there is more that we can do, more that we must do, if we are to render truly effective our service to science in Tennessee.

Acting on the assumption that the training, experience, and wisdom represented by the membership of the Tennessee Academy of Science could serve as a great reservoir of ideas relative to the objectives of the Academy, several months ago you were asked to suggest projects which the Tennessee Academy of Science should undertake as a contribution to Tennessee during the next five years. Our technique in asking the advice and counsel of the membership of the Academy was modelled after that used so effectively by the late Dr. Wortley F. Rudd when he was President of the Virginia Academy of Science about ten years ago. Replies to the questionnaire were most encouraging. It is evident that the scientists of Tennessee agree with the scientists of Virginia in that they believe that the state academy of science should seek the promotion and development of science for the public good, should concern itself with problems of state-wide

interest in which all individuals and groups represented in the membership of the academy may have a part. A number of projects were suggested which are worthy of intensive study and careful consideration, practical projects, if you please, which greatly enhance the possibilities of this organization for intelligently effective service to the people of Tennessee. We are indeed grateful to the members of the Academy for their splendid cooperation in this activity.

It has taken some time to organize and evaluate the information which was obtained. Some of the suggested projects have already received further investigation. Others require much additional study. All are worthy of the attention of this organization. It is my purpose this evening to present certain of the proposed projects for your consideration and to point out why they should become a part of the program of the Tennessee Academy of Science. These projects are:

1. *The interpretation of science.* The subject matter of science provides the tools by means of which we can live the more abundant life—or destroy civilization. The choice is ours. This organization, which seeks the development of science for the public good, has the obligation to serve as the interpreter of science for the people of Tennessee. It has been proposed that the Tennessee Academy of Science establish a "Speakers Bureau" designed to serve civic clubs, garden clubs, farm and church organizations, high school and college science clubs, all classes of public organizations within the state. The subjects for which speakers are offered should be both specialized and popular in nature. Speakers and subjects should be chosen from a variety of sources, education, industry, agriculture, medicine,—representing science in its broadest aspects. The "Speakers Bureau" might also encourage local radio stations to sponsor programs in science such as "The Parade of Science" at WSM in Nashville. It might encourage scientists to offer their services to such programs and to local newspapers as interpreters of science. It is the responsibility of the scientist to make science and its methods understandable to all men everywhere, to reveal the place of science in human existence. No more important service for the public good can be rendered by this organization in these trying times than as the interpreter of science.

2. *The improvement of science teaching.* It has been suggested that among the objectives of the Tennessee Academy of Science should be the improvement of science teaching at all educational levels. It would be highly appropriate for this organization to establish a "Committee on Science Teaching" to study this important question and to keep the members of the Academy informed as to their relation to the problem. A number of individuals called attention to their belief that the certification requirements for high school science teachers in Tennessee should be improved. If that is the case, the influence of the Tennessee Academy of Science should

be used to support a move to raise those requirements. It seems that all too frequently those of us who are in college and university teaching show little consideration for the high school science teacher except to complain about the "deplorable" level of his instruction. We should not forget that he is our product. If he is improperly trained, it is our fault. After all, have we college teachers become so perfect that we can, with impunity, criticize others? One of the most lively and helpful discussions to occur at a meeting of this Academy during the sixteen years of my membership resulted from a paper on "The Teaching of Science in Colleges" presented in 1941. Perhaps we need more such papers and symposia on that important subject. Certain it is that the Tennessee Academy of Science should support a program designed to improve the quality of science teaching at all levels.

3. *The support of research.* There can be no doubt but that the membership of this Academy believes one of its major functions to be the support of research. It was pointed out earlier that the Tennessee Academy of Science administers in Tennessee the grants-in-aid of research of the American Association for the Advancement of Science and, occasionally, supplements these grants from its own funds. The Constitution of this Academy lists first among its purposes: "To promote scientific research." To contribute to that end, we must certainly do more than we are now doing. To undertake any project of importance would require funds of a substantial amount, not hundreds but thousands of dollars, funds which we do not have at hand or in prospect. At the present, about all we can do is encourage all scientists in the state who are capable of doing so to carry on research. This encouragement might come through the use of the funds which are available for grants-in-aid to younger workers and to those for whom a little help means so much; through periodic "official" statements from the Academy on the place of research as a contribution to the intellectual development of the worker and to good teaching as a method of bringing college administrators to the support of research; through the development of a means for recognizing superior research by members of the Academy. These things we can do. It is our belief that they can be accomplished best by a "Research Committee" whose duties would be to administer the funds available for grants-in-aid and to devise a realistic program for the support of research.

4. *The conservation of natural resources.* In recent years, our attention has been called, with increasing forcefulness, to the need for resource-use education. Somewhere between the philosophy of those who shout from the housetops that "All is well" and that of those who preach the gospel of a "Plundered Planet" lies the truth concerning the state of our renewable natural resources. The State Department of Conservation is attempting to meet this problem squarely. What should be the role of the state academy in the

field of conservation? We are the scientists of the state. We should know the truth about the natural resources of Tennessee, the wildlife, the water, the soil, the forests, and their use—or misuse. We should be in a position to provide the Governor, the Department of Conservation, the State Legislature, and the people of Tennessee with the facts upon which a sound conservation program can be built. At the moment, attention is focused on the conservation of water resources. In no state in the union, perhaps, are such resources of greater value. Water conservation requires the attention of many different kinds of scientists, the engineer, the chemist, the geologist, the agriculturalist, the biologist. The control of pollution in the streams in Tennessee may very well be an important item before the State Legislature when it meets in January of 1951. The Tennessee Academy of Science, whose purpose it is to promote science for the public good, should be in a position to advise our elected representatives on that subject and to assist them in formulating a constructive program. The suggestion has been made that the Tennessee Academy of Science establish a "Committee on Conservation" whose duty it would be to study the complex problems involved in their broadest aspects and to inform the members of the Academy and the people of the state of what can be done to solve them.

5. *The support of natural history studies.* Although science is universal and the membership of the Tennessee Academy represents all of science, it is the duty of this organization to support studies dealing with the natural history of the state. A beginning has been made in the study of the flora of Tennessee. It should be pointed out, however, that this project is not the "property" of the Department of Botany at The University of Tennessee. While it is true that certain staff members in that department have, through the years, maintained an enthusiastic interest in the project and are now about to carry it through to a successful conclusion, it should not be forgotten that the very nature of the project makes it of vital concern to every botanist in the state. The objectives have been to find out what plants, particularly the vascular plants, occur in Tennessee, where they occur, and to bring these data together in useful form. The record will probably never be complete but the degree of completeness which is ultimately achieved depends upon the willingness of all interested parties to cooperate by making whatever contribution they can so that the project may be a success of which all can be proud. The proposal has been made, and it seems absolutely essential, that the Tennessee Academy of Science establish a "Flora Committee" which will serve as the clearing agency for information on the plant life of Tennessee. A similar committee, a "Fauna Committee," should be created to correlate information on the animal life of the state. There appears to be a widespread opinion that there is an urgent need for bringing together information on the fish, the birds, the amphibia, the reptiles, the mammals, and the insects of Tennessee. No organization is in such an advantageous position to support floristic and faunistic

studies as is the Tennessee Academy of Science. It is to the records of such an organization that one would turn first for information on the natural history of the state. The establishment of committees of interested persons whose responsibility it would be to bring together such information would tend to make those records much more complete.

6. *The organization of a college section.* We are all agreed that the undergraduate college student with an interest in science should be encouraged. The state academy provides an excellent environment in which he can develop. Until the present time, however, the Tennessee Academy of Science has made no special provisions for him. The Junior Academy was organized for youngsters of high school age. The college student can, if he wishes and has the annual dues, become a member of the Senior Academy. Few undergraduate students have taken advantage of this opportunity. The Texas Academy, as well as some other state academies, has sponsored an organization at the collegiate level which has a most effective program. A college section of the Tennessee Academy would give the young scientist a much needed opportunity to "test his wings," as it were, in an organization in which he plays an important part. It could serve as a unifying agency for all the various undergraduate scientific groups now represented in the colleges of the state by local organizations or chapters of national societies. For example, chapters of national societies, such as Beta Beta Beta, for biologists; Tau Beta Pi, for engineers; Alpha Chi Sigma, for chemists; as well as purely local groups, such as the biological honor society at the University of Tennessee, could become affiliated, if they chose, with the College Section of the Tennessee Academy. It would be appropriate for the section to hold meetings for the presentation of papers, demonstrations, and discussions at the time of the annual meeting of the Academy. A small membership fee could be charged and the section might have its own publication. In sponsoring a college section, the Tennessee Academy of Science would be making a real contribution to the future of science.

7. *The extension of influence to other science groups.* In order to extend the influence of the Academy, the suggestion has been made that there are other groups in the state who should be invited to organize sections and to become active participants in our efforts to serve the public through science. The possibility of developing a section of "Agricultural Sciences" should be investigated. In our neighboring state of Virginia, that section of the state academy is quite strong. In fact, there were fifteen papers on its program at the 1949 meeting. There seems to be no particular reason why such a section should have greater strength in Virginia than it would have in Tennessee. The Virginia Academy also has sections representing the medical sciences, the science teachers, engineering, and bacteriology. A committee might be appointed to study the sectional organization of

this Academy. We must not lose the Psychology Section as a result of the development of the Tennessee Psychological Association. We must keep alive the splendid interest which has been shown in the Physics-Astronomy Section. Perhaps we need a section on wild-life, a science teaching section, a social sciences section, and the section for college students previously mentioned. We are certain that each state academy must build its organization to fit its own needs. To illustrate, the bacteriologists in Tennessee are a part of the active Kentucky-Tennessee branch of the Society of American Bacteriologists. The branch meets once a year in addition to the meeting of the parent organization. It is doubtful if even such a productive group as the bacteriologists could provide papers for two essentially local meetings a year. In addition, we like to hope that the bacteriologists in this state have not forgotten that, in the final analysis, they are botanists and that there is a place for them in the Botany Section of the Tennessee Academy. However, there are undoubtedly other groups of scientists in the state who should be attracted into this organization.

8. *The maintenance of high standards in quality of meetings.* Most of us would agree that the single most useful function of a state academy is to provide a forum, through an annual meeting such as this, for the presentation of current research reports and discussions of problems and recent advances in various fields of science. The state academy can render a real service to science by insisting on high standards in the papers presented and in the method of their presentation. With such a continuous effort toward the improvement of the quality of our programs there should be, nevertheless, a broad tolerance for the work of beginners and amateurs. The state academy is the best place for such persons to gain experience and to make contributions. But even those contributions should represent the best possible efforts of the individual concerned. That concept places a real responsibility on the experienced scientist. He should always be willing to present the results of his most significant work before his state academy even if he duplicates a report at a national meeting. In this way, he can serve as an example for those with less experience. At no time should he prepare less carefully for his academy audience than for that of a national society. Because a paper is presented before the Botany Section of the Tennessee Academy of Science rather than the General Section of the Botanical Society of America is no excuse for less care either in the preparation of the paper or in its presentation. High standards of excellence required within the "family" of the state academy will not only improve our own programs but will bring credit to those who represent us before national groups.

These, then, are among the projects which you have proposed that the Tennessee Academy of Science should undertake as a contribution to Tennessee in the next five years:

1. The interpretation of science
2. The improvement of science teaching

3. The support of research
4. The conservation of natural resources
5. The support of natural history studies
6. The organization of a college section
7. The extension of influence to other science groups
8. The maintenance of high standards in quality of meetings

These suggestions, and many others of real value, were made by you, the members of the Tennessee Academy of Science. They represent no individual and no group; they represent the scientists of Tennessee. Some would be so worthwhile in operation, so simple in execution, and so inexpensive that it seems strange that they have not already been undertaken. Others would be more difficult to achieve and more costly. All merit consideration. It is obvious that we cannot carry all of these proposed projects to completion in five years, or even in ten years, but they represent worthwhile goals toward which we can direct our best efforts. They represent a long range program for the Tennessee Academy of Science. The Executive Committee will be asked to assume the responsibility for setting up the machinery necessary to accomplish these purposes. We shall need volunteers to do specific jobs that require persistence and patience. We shall need committee members who will work with tireless energy and boundless enthusiasm. But, in the final analysis, that which we shall need most is the sustained interest and enthusiastic support of all of the members of the Tennessee Academy of Science for the future of these proposals rests in your hands. As individuals, or as groups of specialists, we can accomplish very little. We should admit failure now. Like the single sticks in the hands of the old Indian chief, we will be broken into pieces. As organized scientists, including the best talent in the various fields of science represented in the state and recognizing our responsibilities to the people of Tennessee, we can render real service. We can accomplish great things. As an organization, we shall grow in public confidence and esteem. We shall have the strength that develops from our common purpose. We shall have the strength of the bundle of sticks and, you will remember, the sticks remained unbroken.

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During the summer of 1950, Dr. C. W. Wilson, Jr., Department of Geology, Vanderbilt University, was engaged in a study of structure and stratigraphy in the Pocono Mountains of Pennsylvania, and in the Catskill Mountains of New York.

Dr. W. B. Jewell, Department of Geology, Vanderbilt University, has been appointed by the Governor of Tennessee to serve on the state conservation commission. A publication by Dr. Jewell, with Mr. Herman Ferguson, dealing with the structure, stratigraphy, and mineral resources of the Del Rio district, will shortly appear as a bulletin of the Tennessee Division of Geology.

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