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FUNCTIONS OF AN ECOLOGICAL SOCIETY¹

By Professor R. E. COKER
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PERHAPS you know that there are two chief reasons for a presidential address, reasons that most people are too polite to mention. One is the gracious desire to flatter the president by making him think he is expected to have something to say that will be interesting or instructive to the members, which may or may not be the case at all; the other is to let people know who is the president. When a man is elected to the presidency of a national society he enjoys justifiably a feeling of great pride; he may even experience a degree of inflation, but that soon subsides as he learns that few know and even fewer care who is president. In a country school near my old home, there was a boy well along in the grades who did not know who was the chief executive officer of the United States. The teacher, wanting to shame or to impress him, told him to go home and ask his father. The

boy went and returned. "Well, Johnny," said the teacher, "did your father tell you who was president?" Johnny arose with an obviously triumphant air, as he replied, "I axed paw and he don't know." Johnny was destined to become a political orator with a flair for the dramatic. He indulged in a rhetorical pause before he added: "Paw don't know who is President—and what's more, he don't give a damn!"

Early in the year some friends intimated that perhaps the society would be pleased if I should bring to an end the practice of having annual presidential addresses. In acceptance of this challenge, I seemed to have two choices: one was to allow the custom to lapse forthwith; the other was to deliver an address to end all presidential addresses. It occurred to me that I might do both. The matter to follow, then, will probably not meet the specifications of a presidential address and it may lead to a conclusion that will discourage the desire, at least, for future addresses of a

¹ Address delivered by the president of the Ecological Society of America at the annual dinner in Indianapolis, December 28, 1937.

similar nature. Actually, I am attempting to open a practical discussion of the significance and function of the Ecological Society of America.

It is appropriate to ask in the first place—What is the historical significance of scientific societies? We are not bound by history, but we are the more liable to make mistakes if we ignore it. It is a fact, I believe, that, taking into view the whole history of modern science, the scientific societies have played a part in its development second to no other agency. Camac, in a study of medical history (“Imhotep to Harvey”), is my authority for the statement that at a time when the universities, dominated by philosophy and theology, were thoroughly inimical to the sprouting natural sciences it was a new type of institution, coming into being in the seventeenth century, that more than the universities stimulated and made possible the birth and growth of modern science. It was not long, of course, before the universities found it necessary to fall into line and they became for a time, at least, the nestors of the new disciplines. I doubt, however, if the scientific societies have ever given up their leading part in the guidance of scientific development. Was it Harvard or Yale or Virginia that kept the light of science in this country before the middle of the last century, or was it the American Philosophical Society (1727), the Charleston Museum (1773), the American Academy of Arts and Sciences (1780), the Academy of Natural Sciences in Philadelphia (1812), the Lyceum of Natural History in Albany (1817), the Boston Society of Natural History (1830), the American Medical Association (1847), and other organizations in which those with the research spirit had voluntarily associated themselves? Give credit to both universities and societies, but the latter, we know, played a great part. I am inclined to wonder now if there is not occurring a shift of responsibility in an entirely new direction, if the shaping of scientific progress is not a task that is being assumed more and more, although quite unintentionally, by the new type of agency that we call “foundations.” What present-day science owes to individual and corporate Maecenas may readily be conceived if we stop to ask what would be the state of advancement of science in all fields, had we not had the laboratories, the observatories, the fellowships, the grants-in-aid, etc., contributed from private or semi-private sources, as contrasted with the facilities derived from government aid or from the private resources of students and research workers. The foundations operate to some extent independently and also in very considerable measure through existing research institutions, such as the universities. It is quite possible, however, for universities to lose their position of partial dominance, not so much through the imposition of an outside will,

as through the temptation to develop their departments and activities in ways that will appeal to those who can grant support. Throughout all the changes that have occurred, the influence of the voluntary associations of the workers in science has remained, and, it is to be hoped, will always remain, an unobtrusive but none the less powerful influence in the molding of the science of the future.

Not infrequently the foundations, or persons of wealth, or even government departments, look to the National Research Council for suggestion and guidance in the use of funds to support scientific research. And what is the National Research Council but a body so organized as to represent the national scientific societies? Of all the 26 members of its Division of Biology and Agriculture, only 3 or 4 are not actually elected representatives of scientific societies and those 3 or 4 are elected by the representatives of the societies. It is a representative body and its merit is derived from its representative nature.

I hold it then to be, not only a moral responsibility of the several national scientific societies, but also an inescapable obligation, that they should strongly and wisely exercise guidance over the advancement of science in general and in every special direction in which its field of exploration should be extended.

Let me quote the following from the address of Dr. Edward R. Weidlein, president of the American Chemical Society, delivered in Rochester recently. “Fifty years ago, Europe led the world, chemically speaking. Far-seeing men predicted even then that in another half-turn of the century the chemical leadership of the world would pass to America. This change has come about, and the American Chemical Society as an organization deserves a large share of the credit.”²

As vistas open in one point of the compass or another, new organizations of scientific workers, new societies, will come into being. When I consider that there were only 181 scientific and technical societies in the United States when I was born and that now there are nearly 1,000 (930),³ I am moved to reflection. From that great surge of activity in scientific research and organization, which has accompanied my fleet passage through time, I derive a certain satisfaction in having been born; others may experience a different feeling, but there are some in this company who have an even worse record than I have.

The birth of new societies is not to be deplored; on the contrary, it is a desirable and necessary consequence as the number of workers grows and the breadth of the visible horizon of science steadily in-

² Edward R. Weidlein, *SCIENCE*, 86: 2229, 249-255, 1937.

³ I am indebted to Miss Callie Hull, librarian of the National Research Council, for these interesting figures.

creases. The well-nourished tree continually branches out with new twigs, each of which is expected in due season to bear its fruit. That is a sign of health and an indication that the day of senescence is not yet at hand. I believe, however, that the new limbs and the new twigs should not become so nearly disconnected from the main trunk that they cease to exert a combined effort in drawing nourishment from the common soil while at the same time contributing more effectively to the health and growth of the other twigs derived from the same trunk. You will see that I mean to put some emphasis on the necessity of a healthier and stronger bond between the twigs. To put the same idea into ecological terms, we need to bind our biological individuals and species into communities and our communities into associations. To return to the tree simile—we have in the American Association for the Advancement of Science a great scientific trunk with its chemical, physical, geological and biological limbs. The chemical and geological limbs, for example, are healthy stock through which streams of intellectual and financial nourishment may flow to the outermost twigs. The biological limb, except for the medical branch, seems now to be little more than a loose aggregation of twigs, each trying to live for itself on the materials available in the free air. Whether we will or no, I think we shall be driven to the formation of a more effective general organization of all biologists. We have, to a very great extent, common interests and common needs and we should put ourselves in position to satisfy those needs and to protect those common interests, without sacrifice, but rather with promotion of the special needs and interests of the smaller component groups.

To return to the original question, what are the functions of the Ecological Society? We have already supplied one answer. It has to play, along with other national societies, a leading part in the development of the biological sciences of the future, *not by any form of control*, and I would underscore those words, but by serving as an open forum for free discussion and democratic expression of opinion, with the assurance that where people who actually work, habitually think and sincerely strive to render public service—where such people get together, exchange information and ideas, advance suggestions and subject their own half-baked or even wholly baked ideas to the fire of comment and constructive criticism, there something in the nature of emergent evolution takes place: the efforts of each and of all combined are lifted to higher and more effective levels. But what, more concretely, are the specific functions of the Ecological Society of America?

(1) In the first place, this society aims to promote ecological research. How?

(a) It stimulates research through meetings for the presentation of papers with discussion and criticism. I do not think that our meetings, or those of any other scientific group, are ideal for the accomplishment of this end. There are now so many workers in most of the broad divisions of the general biological field that meetings seem to tend more and more to become formal clock-controlled affairs for the concise, if not hasty presentation, of the results of research, with a minimum of discussion. I have, however, no suggestion to offer, and I am sure that the program meetings of this society rank with the best in the respect in question.

(b) Our society has also set a precedent in having regular field meetings. Dr. Shelford, last year, emphasized most properly one of the original functions in the minds of Drs. Wolcott, Harshberger, Cowles, Shelford and other founders. I say we have set a precedent, meaning among biological societies. Geologists have long had such meetings, but they are rare among national biological organizations, and it is natural that this should be so. Ecology, in contrast to other divisions of biological science, is concerned not so much with the particular plant or animal or part of a plant or animal, as it looks or behaves in the laboratory, but rather with organisms as they actually live and engage in the battle for existence among others in the real world. We are concerned with the work of individuals or of species in groups; and these groups, from the ecological point of view, are not mere summations or aggregations of unrelated individuals like the several beans in a bushel, but really display some sort of organization in which individuals or species are but minor or major units of function. The ecologist is concerned with the structure and activities of these larger organizations—that is to say, with the composition and the conditions of maintenance and operation of communities. I wonder sometimes that people compare communities to organisms or give them the sort of individuality which in our minds is associated with organisms, which after all, are mere short-lived sidelines from the continuous stream of life. Communities are more like molecules of protoplasm as we envision them; they are dependent upon one another; they continually change, but they persist; they evolve, but they come to no end except from outside causes.

(c) It is a further function or sub-function of the society to aid in the publication of the results of ecological research, both as a means of encouraging such investigative efforts and as the very condition of the effectiveness of research. We have now two good journals which are made available to members of the society and to others at a remarkably low cost. When I speak of the ecological journals as good ones

I am not merely scattering pleasant words. Both journals are surely capable of improvement—what undertakings are not?—but they call for no apologies.

The society, then, promotes ecological research through annual meetings for the presentation of papers, through additional mid-year meetings, through field excursions and through its research journals. This broad function thus served in several ways must, I am sure, be rated as paramount. Were this function to be neglected or abandoned, the Ecological Society of America could become little more than a social or commercial club, or a group of salesmen with little of evident value to sell. If only this one task be performed, the society justifies its existence; it holds its part as one of the significant scientific societies of the world. It lends dignity to a science that we must admit is relatively new, that is very inadequately matured and that has been so generally and so unfortunately unappreciated that it has too frequently seemed to lack the Divine Aura which other groups emanate, at least to their own olfactory sense. Ecology is immature as yet, but we believe in it or we would neither be here nor pay our dues. If ecology is not just at this moment commanding the eager interest of the non-ecological public, enraptured with protons and cell membranes and viruses, etc., that does not matter. It is a living science and it is concerned with absolute fundamentals. An organism can not do without cell membranes, without protein molecules, without genes, or something of that nature; but just as certainly it can not exist, it can not offer the slightest manifestation of life, without an environment. Protoplasm is only *part* of the physical basis of life. No organism lives, moves or has its being except as part of a complex of organisms and in connection with the so-called outside world. Actually, it was what would now be called ecological research that played a primary part in the development of the doctrine of the evolution of species by natural selection, promulgated simultaneously by two pre-ecological ecologists. This doctrine may not have been entirely correct, and no scientific doctrine is, but it established, nevertheless, the principle of evolution as a mode of operation in nature, and incidentally revolutionized thought in a dozen subjects. More recently ecology has established principles of succession, of interdependencies of organisms, of interrelations of organisms and environment, of cycles and niches, that can be ignored neither in the application of biological knowledge to human welfare nor in the scientific presentation of the fundamentals of biological thought. As to what this branch of science may do in the future, we make no prophecy; the ecologist simply does what he enjoys and finds stimulating and satisfying, as does the biophysicist or the geneticist. Whence will come

the next great idea only the gods can tell. We are not the gods, nor among those who assume to know just where the seed of the solution of the mystery of life is soon to shoot, bud and burst into flower.

I say, then, not because there seems to be any special need to say it, but rather in order properly to round out our presentation of this primary function of the society, that it is our first duty to maintain and elevate to the very best of our abilities the standards of ecological research.

(2) The society has also an educational function.

(a) All scientific societies are educational. We have mentioned scientific meetings as promoting research; most of us, however, come to these meetings not so much to stimulate research on the part of our fellows (although our presence may sometimes have such an effect upon them as well as upon ourselves) as to learn, to acquire information and ideas, not only as an aid to our own researches but for our own educational profit. We tell our students that education only begins in college and that self-education is a continuing process. That is really true, and it supplies a major reason for attendance on scientific meetings. Let us note, furthermore, that the educational function of the society is at least a threefold one.

(b) That we educate ourselves and each other is very important, but we need to do much more, and we are perhaps making some progress in the other directions. It is necessary to educate those in other fields of science as to the meaning, the value and the absolute necessity of ecological research.

The ecologist need not forget that he is vulnerable. He deals with things in the large, attacking a whole complex at one time. He knows that certain fundamental biological phenomena manifest themselves only in the large. Some one has to face such problems, and he goes after them and gets results. It is easy and perhaps not unnatural for the outsider to criticize, to say: you have not set up an experiment under the strictest conditions of control. Your only answer is that you know it, but you are going ahead just the same. The physiologist and the morphologist say to the ecologist: yours is not an exact science; and that is true. The physicist says to the physiologist or the morphologist: yours is not an exact science; and that is also true. The mathematical physicist says that physics is not really an exact science; and that seems to be true, too. The only thing left in the nature of an exact science is statistics, a branch of mathematics, which happens not to be a science at all. Mathematics is the tool of science and ecologists can employ it just as well, perhaps better, than morphologists or physiologists. In fact, in my limited vision, communities are like molecules in being statistical entities; but I will not stress that point now.

Undoubtedly, something yet remains to be done in the education of biologists in general, in respect to the value of ecological research and teaching if the biological training of present and coming generations of students is to be properly carried out. Like all special divisions of biological science, ecology tends to develop a language of its own, a jargon, if you will, that may be somewhat discouraging to those whose training is in other fields. As more knowledge is gained and as the science matures, the translation of essentials into ordinary language becomes a normal part of the procedure. In any event, a properly balanced program in the teaching of biology requires that we keep always in mind that the field of organization is not bounded by the cell membranes, by the sheath about the organ or by the epidermis of the individual, and that community life is as much a basic condition of organic existence as is protoplasm.

Just a few months ago the head of a department of biology, a man whose special interest in research is far removed from ecology, told me that he had set out to find a man to teach comparative anatomy and he must have some one with a degree of ecological training. Comparative anatomy was what the administration of the institution would provide for, but he personally was convinced that they must get away from the presentation of introductory zoology as pure morphology and organ physiology and must introduce the students in some way to the principles of ecology, to the conditions governing the community relations of animals and plants in nature. This particular illustration is merely one indication that progress has been made toward providing that more consideration be given in the future than has been given in the past to the organism as it actually lives *at home* and under conditions of incessant and inescapable external organic pressure.

(c) A third part of our educational task has to do with inducing the public to support ecological teaching and research. What is perhaps even more important is the education of the public in appreciation of the need for preservation of the conditions necessary for proper ecological studies. This last-mentioned function, while not of a type ordinarily intrinsic to national scientific societies, is, nevertheless, one of such importance and one involving such a genuine responsibility on the part of some organization that we may well dwell upon it for a few moments at this time.

(3) We are all too deeply impressed with the need for the preservation of natural conditions and the conservation of native plants and animals for it to be necessary before this group to enlarge upon the need. We do not have to prove it, we admit it! Unfortunately, however, the general public neither admits

it nor knows anything whatever about it. That natural areas are necessary for research *in situ* and for controls against research conducted elsewhere and against our agricultural and industrial developments has little meaning to the ordinary sojourner in this great land that we appropriated some three hundred years ago from its original guardians and conservators. Now, as a matter of fact, the ordinary present-day sojourner might very well say that we have done so much better for ourselves through despoliation than our predecessors did through intensive, if partly unintentional, conservation, that the argument for conservation seems to him to be very weak. We have, then, not only to overcome the inertia of the human mind reinforced by the ignorance of the technically uninformed but also to contend against a sort of *prima facie* evidence as it were. The answer to the objection is too easy. Obviously civilization, our own, as well as any in the past, is based upon the utilization of available resources, natural and human. We are committed to civilization and, therefore, the only debatable question is whether current modes and degrees of utilization tend in every respect to the realization and perpetuation of the desired form of civilization. Each thoughtful individual, interested in either human or physical materials, will answer the question in any particular instance according to the facts presented to him and in the light of his own ideals and judgment.

Dr. H. C. Hanson has recently called my attention to the fact that about 42 per cent. of the exposed areas of the surface of the earth is grassland. Not only in America but throughout the world mankind has long engaged in completely changing the aspects and conditions of the grassland areas, to say nothing of the forests and streams, and apparently without ever giving the least consideration to the secondary effects of this disturbance. Nowhere in this country, at least, has there ever been expressly set aside a single adequate area of grassland as a control or check plot. This is an extraordinary condition, and it might seem even more so were it not for the fact that we see so many other indications, in respect to war for example, that modern man is still at the beginning and not at or beyond the end of the real Renaissance. Now we are gaining some appreciation of the unhappy results that sometimes flow from our thoughtless policies with respect to grasslands.

It seems to have been the work of a Divine Providence to cover the greater part of the earth with the seas and at the same time to endow mankind with no means of making any great change in them. "I will give you," he might have said, "dominion over the lands, over the beasts of the field and the birds of the air and over the shrubs, trees and grasses, but over

the oceans you shall have no control. I trust you with small things, but the greater part of the surface of my beloved mundane sphere I shall keep under my own lock and key. By means of the seas, which you can not measurably modify, I shall protect you against your own follies." So the undisturbed high seas remain the great balance wheel of the terrestrial machine, the chief source of the rainfall necessary for the continuance of organic life on land, the real fountainhead of the waters whose return journey to the ocean carries the power required for our industries, the mainstay in regulation of temperature, the molders of climates. Concerning the significance of the seas to organic life anywhere, I do not need to say more to climatologists, geologists or biologists. Suppose that man could have put his plow and machinery and his chemical reagents to work on the whole surface of the earth. Might he not long ago have decided that such a great expanse of brine was an error in Creation, as he has in effect concluded, and perhaps properly, with reference to the great areas of forests and grasslands? Might he not have converted the saline waters into some other chemical form? Think how much more tasty or more useful the sea waters might be were they turned into 20 per cent. alcohol, for example, or into gasoline; and we might have had now to form a committee for the preservation of some small marine areas to be kept always as scientific "controls" and as refuges for the native population of non-alcohol addicted and non-gasoline tolerant diatoms, coccolithophores, Salpas, etc.—very useless things in the eye of the practical man, but none the less interesting to the field biologist.

But the designer of nature gave us no opportunity to bring such things to pass. "No," he might have said, "you may ravage the forests and you may drain the marshes, you may change the virgin grasslands into desert, you may pollute the waters and dam the streams as much as you please. You may accomplish much that is good by doing these things wisely; you may effect great harm by doing them unwisely. You mean well, but all the same, and for reasons that are quite satisfactory to myself, I put quite out of your reach the seas as the mainstay of organic life on your planet." And this is not as facetious as it may sound!

Our several committees and important committees of the National Research Council, under the leadership of such men as Shelford, Weese, Hanson, Anthony, Adams and others, are doing much to inform us and to educate the public in respect to the very important matter of conservation.

So much for what I conceive to be the major functions of the Ecological Society; first and foremost, the promotion of basic research in ecology; second, the education of the biological world, in which we ourselves are included, and the education of the younger

generation of students for whose proper intellectual development we are vested with some responsibility; and thirdly, the education of American citizens and of the political and administrative leaders of that citizenship in respect to the conservation of our natural biological resources. I put these functions in this order advisedly; because without a science of ecology, the natural areas would be of very little value, and without education there is not the slightest chance of securing the preservation of natural areas or of having them maintained and used to advantage by those who follow us.

Now, let us turn briefly to certain functions which may be called minor functions or corollaries of the major functions, but which are none the less important.

(4) One of these corollary functions we may describe as integration. The society is a specialized one, and it will remain so if it is true to its purposes. Other societies have their special fields of interest—heredity, plant diseases, parasitology, etc.; ours is ecology. Nevertheless, and without prejudice to our special function, this society should be especially interested in cooperation, in the general principle of integration. It is through the Ecological Society that botanists, zoologists and geologists are brought together. It is obvious also that the geographers are concerned in ecology; it might indeed be said that geography is a branch of ecology. It is probably unfortunate that there is not yet as intimate cooperation between physiology and ecology as would be desirable. Some physiological research might be sounder and more effective in approximation to the truth if correlated with field studies, and the ecologist stands always in need of the best physiological training and of the further aid of the specialized physiologist. Doubtless, also, better coordination of the work of geneticists, taxonomists and ecologists is a part of the future. The biochemist and the biophysicist are easily found to be needed in the advancement of ecological science and perhaps to be helped reciprocally by contacts with ecological problems.

The Ecological Society is in itself, to a degree, a coordinating and integrating agency. I have already expressed a strong personal conviction that biologists will be compelled sooner or later, and probably not very much later, to form a closer union, a more compact organization. I hasten to add that I am sure the Ecological Society can not itself afford the basis for that organization; it is an agency for specialized service and must so continue to be. I do feel strongly, however, that this society and others should take a keen and active interest in any sound movement looking to a closer union of biological societies, whether that end may be best accomplished through the existing

Union of American Biological Societies or through the formation, as some have suggested, of a new American Biological Society. I merely throw out the thought for your consideration.

(5) Our presentation of the functions of the society would not be complete if we did not allude to its service in promoting fellowship among the ecologists and all interested in or appreciative of ecological science. I mention the idea of fellowship not to discuss it, but only in order not to seem to exclude or to depreciate what is indeed a matter of vital importance. However impersonal we try to be in our researches, we are after all human beings subject to all the psychological influences that affect people of any other interest. What we do and what we think is in no little measure the product of the impacts of our associations. We gain in spirit, in perspective, in balance of judgment and in efficiency by our social contacts, especially the contacts with those of like interest and ideals with our own.

With some digressions, which, I hope, have not seemed irrelevant, I have tried to emphasize the significance of scientific societies in general, the crying need among biologists for integration of efforts, and the significance and complexity of the special functions of our particular society.

Now, as we come to an end that may have been too greatly delayed, there is one unpleasant practical conclusion that issues in part from what has been said. Annual program meetings, interim meetings, symposia, sectional organizations, quarterly bulletins, general educational activities and committee work for the preservation of ecological areas, all together are not consistent with an accrual to the general treasury of approximately one dollar per member.

If I must now break the personal precedent of a lifetime, by offering a recommendation for an increase of dues, you will doubtless agree that I have found the best way to make an address to end all presidential addresses.

SCIENTIFIC EVENTS

THE FOREST LAND PROBLEM

PRESIDENT ROOSEVELT has requested the Congress to set up a joint committee to study the forest land problem with a view to taking "definite action" at the next session to check the "using up of our forest resources without replacement."

Mr. Roosevelt emphasized especially the situation respecting private forest lands and made the following recommendations:

1. The adequacy and effectiveness of present activities in protecting public and private forest lands from fire, insects and diseases and of cooperative efforts between the Federal Government and the states.

2. Other measures, federal and state, which may be necessary and advisable that timber cropping on privately owned forest lands may be conducted as continuous operations, with the productivity of the lands built up against future requirements.

3. The need for extension of federal, state and community ownership of forest land, and of planned public management of them.

4. The need for such public regulatory controls as will adequately protect private as well as the broad public interests in all forest lands.

5. Methods and possibilities of employment in forestry work on private and public forest land, and possibilities of liquidating such public expenditures as are or may be involved.

The statement continues:

I make this suggestion for immediate study of our forest problem by this Congress in the belief that definite action should be taken by the Congress in 1939. States, communities and private capital can do much to help—

but the fact remains that, with some outstanding exceptions, most of the states, communities and private companies have, on the whole, accomplished little to retard or check the continuing process of using up our forest resources without replacement.

This being so, it seems obviously necessary to fall back on the last defensive line—federal leadership and federal action. Millions of Americans are to-day conscious of the threat. Public opinion asks that steps be taken to remove it.

If the preliminary action recommended is taken at this session of the Congress, Mr. Roosevelt said that he planned to address letters to the governors of states in which the amount of state and privately owned forest land is substantial, asking their cooperation with the Congress and with the executive branch of the government in whatever steps appeared necessary. The message directed particular attention to the southeastern and Pacific Northwest sections.

THE LAKE LABORATORY OF THE OHIO STATE UNIVERSITY

DR. THOMAS H. LANGLOIS has been appointed director of the Franz Theodore Stone Laboratory of the Ohio State University situated on Gibraltar Island in Lake Erie at the entrance to Put-in-Bay Harbor. He succeeds Dr. Dwight M. DeLong, who will continue as professor of zoology and entomology.

Dr. Langlois, who has long been associated with the Ohio Division of Conservation, has been assistant director of the Lake Laboratory during the past year. Under the cooperative arrangement between the university and the division, he will continue to serve as