disease, wretchedness, poverty and despair. This, ladies and gentlemen, is truly the highest mission of the medical man.

There remain many problems which in our day are yet unsolved and in each decade new questions will arise.

Among some of the more pressing problems which face the medical profession of to-day is the discovery of the cause of cancer; a more perfect control of tuberculosis, leading to its ultimate eradication; the ultimate elimination of venereal diseases through compulsory registration, and a wider dissemination of the knowledge of these diseases among the laity, a more accurate knowledge of the etiology, pathology and care of epilepsy, the sufferers from which are the most pathetic and dependent members of society; the relief of and the ultimate prevention of nutritional diseases through a more perfect knowledge of dietetics and hygiene on the part of physicians and the public; a crusade against the ever-increasing number of those, especially the young, who are afflicted with defective eyesight, due chiefly to improper lighting of homes and school rooms; and too frequent attendance at motion picture entertainments.

In closing I can not do better than to leave with you the thoughts embodied in an address by that great medical teacher, Dr. Keen, who says:

> In all humility, but with earnestness, medical men tender you their labor and practise, in the hospitals, on teacher's platform, and in the laboratory. What they expect and look forward to is appreciation, not of the individual, but of the aggregate work, and cooperation on the part of the public, for the immediate results of our work are at the same time humane and practical. The reduction in your death rate of one in a thousand means, beyond the saving of one life, a lowering of more than thirty in the total number of cases of sickness, and therewith prevention of much anxiety, wretchedness, and financial loss or ruin in as many families. Results like these are liable to be accepted as natural. It should not be forgotten, however, that they are obtained only by the work of medical men who labor for the good they can do, often as hermits, unknown, unappreciated, always bent upon the diminution of the number of problems which hitherto were deemed hopeless.

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THE SCIENTIFIC BASIS OF SCIENCE TEACHING

The article on "The Scientific Teaching of Science" in the issue of October 15, 1920, is both suggestive and disappointing. It is suggestive because it is the record of an experiment in the methodology of science teaching; it is disappointing because the title leads one to hope that some one has at last accumulated the necessary fact basis for the scientific teaching of science, yet the article presents no such facts.

The author says that "a student will much more rapidly develop the right mental attitude by discovering facts for himself, even though they were known before, than by memorizing a multitude of facts discovered by other people." If this statement were challenged it would be quite impossible in the present state of our knowledge for the author to substantiate his point of view with facts. Probably the statement is true but the business of science is to provide a fact basis for our knowledge and establish principles indisputably. Furthermore it must not be supposed that these two alternatives exhaust the methods of procedure. It is conceivable that a student might develop the right mental attitude more quickly by imitation, following through the steps of discovery taken by some original investigator than by blundering around in a problem of his own. Whether he will or not must be determined by careful experiment, record of results, and this not with a single student, but with many.

There can be no question but that it is a very important thing both in the university and in the earlier schools to develop in the student the power of creative thought. The author of the article records an experiment in progress for three years in the scientific department of a university in which the customary laboratory-lecture-quiz method was re-

placed by a "group method" in which each pupil followed a line of investigation for himself. The results of the three years' experiment he states in the following terms: "and as the course continued, the method seemed to them (the students) increasingly desirable and successful." It seems pertinent to enquire how this was determined. Would it not be possible to present the evidence in favor of this type of work in a more concrete way? In fact, if such an investigation is to be a real contribution to the science of science teaching, must the evidence not be presented in a more concrete way?

It is not the aim of the present article to question the value of the article mentioned. It is its ambitious title that challenges criticism. The average science teacher, even the university teacher, is not yet aware of the fact that the science of science teaching must proceed in exactly the same way that other sciences have proceeded. The science teacher must awake to his pedagogical problems, these problems must be clearly defined and we must proceed to their solution by the patient accumulation of facts, formulation of tentative hypotheses, discovery of additional facts frequently by experimental methods, and on the basis of such facts we must reason to the correct solution of the particular problem. To get at the desired facts methods must be devised for the evaluation of processes, for measurement of results and these results must be capable of accurate mathematical expression. Imagine a chemist who is investigating the problem of the economic production of some industrial product presenting his results to a scientific body with the statement that "the method seemed to them (the workmen) increasingly desirable and successful" and having back of that statement no facts which he could present, no data to convince his audience. I am not criticizing Mr. MacArthur's statement. To make even such an indefinite statement is a valuable contribution at present to the methodology of our science instruction, but it shows the pitifully small progress that has been made in the science of science teaching. Until the science teachers of the country realize that pedagogy is a science, that the problems of science teaching are clear and definite and must be solved as all science problems have been solved, we can make little progress in our science instruction.

Mr. MacArthur would make the chief aim of science instruction the development of creative thought or the ability to think scientifically, and this not only in the graduate school but in the elementary school.

> It is equally important that the beginnings of a science be taught by the scientific method as that graduate work be so carried on. For the early years in any science should be given largely to discovery and original research, as are the early years of childhood. Thinking and first-hand contact would better come early, else they may never come.

Personally I heartily endorse this statement. The discovery of the importance of the scientific method of thinking and its application to the problems of life is one of the great if not the greatest contribution of science to the life of mankind and it is the greatest contribution that science teaching can make to the life of the individual. Yet in a class of thirty-eight principals and superintendents this last summer to whom was submitted a list of aims of the elementary science of the high school with the request that they number them in order of importance, this matter of training students in the scientific method of thinking was placed nine in the list of ten. This indicates—much additional data is required to prove it—what I believe is the general impression among the executive officers of the secondary schools that training in scientific thinking is a relatively unimportant thing in science instruction. Indeed science instruction is not deemed a matter of great importance. Less than half the high schools of Illinois (48.5 per cent.) require any science for graduation. In 18.8 per cent. of them the requirement is satisfied with one half year of physiology.

Is it not high time that the science teachers of the country be organized into a national association

(*a*) to enlist in active propaganda to impress the community at large and the educational fraternity in particular with the importance of science instruction;

(*b*) to discuss and agree upon the aims of science instruction, their relative importance, and proper grade placement;

(*c*) to discuss and agree upon the principles of selection of the subject-matter for the curriculum and the placement of this subject-matter in the various levels of the school;

(*d*) to stimulate accurate scientific investigations along the above lines and also in the methods of teaching science;

(*e*) to devise tests to determine in how far we are succeeding in accomplishing the desired aims of science teaching by the methods in vogue;

(*f*) to employ a national secretary for part time at the outset and ultimately for all of his time who would extend the influence of the organization, make it efficient and coordinate the work of individual investigators along the above lines.

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SCIENTIFIC EVENTS

BIOLOGICAL SURVEY OF THE STATE OF WASHINGTON

During the past year biological investigations of the distribution and habits of the birds and mammals of the state of Washington have been continued by the Bureau of Biological Survey, U. S. Department of Agriculture, in cooperation with the State College of Washington, and the State Normal School, Bellingham, Washington. Early in July, 1920, there was begun a biological cross-section of the state, which, when completed, will extend from Bellingham on Puget Sound to the Pend d'Oreille country in the extreme northeastern corner of the state. During the summer season more than 200 miles were traversed by pack train in the northern Cascade Mountains, the party consisting of Professor William T. Shaw, State College of Washington; J. M. Edson, State Normal School, Bellingham, and George G. Cantwell and Dr. Walter P. Taylor, of the Biological Survey, the last named being in general charge of the work. During the fall months Mr. Cantwell continued the cross-section, making studies in the Okanogan Highlands just south of the Canadian boundary between Oroville and Marcus, Washington. Contrasts in the fauna and flora as thus far developed are marked, and indicate that when the work is completed, materials will be available for a significant treatment of an interesting ecologic transect. It is hoped to complete the field work in the state during the present year.

THE PRESERVATION OF NATURAL CONDITIONS

The Ecological Society of America's Committee on the Preservation of Natural Conditions has been listing and describing areas with original flora and fauna, preserved and desirable for reservation for scientific purposes, and is now just entering on the more extensive field work, with three additional joint chairman added. The plan of work and men in charge are as follows: Professor V. E. Shelford, University of Illinois, Urbana, Ill. (senior chairman, research and publication) is continuing preparation of the list which is to serve as a manual on natural areas with sections on the care, management and uses. R. B. Miller, state forester, Urbana, Ill. (chairman, publicity state organization) wishes to enlist the cooperation of one organization interested in science in each state and province. Dr. F. B. Sumner, Scripps Institution, La Jolla, Calif. (chairman, organization of research interests) is working on a union of research interests in natural areas, as represented by scientific societies, museums, and universities, into an organization to provide needed funds. C. F. Korstian, U. S. Forest Service, Ogden, Utah (chairman, Natural Areas in National Forests) is working on the selection of suitable natural areas which may be set aside within the existing national forest. Those having knowledge of areas preserved suitable for preservation, es-