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Rehabilitation and the College Curriculum in Biology: PROFESSOR WALTER F. LOEHWING 457

Post-War Military Research: REAR ADMIRAL J. A. FURER, U.S.N. 461

Obituary:

Charles B. Lipman: PROFESSOR HOWARD S. REED 464

Scientific Events:

The Industrial Development of India; The Institute of Geophysical Technology at St. Louis University; The Department of Geology and Paleontology of the American Museum of Natural History 465

Scientific Notes and News 467

Discussion:

Biochromes: PROFESSOR DENIS L. FOX. *The Opportunity of Pure Science:* DR. JOHN M. PEARSON. *Education in Argentina:* PANAMERICAN 470

Scientific Books:

The Chemistry of Cellulose: PROFESSOR STEPHEN P. BURKE. *Solid Adsorbents:* PROFESSOR MARSTON TAYLOR BOGERT 472

Special Articles:

Prevention and Treatment of d-Tubocurarine Poisoning: PROFESSOR THEODORE KOPPANYI and A. EARL VIVINO. *The Level of Performance in the White Rat:* KATHRYN E. ALBERT and PROFESSOR CARL J. WARDEN. *Toxicity of Dichloro-Diphenyl-Trichlorethane (DDT) to Goldfish and Frogs:* PROFESSOR M. M. ELLIS, B. A. WESTFALL and M. D. ELLIS 474

Scientific Apparatus and Laboratory Methods:

Inhibition of E. coli by Penicillin: DR. GREGORY SHWARTZMAN 477

Science News 10

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REHABILITATION AND THE COLLEGE CURRICULUM IN BIOLOGY[1]

By Professor WALTER F. LOEHWING

STATE UNIVERSITY OF IOWA

PROPOSED and existing federal legislation concerned with education provides a fairly good index to the general concepts and major plans for American postwar instruction. In addition to the existing laws for the rehabilitation and training of veterans (Public Laws 16, 1943 and 346, 1944), there are pending, and apparently certain of early enactment into law, three other important federal bills on education. These include the General Aid Bill (S-637), the Vocational Education Bill (S-1946) and the College and University General Extension Act (S-1670). The General Aid Bill aims to equalize educational opportunities in public schools through federal subsidy to inadequately financed institutions. The Vocational Education Bill contemplates an initial appropriation of $97,500,000 for vocational training, essentially on a post-high-school level, of veterans, displaced war workers and adults. The General Extension Act will grant funds to state universities and land-grant colleges for extension and adult education supplemental to agricultural extension work. The foregoing bills are the outgrowth of various nation-wide studies to meet the probable postwar educational needs of major groups of our population. Federal legislation of the above type is already being supplemented by similar laws in individual states.

These proposals clearly indicate that our schools, especially colleges and universities, face the task of serving a very large and extremely heterogeneous body of students. The traditional pattern of college curricula hitherto designed to serve primarily the needs of relatively immature high-school graduates will have to be modified for battle-hardened veterans and mature

[1] Address before the Botanical Society of America, at the meeting of the American Association for the Advancement of Science in Cleveland, Ohio, September 11, 1944.

war workers. Consideration will also have to be given to the large number of women veterans who will avail themselves of the opportunity for federally subsidized college education. There also are many portents that women veterans and war workers will be reluctant to relinquish careers in new fields in which the war has given them an opportunity to demonstrate their competence. Though endowed schools may be able to exercise considerable choice as to the groups which they elect to serve, tax-supported colleges and universities already feel the pressure to serve all those of college age. State universities especially confront the problem of making curricular adjustments which are adapted to all these extremely dissimilar groups of students. The great diversity of new curricular patterns now being inaugurated in our major colleges and universities to meet postwar demands betokens the uncertainty of the future and the lack of agreement concerning educational procedures appropriate for a student body of great heterogeneity in background and age. In endeavoring to serve all groups we run the risk of not serving any group effectively. To judge from the scope of proposed federal subsidy of education, existing college facilities will be inadequate to meet the immediate postwar demands. The implication is that there will be more than enough students for all schools, a situation which should encourage cooperation among institutions on a regional basis in order to provide the necessary curricular diversity among schools in a given area rather than to attempt the entire ranged diversification in every college and university.

It is obvious that personal advancement won by technical skills in industry and war service will provide veterans and displaced war workers with a strong motivation for further education along these lines. Technical education will seem the most certain guarantee of and the most rapid road to economic independence. Even the high-school graduate without military or job experience will enter college mentally conditioned in favor of technical and functional as opposed to liberal education due to the wartime emphasis upon the mathematics and the physical sciences in secondary schools. The huge subsidy for technical education in pending federal legislation will actually provide the implementation for such technical-vocational training in postwar education. A classroom teacher can not help but wonder about the pedagogical methods which will be necessary to teach students who have acquired an exaggerated notion of their ability as a result of high wages paid for ordinary skills in wartime industry. There is also the problem of teaching those who have achieved considerable proficiency in techniques without training in relevant scientific principles or basic theory. If, as we are being continuously assured by radio and press, many types of new industry and consumer products are destined to appear in the postwar period, the demands of technology upon education will not only be quantitatively great but will also be qualitatively diverse along lines as yet only vaguely discernible.

The complexity of the problems in postwar education will create a need for competent personnel guidance services by professionally trained experts. It has been gratifying to note the great increase in this type of service in our higher institutions. The increasing perfection and use of guidance techniques has, however, already indicated that we must create more curricula to train students along the lines of their major competences and eventually we should also be reasonably certain that vocational openings exist in the field for which training is recommended. To judge from the experiences of many schools, assumption of the function of personnel guidance for students eventually culminates in a demand for vocational placement service which is becoming especially great in liberal arts colleges.

In view of the probable heavy emphasis upon technical education, one may inquire about the future of liberal education with which biology has long been intimately associated. Liberal education, so necessary to the understanding of world economics and society, has already been reduced almost to extinction, at least for men, on account of war. There are several factors, however, which may operate as an incentive to full restoration and perhaps expansion of liberal education after peace comes. The new alignments of nations and world trade in the postwar world will place a certain premium upon an understanding of social and political forces. The greater intimacy among nations and cultures arising from improvements in communication and the speed of travel will implement study and exchange of the cultural heritage among all nations of the world. In America we face the problem of industrial reconversion to production of civilian commodities, a process which may require considerable time and produce a temporarily swollen labor market. It seems safe to assume that during this transition period thousands of young people will be encouraged to withdraw from the labor market by returning to school for several years after the war. Severe or protracted post-war unemployment will encourage extended periods of education for those able to seize the opportunity and, as the period of training lengthens, our curricula will tend to supplement vocational training with increasing amounts of liberal and cultural education. There is, consequently, not only interest in but considerable justification for the immediate formulation of educational devices which

serve cultural as well as vocational objectives in a changed world order.

For a variety of reasons, there will probably be a tremendous demand for biological instruction. Cessation of hostilities usually inaugurates a great resurgence of interest in human values as opposed to the dominant technological and mechanized activity of war itself. The factors of human well-being are intimately intertwined with plant and animal science, especially with their applications in agriculture and medicine. The demands for world-wide service in agriculture and medicine are too obvious to require more than mere mention. These sciences are also surrounded by a host of peripheral services requiring biological training. During the current conflict, biologists, unlike the personnel in the physical sciences and their industrial technologies, have not generally been accorded deferment from military service with the result that the supply of recruits for biological vocations has been more seriously depleted than in physical science, mathematics and engineering.

The great humanitarian service which applied biology will be called upon to contribute to healing the bodily and spiritual wounds of mankind, coupled with the reduction in numbers of biologists now being trained, will create a sharp demand for professionally trained specialists not only in agriculture and medicine but in the fields of nutrition, sanitation, recreation and public health. Perhaps no feature in the huge mobilization of America's man and woman power for the war has been more disconcerting to the nation than the rejection of approximately 25 per cent. of the inductees and the dismissal of an additional 1,200,000 men from military service itself because of physical or mental inability to qualify for active field service. These statistics give us an appalling picture of the state of America's health. Unfortunately this state of affairs will be gravely aggravated by an unprecedented number of war casualties. To the list of battle casualties, we shall also have to add a huge but as yet unpredictable host of diseased bodies and minds. The possibility of epidemics of contagious tropical diseases, which may be introduced on a large scale by returning veterans, is already giving serious concern to medical and public health authorities. In anticipation of some of these heavy demands some provision is already being made for the training of an increased number of medical personnel but little if anything is being done in the realm of agriculture and other phases of biology to meet postwar needs. The foregoing are but a few portents of the future with which college curricula in biology will be closely associated.

The importance of biological education in relation to the above trends is readily evident. The human body is destined to receive more attention in schools than ever before. Greater and more widespread knowledge of diet, housing and health will be disseminated in our schools probably to parents as well as to youth. The biology teacher will in the future be called upon to assist much more extensively with the scientific phases of public health and recreation. The state of New York has already assumed leadership in making health instruction mandatory in public schools. Instruction in nutrition will be pointed to improved health and more desirable dietary habits of the nation. Changes in human nutrition will in turn probably lead to certain new practices in agriculture. Agriculturists also confront the problem of restoration of the greatest of our renewable natural resources, namely, soil fertility which has unavoidably suffered staggering depletion in the extremity of wartime production.

In addition to these, there are still other needs for biology. The rapid expansion of social studies, already under way prior to the war, will receive added impetus from sociological problems arising in the postwar world order. Since our social order deals with living beings and rests largely upon a biological foundation, expansion of instruction in the social sciences is destined to have a commensurate impact upon biology as a collateral science. Current interest tends to center increasingly in those phases of biology which underlie legislation on health, housing, nutrition, conservation, agriculture and medicine. Eminent civic leaders and school administrators have already recommended that biology and science education in general be presented in terms of their bearing on social action. Because the social sciences deal with human beings, a better understanding of biology will make our sociological programs more effective. This is but another way of stating that biology is a logical starting point in what promises to be a major program of social action growing out of the present world crisis. The influence of biology in the field of social sciences is already evident in the adaptation of the concepts of ecology to problems of human populations and eugenics. To this new sociology will be added man's ever-dominant interest in his own biology as a living organism. It seems safe to predict a closer integration of pure biology with the social sciences than we have ever had before.

In connection with educational methods, it may be pointed out that certain as yet inconspicuous but nevertheless widespread tendencies have been gaining ground. There already exists a definite movement in the direction of a balanced earn-learn program. This idea of providing realistic job experience as an integral part of the student's schooling is by no means new and it has long been successfully practiced at the

well-known Berea and Antioch Colleges and more recently at the University of Chicago. This policy, of course, has as its prime objective the immediate employability of college graduates and the establishment of contacts which are helpful in obtaining their first full-time job. The significant recent development has been the rapid expansion of this method of education as fostered in the prewar period by outside subsidy from the United States National Youth Administration and during the war by subsidy of the federal E.S.M.W.T. programs. Government and industry are currently urging immediate adoption of such a plan for the post-war period.

The earn-learn program envisages enlarged opportunity for complete or partial self-support and bona-fide job experience while the student is in school. Self-support aims to provide not only the means to education itself for those who would otherwise be barred, but to introduce the elements of morale, self-confidence and job apprenticeship as well. Pre-war census figures make it evident that education was not accessible to some three and one-half million youth of 14 to 17 years of age for financial reasons. Only 11 per cent. of our college-age, pre-war population were actually enrolled. Of the 21 million high school and college age group, nearly two thirds were excluded from schooling by pitifully small financial margins. During the depression, most of the 13 million out-of-school youth were also unemployed and, ironically, often prevented from obtaining jobs because of child labor laws. Labor laws which had originally been idealistically enacted to prevent industrial exploitation of children, in the depression penalized preeminently the very group they were designed to protect. This grave situation was subsequently aggravated for out-of-school youth by restrictive regulations of trade unions against minors.

The youth crisis became nationally so acute that the federal government created the N.Y.A. and C.C.C. as emergency relief agencies. The National Youth Administration was started in 1935 for the purpose of removing school-age children from the labor market by financially subsidizing their return to school. It is interesting to note that by creating an opportunity to earn from five to twelve dollars per month, 650,000 children were restored to school. The Civilian Conservation Corps proved to be highly successful as a job-training project and achieved about a 40-per-cent. annual turnover due to acceptance of C.C.C. graduates into permanent employment as compared to only one per cent. for school-age youth registered with federal unemployment agencies. The C.C.C. obviously possessed spot value in job training which the public school education lacked.

As a relief measure, federal subsidy thus came into American education on a large scale. As unemployment diminished both the N.Y.A. and C.C.C. were nevertheless continued for several years largely as a nation-wide experiment with the earn-learn program. Though the N.Y.A. and C.C.C. have been eliminated, the E.S.M.W.T. program still continues under federal subsidy. We thus have the precedence, policy and experience necessary to develop a comprehensive national earn-learn program which can be immediately expanded on a large scale and rapidly modified to meet post-war exigencies. Problems similar to those of the pre-war depression may again arise with collapse of the present war boom and federal subsidy may again be necessary for education designed to facilitate employability of American youth.

One may ask how this shift in educational method will affect biology. The answer may prove to be that biology will be called upon to prepare students for gainful employment in its applied phases at technical as well as at professional levels. Formulation of details for such a program may not be difficult in vocational schools and agricultural colleges, but real administrative ingenuity may be required to create such projects in our liberal institutions. One immediate problem will be that of the time schedule. Daily classroom meetings of one hour are poorly adapted to realistic laboratory work in biology or to earn-learn programs for the student. The length of laboratory periods may have to be increased and to a large degree biology courses may be transferred from the laboratory to the greenhouse and the out-of-doors. Such biological information can be given sound scientific values and made more valuable to the student by means of direct rather than indirect participation through the textbook or lecture. The imperative need for wider information on conservation in all its aspects will also give further impetus to field work. Despite the informality of method, substantial quantities of sound biological information can be effectively inculcated in the field and laboratory under informal auspices. But the schedule of courses must provide realistically for adequate time for field work and for laboratory periods long enough to complete biological experiments.

The close of the war will inevitably bring extensive curricular changes. While it is only proper that education should meet new social needs, it will be necessary for administrators and teachers to anticipate these needs, to safeguard standards and to avoid the assumption that change alone constitutes educational progress. The place which science and biology assume in the new educational order will in large degree be determined by the thoroughness of the study of new social needs, by the preparation of a comprehensive

program of science instruction supported in a unified way by scientists throughout the nation. The large educational and biological societies of America have the opportunity and the obligation of leadership in placing the judgment as well as the talent of science and biology at the disposal of the nation in peace as it has been in war.

To be effective in the implementation of biological programs, however, we now need a unified and aggressive parent organization, one which recognizes that many small societies are necessary for professional specialization but which compensates the diminishing social effectiveness of small groups by their affiliation with a large assemblage of biologists with certain common needs and purposes. Unification of small groups on the basis of mutual interests which transcend specialization in biology is the basis of professional prestige and scientific effectiveness. As scientists, we owe it to ourselves and to the nation which supports us to organize on a comprehensive basis for the early formulation and rigorous implementation of programs for pure and applied biology in institutions throughout the nation. Our schools, government and industry stand ready to consider any educational program for science and biology which represents the consensus of scientists themselves.

POST-WAR MILITARY RESEARCH[1]

By Rear Admiral J. A. FURER, U.S.N.
COORDINATOR OF RESEARCH AND DEVELOPMENT, U. S. NAVY DEPARTMENT

I AM glad of the opportunity to address the Industrial Research Institute on the subject of "Post-War Military Research" because I believe that you, as an organization and as individuals, can play an important part in the work that should be done during the peace period following this war to develop the weapons for the next war. You will note that I did not say, "If we should ever again be called on to fight another war." That was the customary phrase used after World War I in speaking of anything connected with preparedness. I think that Americans are now ready to face the fact that the war to end all wars has not yet been fought. I believe that the country realizes that we have had a very close call and that we must never again take the chances which we took after the last war.

The Secretary of War and the Secretary of the Navy, some months ago, requested Mr. Charles E. Wilson to head a committee, consisting of four scientists, four representatives of the Army, and four representatives of the Navy, to study the subject of post-war research and to make a report on how best to keep military research in the forefront of national preparedness. Frank Jewett, president of the National Academy of Sciences, Karl Compton, president of Massachusetts Institute of Technology, Jerome Hunsaker, chairman of the National Advisory Committee for Aeronautics, and Merle Tuve, of the Carnegie Institution, were the scientists on this committee. General Echols, of the Air Forces, General Waldron, of the Ground Forces, General Weaver, of the Service Forces, and General Tompkins, director of the Special Planning Division, were the Army representatives. Rear Admiral Cochrane, the chief of the Bureau of Ships, Rear Admiral Hussey, the chief of the Bureau of Ordnance, Rear Admiral Ramsey, the chief of the Bureau of Aeronautics, and I, as Coordinator of Research, represented the Navy. We have made our report, and I believe you will be interested as much in the considerations which led the committee to its conclusions as you will be in the recommendations which were made.

In attacking the problem of how best to keep post-war military research in the forefront of national preparedness, we began with the assumption that the Army and Navy must continue to carry the major responsibility for such work, especially in times of peace. The Army and Navy are employed to do just that job, and it is hardly conceivable that the country, and Congress as representative of the country, would be willing to relieve the Armed Services of that responsibility. Experience with the Office of Scientific Research and Development during the past four years has, however, demonstrated that scientists in civilian life when given the opportunity are capable of making outstanding contributions to the invention, development and operation of all manner of instrumentalities of war. In other words, that a scientist need not be a professional with years of experience in the armed services, in order to contribute effectively to the solution of the many problems that confront the Army and Navy in making war. Obviously the Government can not, after the war, continue to employ on military research all the scientists who were mobilized under the Office of Scientific Research and Development for such work during the war. The great majority of these men would not even be willing, after the war, to devote their time to work of this kind. Nevertheless, it is our belief that a way should, and we hope can, be found to keep the country's outstanding scientists interested in military research after the war, so as to give the Army and the Navy the continued benefit

[1] Address before the Industrial Research Institute, Atlantic City, October 6, 1944.