SCIENCE

VOL. LXIV SEPTEMBER 24, 1926 No. 1656

CONTENTS

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

BIOLOGY AND THE TRAINING OF THE CITIZEN[1]

I PROPOSE in this address to depart somewhat from precedent and to devote it neither to a general review of recent progress in our science, nor to the exposition of my own special views on problems of evolutionary morphology, but rather to a more general subject—one which I believe to be at the present time of transcendent importance to the future not merely of our nation but, indeed, of our civilization—namely, the relation of biology to the training of the future citizen. Speaking as I do from this chair, I need hardly say that by biology I mean more especially animal biology.

It is unnecessary to emphasize at length the enormously important part which biological science plays in the life of our modern civilized state. The provision of food for the community—crop-raising, stock-breeding, the production of dairy products, fisheries, the preservation of food by canning and freezing, and so on—is obviously an immensely complicated system of applications of biological science. And so also with the maintenance of the health of the community—the prevention of disease, much of which is now known to be due to the machinations of parasitic microbes, often transported and spread by other living organisms, and the cure of disease by the modern developments of medicine and surgery—these again are applications of biological science. When we contemplate merely such simple facts known to every one, when we see to what an extent the results of biological science are woven in and out through the whole complicated fabric of modern civilization, when we contemplate further the gigantic expenditure in money devoted to the school training of our future citizens, it must surely strike us as an extraordinary fact that biological science enters hardly, if at all, into the school training of our average citizen.

What I have said indeed applies, if only in lesser degree, to the subordinate position occupied by science as a whole in our school training. In the early stages of human evolution, as we see illustrated on the earth of to-day by those comparatively primitive savages who still remain in the nomadic hunting phase, what we should now call science plays an all-important part in the education of the young indi-

[1] Address by the president of Section D—Zoology—of the British Association for the Advancement of Science, at Oxford, England, August, 1926.

vidual: he is taught to observe accurately the phenomena of nature, dead and living, to draw the correct conclusions therefrom, and to regulate his actions accordingly. In our own early history science undoubtedly played an equally important part in the training of the young. Even down into the Middle Ages it supplied an appreciable part of the curriculum of the educated man, the seven liberal arts of these days containing a large infusion of what we now call science. In later times, however, from the renaissance of classical learning onwards, science has been kept in the obscure background of our educational curriculum, and in spite of much tinkering of detail in recent years that curriculum continues unchanged in its main features: it remains preponderatingly literary and classical. Even to-day, if we listen to contemporary discussions on education, we commonly hear arguments as to the relative merits of different constituents of the current curriculum, but the general framework of that curriculum seems to be regarded as sacred from all interference.

And yet these recent years have witnessed the most tremendous advances in the evolution of our social organization, and, as the position now is, it seems as certain as anything can be that unless further advance is accompanied by a corresponding evolution in the training of our future citizens a condition of instability will soon be reached such as to involve the risk of complete disaster. Probably the factor in our modern social evolution which has brought in its train the greatest danger is the development of what in general terms we may call means of intercommunication—the means by which transport is effected—on the one hand of material things, on the other hand of ideas. Primitive man in the hunting phase of his evolution is a nomad, but a nomad within a restricted area: his wanderings are limited by the more or less vague boundaries between his own territory and that of neighboring tribes. He is entirely dependent for food and raiment upon what nature provides within these limits: he knows little of the world beyond except that it is peopled by strangers of varying degrees of hostility: his code of ethics is limited by the same boundaries—highly developed as regards intercourse with his own tribe it ceases to exist in his intercourse with those outside. His dominating idea is loyalty to his own kinsfolk and fellow tribesmen, and for this idea he is ready to make any sacrifice.

With advancing evolution, when the communal unit is no longer the clan or tribe but the nation or federation of nations, geographical and political boundaries still exist; but with the evolution of means of transport by road and rail and sea they cease to form impassible barriers—men and goods are able to pass them freely. Of even greater moment to citizenship than the transport of material things is the transmission of ideas. The great developments in this have come about in the first place with the evolution of language, the vehicle of thought, which has rendered possible the transmission of thought from individual to individual. The use of visible material symbols of a lasting kind—whether pictorial or simply conventional, as in writing and printing—while facilitating still further the transmission of thought from individual to individual and from place to place, has done far more, for it has enabled the achievements of each generation to be handed on to its successors with a completeness that was quite impossible by the merely spoken word.

While these advances in the methods of transmitting thought have played an all-important part in rendering secure the orderly progress of human knowledge, they have brought in their train curiously one of the most potent disturbing factors to the progress of communal evolution. This disturbance is brought about through interference with the workings of one of the great principles of communal evolution —that of leadership.

Leadership

Already in the primitive tribal community we find this factor at work. Tribes differ in their size and power—their men may number a mere half dozen or several hundreds—and the main factor in this is the personality of the tribal chief. Among his own men the chief stands out by his capacity, mental and physical: a quick and accurate observer, he is also quick and accurate in drawing his deductions: he is wise, he is rich in knowledge and in its bearings; while alert and quick in decision, he is of steady nerves, has a good sense of balance and is reliable in emergency.

And so it is onwards through historical evolution—the chief, the ablest man of his tribe, finds his successors in a long sequence of natural leaders of men.

It is the more modern developments concerned with the transmission of thought—printing, telegraphy, wireless telephony, cinematography, and so on—that constitute the great disturbing factor, inasmuch as they have given enormously increased importance to elements of individual personality quite distinct from general strength and capacity, mental and physical. Amongst such elements there stand out conspicuously oratorical power and skill in the method of advocacy. The leader no longer forces himself to the front by the sheer power of his outstanding constructive ability; the place of this is to a great extent taken over by the power of effective and persuasive writing and speaking. The most responsible posts in the leadership of the modern state have been rendered accessible to the skilled orator, even though his constructive ability in statesmanship may not be of the highest. That this development involves serious dangers is obvious; it seems equally obvious that one of the main tasks confronting the community is the devising and setting up of the educational safeguards which alone can be efficient against these dangers. The task will, indeed, be no easy one: it will clearly, for its satisfactory accomplishment, call for the best intellects the community can provide. However great the ability of those to whom the task is entrusted, it will prove one of high complexity and much difficulty; but certain inevitable conclusions seem to be visible, one of the chief of these being the need of drastic cutting down of the number of subjects at present inflicted upon the young citizen in training during his school period. How exactly this is to be done will have to be carefully worked out; but it seems clear that at present an immense amount of time is given, during the early stages of the curriculum, to subjects which might profitably be replaced by others of greater value in mind-training during these earlier stages. If postponed to a later stage of mental development such subjects can be mastered in a small fraction of the time required in the earlier stages—when, by the way, their prolonged and wearisome study is but too apt to kill effectively all interest on the part of the pupil in the particular subject.

While I am in complete agreement with those who desire to see the school curriculum greatly lightened as regards number of subjects and who desire to see "snippets of many subjects" replaced by more thorough training in a few, my special task now is to urge the necessity of including in the training of every citizen before the completion of his school period at least a grounding in the main principles of biological science.

It is necessary in approaching any such question to keep clear in our minds the two main functions of education: (1) the educative function in the strict sense—the training and development up to the highest attainable level of the brain-power which nature has provided, and (2) the informative function—the providing the mind with an equipment of information which will be of use to it later on.

Science and the Curriculum

It is again necessary to glance for a moment at the general question of science in relation to education. I, of course, believe that the almost complete exclusion of science from the elementary education of the young which has persisted over a prolonged period has been a real tragedy. In the life of the ordinary active citizen, as opposed to that of the mere scholar and recluse, some of the most important factors are those which training in science is specially adapted to develop. Such above all are the powers of accurate and rapid observation, and of the accurate and rapid drawing of conclusions from observation.

But I do not support the claim of biology to an important place in the basic stage of school education, which should have to do with the early development of these powers. On the contrary, I harbor no doubt in my mind that the department of science to be used for this purpose is not biology but physical science. For the early training of the powers of observation there are two essentials: (1) that the phenomena observed should be capable of numerical expression to a high degree of accuracy, or, in other words, that they should be measurable; and (2) that a given observation should be capable of repetition over and over again under approximately the same set of conditions. Biological observation fails as regards both of these essentials. When we proceed to apply the method of measurement to something that is alive or that has once been alive, or to some form of vital activity, we find ourselves confronted not with a phenomenon of comparative simplicity, but with a complex of extreme and, in great part, unknown intricacy. If we measure the length of marks upon a piece of paper, or of similar rods of a particular metal, we obtain by so doing data of a totally different order of scientific reliability from those that we obtain by measuring the length of some particular animal, where the particular dimension is the visible residuum left at the end of an immense chain of events during the racial and the individual history of the animal. While such measurements may provide important material for the skilled biometrician, they are, as I believe, totally unsuited for use in elementary education. And a somewhat similar consideration affects the *repetition* of observations upon living things or upon things that have lived—the observable phenomena result from the interaction of so many imperfectly known factors, and are so liable to the influence of disturbing forces, that it is difficult or impossible to repeat observations with any assurance that all the conditioning factors are really the same.

It is rather in the later stage of education—the informative stage—when the individual has already had his powers of observation and reasoning developed in the earlier stages, that biology should be called upon to play its rôle.

What is required is by no means the storing of the memory with a vast array of separate facts. It is rather that the budding citizen should be given a grasp of broad principles, as accepted by the competent authorities of the day. Such broad principles are generalizations from immense masses of detail.

The probable soundness of the generalization is intimately related to the broadness of its basis of fact. It is, of course, impracticable to place before the pupil the entire body of facts that constitute this base, and if it were possible it would be useless, for it is only a master who is able to perceive clearly the relations of superstructure to base. The object of the teacher is then not to attempt the vain task of demonstrating the truth of the general principle in the short period available: such facts as are introduced should serve merely to illustrate the particular principle and facilitate its appreciation.

I know that there are many who will criticize as unscientific and unsatisfactory such a simple manner of approach to general principles. They will say you can not really instil such principles unless you make the pupil go through an elaborate course of laboratory training in dissection and microscopic observation such as we impose upon the specialist student of biology. I do not agree. My experience has been that an audience, whether of youths or of adults, of ordinary average composition such as we get in a public lecture in a big industrial city, appreciates the points and follows the argument perfectly satisfactorily without such elaborate preparation, provided always that the argument is clothed in plain, non-technical English.

Biology in the Curriculum

The question may now be put: What exactly are the biological facts and principles that should be introduced into such a course of instruction?

I. Firstly, the great fact of evolution. We still see with tiresome frequency in magazine articles the statement that evolution is not a fact, but merely an unproved hypothesis. No doubt it may be said with perfect accuracy that in one sense absolute proof is unknown to science, except in relation to successive steps of an operation in pure mathematics. Taking, however, the word "proved" as we use it in ordinary life, *e.g.*, in relation to a matter inquired into by a court of law, then we are completely justified by the data of embryology and paleontology in stating that evolution is a definitely proved fact. The realization that it is a fact admitted by all competent judges should be incorporated in the mental equipment of every citizen at an early stage of his training.

II. Secondly, the broad fact of inheritance: the fact that the offspring repeat the characters of the parent—physical, mental, moral—but that this repetition is never so complete as to amount to identity as regards such characters. It is not always realized that, were the repetition actually exact and complete, it would constitute a fact that would shake our whole biological philosophy to its foundations!

The voyager upon the open ocean often sees a towering wave approaching his vessel, overwhelmingly impressive in its seeming individuality, and yet we know from physics that that onwardly rushing wave is merely an apparent form, its outward semblance cloaking a comparatively gentle heave of the constantly changing particles of water. Or, again, one sees a cap of cloud covering a distant mountain peak. It seems to remain unchanged for hours, and yet we know it is undergoing constant change—water particles separating off on its leeward, and others being added on its windward, side. So it is with every mass of living substance: active interchange of substance—regarding much of the details of which we are profoundly ignorant—is constantly taking place not only between different parts of itself, but also between itself and its environment. It is this swirl of activity that constitutes life, and it carries with it the necessary implication that a bit of living substance is never the same at two separate instants of time, nor two separate bits of living substance ever identical in detail with one another. As soon might we think of constancy in a flickering candle flame as in substance that is alive. And how, in view of this lack of constancy in all that lives, could we expect the progeny to be exact repetitions of the parent? How could we expect them to be otherwise than different from one another? If I would emphasize this point, commonplace though it will seem to many, it is because of the widespread tendency to ignore it even amongst biologists themselves.

The biologist constantly using the species as his classificatory unit involuntarily becomes dominated by his mental picture of the ideal member of the species, conforming exactly to description, and an individual which obviously does not so conform impresses him as a departure from his ideal. He comes in this way to think of variation as being an active positive process by itself, instead of an inherent characteristic of life and of inheritance. It would not occur to him to decry the science of physiology because it does not know the ultimate nature of the phenomena of life with which it deals, but yet he will sometimes attempt to discredit our evolutionary philosophy because it is similarly without any clear idea as to the ultimate nature and cause of the variation which is the necessary accompaniment of life.

This instability of living things which finds its expression in the constantly fluctuating incompleteness of inheritance has to be driven well home—in the first place because it constitutes the raw material of evolutionary progress, and in the second place because its proper appreciation provides the citizen with his surest safeguard against the talk of those who make it their business to belittle, if not to deny, the ever-present differences in the capacities of their fellow-men.

III. Thirdly and lastly, the fact of the struggle for existence in nature and the consequent elimination of the less fit. To the biologist and, indeed, to any one who devotes thought to the matter, the struggle for existence and the consequent elimination of the unfit is an obvious truism, apart altogether from the question whether or not he accepts the Darwinian view of its potency as a factor causing evolutionary change; but yet among our fellow-citizens interested in sociological questions there is a very prevalent lack of appreciation of the widespread nature and the intensity of the struggle, induced in many cases by the perusal of charming descriptions of mutual aid in the animal kingdom, combined with ignorance of the fact that such mutual aid is restricted to the individuals of a community and is actually an important factor in rendering the community efficient in holding its own in the struggle with other communities.

When once the pupil has fully grasped the three great primary facts I have mentioned, he can profitably pass on to elementary notions of the biology of communal life. Gateways leading to these may be found by way of the fascinating phenomena presented by communities of social insects such as bees and ants and termites. Still better in some ways is the study of cell-communities, culminating in the immensely complex cell-communities that constitute the bodies of the higher animals. By whichever route, the pupil is easily led to the three great principles of communal evolution: (1) increase in the size of the community, (2) increased specialization of its constituent individuals, (3) increased perfection of the organization by which the constituent individuals are knit together into the communal individuality of a higher order. In some animal communities this organization is of a material kind, the individuals being linked together by strands of living substance, in others the connection is not material but is of the nature of social interrelationships.

When once these basic principles are clearly apprehended an approach may profitably be made to the study of human society, where the same principles are seen clearly at work—the simple nomadic group with its individuals few in number, showing hardly any trace of specialization and so loosely knit together that they separate from one another under stress of circumstances, such as attack by a hostile tribe—leading up to the complex modern civilized state with its millions of inhabitants, intensely specialized for the performance of the various communal functions and knit together by an immensely complex social organization.

The Intercommunal Struggle

The appreciation of the fact that our civilized community has come about by a long process of social evolution paves the way to an appreciation of the further fact that human societies are still in process of evolution—states becoming larger and larger, the specialization of their citizens becoming ever more pronounced, their social organization more complicated—and that here again a great driving force is the struggle for existence, in this case an intercommunal struggle.

It is surely one of the saddest experiences a biologist can have, to live amongst men whose communal evolution has lagged behind, and to see how, unless helped in their struggle with competitors at a higher level of social evolution by some natural protective feature such as geographical isolation or immunity to local diseases, they are doomed to disappear. Innumerable examples of this are seen in the continents of the New World, where the relatively primitive communities of red men have been displaced by whites in a higher stage of communal evolution. The same process has taken place in the past, races that lagged behind in their communal evolution giving place to others more progressive.

The realization of the importance of intercommunal and interracial competition is of use indirectly as a safeguard against falling into the common error of ignoring differences—in material interests, in racial prejudices, in religious beliefs—those troublesome factors which, in actual practice, form serious obstacles in the way of those who would find in signed agreements between different nations a sure shield against the danger of war.

The Biological Outlook

Finally, our training, if successful in inducing in our citizen's mind what we may call the "biological outlook," enables him to take a fresh and an enlightening view even of that distressful subject, economics. He appreciates more fully how the customary units of the economist, pounds and dollars, are merely tokens with local values dependent on their power of purchase. In a remote spot on the earth's surface, a pile of golden coins becomes merely so much workable material out of which articles useful or ornamental may be fashioned; a bundle of scrip becomes material of possible use for kindling a fire. Their actual value bears no relation whatever to their token value in other circumstances.

Our citizen from his biological viewpoint looks beyond this veil of make-believe and realizes that the true unit of value is the capacity of the human individual. He sees in each individual a biological capitalist. His store of capital may be small or large. It may consist of the precious bullion, intellectual power or the humbler metal, bodily strength. And the store, small or great as it was to begin with, may have been simply left like talents buried in the earth, or by education it may have been increased in amount and coined into the kind of currency, such as skill in handicraft or other form of social activity, which gives it its greatest local value in the community.

TO WHAT END?

But how the question may fairly be put: what good would come of it all were the biologist given his way, and his subject, resting on a basis of elementary physical science, accorded the place in the ordinary school curriculum that he claims for it? How might it fairly be expected to work out in practice to the advantage of the community and of the individual citizen?

To state adequately the answer to this question would exhaust the time not merely of one address but of many, and I can only indicate one or two points which the answer would include. The scientific training we are arguing for would in the first place be a potent power on the side of social stability, inasmuch as it would help to develop the scientific habit of mind with its constant distrust of the ably stated "case." There is no more potent defense against the plausible rhetoric of the advocate than infusion of the scientific habit of bringing verbal statements up against the touchstone of actual fact.

With recognition of the principle that the welfare and happiness of the individual citizen is by no means independent of the material prosperity of the community, proper appreciation would be given to biological economics. It would be recognized that the training of the individual citizen must include the scrutiny of the nature and amount of his biological capital and the taking of appropriate measures to increase his stock and to ensure its being minted into the most suitable form of currency.

Individual scrutiny would in turn drive home the necessity of confining within as narrow limits as possible the workings of the principle of mass production in education. The application of that principle plays a great part in industry, but its introduction into the sphere of education is apt to be accompanied by forgetfulness that its success in industry is entirely conditioned by one basic factor, namely, uniformity of raw material. Without such uniformity the practice of mass production is recognized as absurd. The clearer realization how completely wanting this uniformity is in the human raw material on which education works will serve to impress upon us all the desirability of confining mass education within the narrow limits at the commencement of the educational period when it is for practical reasons unavoidable.

The fostering of the biological element in education would do something to quicken into renewed life the primitive relationship of parent and offspring which has tended to become deadened under the influence of modern civilization and more especially of mass education. The parent would be no longer encouraged to regard his child as merely number so-and-so in a vast number of units poured into the hopper of the educational mill. He would be encouraged to keep up his natural sense of responsibility for the welfare and interests of his offspring—the slackening of which in our present system is responsible for so much that is deplorable—and incidentally he would be stimulated to take a live interest in the education of his children, in the selection of those responsible for the ordering of that education, and in the subject of education as a whole.

This greater interest would lead him to a better appreciation of many things connected with education. One of those of which a deeper appreciation is greatly needed has to do with the reciprocal relations of physical and mental deportment. Passing along a city street the biologist is constantly having his attention caught by little peculiarities of attitude and movement which reveal to him the existence of peculiarities of quite another kind—stability or instability of character, mental sluggishness or alertness. He realizes to the full that there is a reciprocal relation between mind and body. With the spread of the biological outlook through the community this realization would become general, and we should have the average parent awakening to the full appreciation of the fact that he is inflicting grievous harm upon his children if he fails to see to it that their ordinary education is accompanied by the full allowance of physical training and games, which, while developing physical activity in the first place, plays a great part in developing mental alertness as well.

The training of the individual to the highest attainable degree of biological aptitude as a citizen involves naturally his relations to other members of the community. He must be fit not merely to play his part as an isolated individual, but also to carry out smoothly and efficiently his communal activities. As communal evolution progresses, these latter relations become relatively more and more important. In the primitive savage phase the individual is still subject to the ruthless pressure of natural selection. His whole organization—his bodily health and strength, the acuity of his senses, his mental alertness—is kept up to the highest pitch. As communal evolution goes on, however, the pressure of natural selection becomes modified. In one particular respect no doubt it becomes intensified, for the crowded community provides greatly increased liability to the attacks of pathogenic microbes, and consequently we find active evolution proceeding in the direction of increased immunity to such as are prevalent and dangerous. It is a hideous experience to witness the immigration of people from a more highly evolved society with their accompanying microbes into the midst of a remote and primitive community and to see the horrible ravages these microbes produce when disseminated amongst the virgin population. While, however, in this particular respect evolution proceeds actively in the more advanced communities, it is not so in other respects. The individual no longer depends on his perfect bodily fitness, on the acuity of his senses, on the alertness of his mind, to survive and reproduce. As a result, as seems beyond question, the individual necessarily deteriorates with high civilization in his all-round fitness both mental and physical, and this retrogression renders him correspondingly more and more dependent upon the community for his welfare. Emerging from this consideration, we have the conclusion that with higher and higher communal evolution, with more and more intimate dependence of the individual upon the community, we should have greater and greater attention paid in our educational system to these subjects which have to do with the citizen's relations to and duties towards the community—such as discipline, ethics, patriotism and loyalty to country and comrades, and the past history of the community and race.

The last of these, in fact, the history of our race, is one of the subjects of the present school curriculum which the biologist would be particularly anxious to see retained, and even accorded increased importance. His natural sympathies go out to it, for his own philosophy—evolution—is but history of a larger growth. No doubt he would sometimes wish its teaching to be modified in detail: he would like to have less attention devoted to brawls and murders—on however great a scale—and to have a little space spared for the achievements of science. In my own town of Glasgow I often wonder how much the average child is taught regarding the two great events of the world's history which took place in that city—James Watt's improvement of the steam engine and Joseph Lister's inauguration of antiseptic surgery.

In these flippant days there is a tendency to scoff at pompous lines regarding "lives of great men," and so on; but are we quite sure that our children are not greatly the losers by hearing so little in their school days regarding the dedicated lives of great heroes of science like Darwin or Lister?

In this address, which I must now draw to its close, I have touched upon some of the general considerations which naturally come to the mind of the biologist when he thinks of his subject in relation to this great and, as it has become, vitally important problem of the training of the future citizen. Some matters that at once suggest themselves I have deliberately avoided: Eugenics—there are others who speak of that; sex—the whole air is abuzz with discussions on sex. The importance of every citizen being given a little elementary knowledge of the biological aspects of health and disease; the importance of the school paying more attention than it generally does to training the power of prolonged and concentrated effort upon dull bits of work; neither of these points requires any special emphasis.

There are, however, many other aspects of the problem which I refrain from developing, only because forbidden by the tyrant time. Summing up the more important of these, I would say that the biologist would like to see a movement of our whole educational system away from the merely literary, doctrinaire, academic regions, in which it is apt to be out of touch with the reality of biological fact and practical affairs. He would like to see a far more general recognition of the fact that the primary object of education is to make the individual able rather than learned. A learned individual may be, and often is, a stupid one. And in any case the development and the training of general brain-power fits biologically into the earlier years of life in a way that is not the case with the acquirement of mere learning.

He would regard as another prime object in the training of the citizen the getting him back towards the primitive habit of thinking constantly. The primitive savage is kept constantly alert by ever-present danger. He is constantly thinking about the meaning of what he sees and hears. Civilized man, freed from the stress of savage life, gets into the habit of not thinking. His actions become automatic. He gulps down whatever is served up to him. If he were only to think he would promptly discriminate as to what is worthy of acceptance and what is not.

The biologist would like to see still another reawakening of ancient custom, namely, the more effective shackling of personal liberty in the bonds of duty towards the community. Amongst primitive men one finds a high degree of personal freedom, but this is bounded strictly by the interests of the community. These interests are regarded as sacred, and the offender against them receives prompt and severe punishment. Throughout the long ages of social evolution, the traitor—the blackleg to his country—has ever been regarded as the most despicable of men, and it is a new and strange development of modern times that toleration is extended to those who deliberately work an injury to their country and kindred—it may be on the grounds of their own material interest. A biologically educated community, while according to the individual in his ordinary affairs the widest range of personal freedom, would take measures to prevent effectively its interference with the public welfare, whatever might be the form of this interference.

There is one other argument I would use for the biological factor in training the citizen. As social evolution progresses, the natural differences between men become more and more marked, as does also the material expression of these differences. One individual—say a Lister—is worth to the community many millions of pounds; another is worth little or nothing, or in some cases his value may be expressed by a negative quantity. And along with this increase of inequality there comes, unhappily, the deteriorating nervous balance which accentuates discontent and social friction.

The biological outlook I believe to furnish a most potent aid towards the smoothing away of such social difficulties and the lubrication of the social mechanism, for it enables us to see with clear vision through the obscuring veil of superficiality that separates class from class, and shows us how our fellow-citizens beyond, in spite of their differences in manners and clothes and language, are after all, on the average, merely human beings like ourselves, fitted out with the same strengths and trammelled by the same weaknesses as our own.

J. GRAHAM KERR

UNIVERSITY OF GLASGOW

AN INTERNATIONAL COMMITTEE ON BOTANICAL NOMENCLATURE

THE International Congress of Plant Sciences, recently in session at Ithaca, New York (August 16 to 23), held its meetings in several sections, one of which was taxonomy. The program for this section provided for several sessions, three of which were set aside for a round-table discussion on nomenclature, with Mr. A. S. Hitchcock in charge.

At the first meeting of the round table, Thursday afternoon, the chairman placed before the meeting for discussion: (a) The proposals adopted by the Imperial Botanical Conference held in London, 1924 (presented at the Ithaca meeting through Dr. A. B. Rendle); (b) the resolutions adopted by the Botanical Society of America at the Kansas City meeting (1925); (c) certain generic names, suggested for addition to the list of nomina conservanda, presented by the Committee on Australian Botanical Nomenclature, through Mr. Sprague (Kew); (d) a paper on Standard-species of Nomina Conservanda by M. L. Green, presented by Mr. Sprague. These proposals were written on the blackboard for examination by the audience.

Four invitation papers were read by Dr. John Briquet, Geneva, Switzerland; Mr. T. A. Sprague, Kew, England; Dr. M. L. Fernald, Gray Herbarium; Dr. M. A. Howe, New York Botanical Garden.

At the suggestion of the chairman the proposal for an international committee was first taken up for discussion. The section decided that such a committee be chosen by a temporary committee of five appointed by the chairman, providing that one member should be the chairman, that two others should be Dr. Briquet and Dr. Rendle and that the remaining two members should have special knowledge of cryptogams. At the Brussels meeting (1910) of the international congress, there was appointed a permanent committee on nomenclature, consisting of Briquet (Geneva), rapporteur general, Harms (Berlin), vice-rapporteur, Rendle (London) and Mangin (Paris). Briquet and Rendle, the only members of this committee present at the Ithaca meeting, were asked to serve on the appointing committee in order to coordinate the new international committee with the old permanent committee of the Brussels Congress, which had certain duties in preparing material for the London Congress (intended to be held in 1915 but delayed and now planned for 1930). The chairman asked Dr. Briquet and Dr. Rendle to suggest the cryptogamic members of the appointing committee, which suggestion was followed. The appointing committee consisted of Briquet (chairman), Rendle, Arthur, Ostenfeld and Hitchcock.

On motion of Dr. Hill (Kew) the meeting adjourned until Friday evening in order to give the committee time to make its selection.

On Friday evening the appointing committee reported, proposing an interim Committee on Nomenclature, consisting of twenty-nine members, including the four members of the old permanent committee mentioned above. The report was adopted by the section on taxonomy and sanctioned by the congress at a general business meeting. It was provided also that the officers of the original committee (Briquet, chairman; Harms, vice-chairman) should be the corresponding officers of the interim committee. The interim committee consists of:

Barnhart (New York), Bitter (Goettingen), Black (South Australia), Briquet (Geneva), Degen (Budapest), De Wildeman (Brussels), Diels (Berlin), Domin (Prague), Fedtschenko (Leningrad), Harms (Berlin), Hitchcock (Washington), Jaczewski (Moscow), Janchen (Vienna), Lecomte (Paris), H. Lindberg (Helsingfors), Maire (Algiers), Mangin (Paris), Moss (South Africa), Murbeck (Lund), Nakai (Tokyo), Ostenfeld (Copenhagen), Ramsbot-