variations occurred in cases where the distance between the transmitting and receiving station was great—being rarely less than 100 miles and in some cases as great as 1500 miles. Also the waves had travelled for considerable distances over land. These facts probably account for the changes in the apparent direction of travel of the wave front necessary to produce the large variations observed. Fortunately in the application of radio direction finding to navigation such conditions as a rule do not occur. Ships usually require their positions or bearings to be given when they are nearing land, and there is a considerable amount of evidence to show that, in the case of the shorter waves, as used by ships, passing entirely over sea for distances of the order of 50 to 80 miles, individual bearings very rarely show a maximum error of more than 5° , while simultaneous observa-

tions carried out on the same waves after passing over land frequently show variations of the order of 40° .

From the experimental evidence available it would seem that with a suitably situated shore direction finding station a ship at a distance of the order of 50 miles can be given a bearing, under normal conditions, with an accuracy to 1° to 2° . A single direction finding station can only give a ship her bearing from the receiving station, but if a second direction finding station suitably placed with respect to the first is available, two bearings can be given and the position of the ship can be fixed by their intersection. Experience has shown that such an intersection is usually sufficiently correct to enable a ship's position to be given with all the accuracy necessary for safe navigation.

O. F. B.

The Education of the People.¹

By Prof. T. PERCY NUNN.

IN education, as in all the great fields of practice, there are, and must constantly arise, problems that can be solved only by patient application of the methods of science, but however far the scope of educational science may extend, the critical educational issues will always lie beyond it. For in its origin education is a biological process which does not wait for deliberation to call it into existence or for science to guide it, but has the inevitability of behaviour rooted in instinct.

What is it, then, that determines the general character of the educational process at a given point in the history of a human society? The answer is that the same *élan vital* which brought the society to that point urges it so to train its young that they may maintain its tradition and ways of life. It follows that the education a nation gives its children is, perhaps, the clearest expression of its *ethos* and the best epitome of its scheme of life. Thus the ideas of too many of our Georgian forefathers upon the education of the masses corresponded faithfully with their belief in the great principle of subordination about which Johnson and Boswell talked so often and agreed so satisfactorily. One remembers, for example, how hotly Miss Hannah More denied the scandalous rumour that she was teaching the poor of Cheddar to write! Similarly, the liberal curriculum of our elementary schools reflects the prevalence to-day of a widely different view of the nature and purpose of society. In brief, it is an expression of the steadily growing belief, first, that every member of society has an equal title to the privileges of citizenship; and, secondly, that the corporate strength of society should be exerted to secure for him actual as well as theoretical possession of his title.

How the movement based upon that belief will ultimately affect the happiness of our people no one can with certainty foresee; nevertheless, I am bound to record my opinion that in its main tendency it ought wholeheartedly to be accepted. I think this chiefly because it seems to be inspired by the Christian

principle of the immense value of the individual life, or, if you prefer to put it so, by the Kantian principle that no man ought to be treated merely as a means but always also as an end in himself. But if the movement is accepted, public education must correspondingly assume a character which would follow neither from the principle of subordination nor from the principle of *laissez faire*. The view I submit is that the education of the people should aim at enabling every man to realise the greatest fullness of life of which he is by nature capable—"fullness" being, I add, measured in terms of quality rather than of quantity, by perfection of form rather than by amount of content. That view is the basis of all I have to say.

During the last century we learnt, following Darwin, to look upon all biological phenomena as incidents in a perpetual struggle wherein the prizes to be won or lost were the survival of the individual and the continuance of his species. From this point of view there could be only one object of life, one *causa vivendi*, namely, to continue living, and the means by which it was to be attained were adaptations to environment achieved by an individual, and perhaps handed on to its offspring, fortunate germinal variations, or lucky throws of the Mendelian dice. It was natural, if not logically necessary, that the doctrine should fuse with the view, as old as Descartes, that life is but an intricate complex of physico-chemical reactions. Upon that view, even to speak of a struggle for existence, is to use a metaphor admissible only on account of its picturesque vigour; when we study the forms, processes, and evolution of living beings we are spectators merely of the operation of physical and chemical laws in peculiar forms of matter.

These ideas, in either their more moderate or their more drastic form, affected the attitude of men towards matters lying far outside the special province of biology. National policies have been powerfully influenced by them, and it has been widely held that the education of children should be shaped mainly, if not solely, with the view of "efficiency" in the struggle for existence. It is, therefore, relevant to point out what tremendous difficulties are involved in their thorough-going

¹ From the presidential address delivered to Section L (Educational Science) of the British Association at Liverpool on September 14.

application. I will not speak of those which have driven physiologists of high standing to reject the mechanistic theory of life as unworkable, for they do not bear directly upon my argument. It will be more to our purpose to raise, as William James did in his great treatise on psychology, the question of the higher æsthetic, moral, and intellectual qualities and achievements of man, and to ask how these are to be brought under the conceptions before us. We will not press the question how the emergence, say, of Beethoven's Fifth Symphony is to be explained in terms of physics and chemistry; for even the most stalwart mechanists scarcely expect that it will actually be done; they only believe that conceivably it could be done. But it is both fair and necessary to ask how the things of which the symphony is typical can be accounted for on the principle of survival-value. James, facing this question with characteristic candour, felt bound to admit that they have "no zoological utility." He concluded, therefore, that the powers and sensibilities which make them possible must be accidents—that is, collateral consequences of a brain-structure evolved with reference not to them but only to the struggle for material existence. The premises granted, I do not see how the conclusion can be avoided; but surely it is extremely unacceptable. If, with Herbert Spencer, we could regard art merely as something wherewith to fill agreeably a leisure hour, we might be satisfied by the hypothesis that our sensibility to beauty in form, in colour, and in sound, is an "epi-phenomenon" having no significance in relation to the real business of life. But when we think of men whose art was in truth their life, and consider how eagerly the better part of mankind cherishes their memory and their works, it is next to impossible to be satisfied with that view. Take the case of science. Votaries of pure science often seek to justify their ways to the outer world by the argument that discoveries which seemed at first to have only theoretical interest have often disclosed immense practical utility. It is a sound enough argument to use to silence the Philistine, but would the pursuit of science lose any whit of its dignity and intrinsic value if it were untrue? I will not lengthen the argument by extending it to the saints and the philosophers, for its point should be sufficiently plain. The activities of "our higher æsthetic, intellectual, and moral life" have such intrinsic worth and importance that to regard their emergence as accidental and biologically meaningless is outrageously paradoxical. They must be at least of equal significance with anything else in man's life, and may not unreasonably be held to contain the clue to life's whole meaning.

It may be helpful to put the conclusion in other language. Man's life is a tissue of activities of which many are plainly *conservative* in nature, their function being directly or indirectly to maintain the existence of the race and the individual. Agriculture, industry, defence, medicine, are obvious examples of the type. But there are other activities—art and pure science are capital examples—the character of which is best indicated by the term *creative*. The point made is that in any sane view of human life as a whole the creative must be regarded as at least as significant and important as the conservative activities.

Purely conservative and purely creative activities, if indeed they exist, are only limiting instances; in most, if not in all activities, the two characters are interfused. For example, the motive of pure science is unmistakably creative, yet its extrinsic conservative value is unlimited; on the other hand, the vast industrial organisations of to-day exemplify activities which, though conservative in their genesis, yet have developed the creative character in an impressive degree. Considerations of this kind prepare one to see that the higher creative life, far from being merely a splendid accident, is really the clearest and purest expression of the essential character of life at all its levels. The poets are, as the Greeks called them, the supreme *makers*, for all making has in it something of the stuff of poetry. In short, there is no life, however humdrum, however crabbied by routine, which is not permeated by the self-same element, the inflorescence of which is literature, art, science, philosophy, religion.

The foregoing discussion has a close bearing upon the questions what should be taught and in what spirit the teaching should be given. The curriculum always *will* be a partial reflection of the actual life and traditions of a community, and *ought* to reflect all the elements therein which have the greatest and most permanent value and significance. Without doubt these will, in general, be the things that have the highest significance and value for the human family as a whole, but there can scarcely be said to be a common human tradition. There exists, it is true, a common European tradition based mainly upon the Græco-Roman and Christianity, and it is vastly important for the happiness of the world to deepen and vivify men's consciousness of it. But even this lacks the concreteness needed to form the basis of popular education. In short, a nation is the largest social unit whose *ethos* has the necessary individuality. Hence, though we should aim at making our young people "good Europeans," we can do so only by shaping them into that particular brand of good Europeans who are rightly to be called good Englishmen. Hence the importance of fostering in our elementary schools the special traits of the English character at its best; of giving English letters a chief place among the studies of our youth; of cherishing the English traditions in the arts and crafts, including our once proud art of music; even of reviving the old dances which were so gracious and typical an expression of our native gaiety and manners.

Lest this contention should be misunderstood, I add that I preach neither the hateful doctrine that what is foreign should, as such, be excluded, nor the ignorant and presumptuous doctrine that what is our own is necessarily the best, and that we have nothing to learn from other peoples. The whole burden of my argument is that the things which have universal human value are the things of most importance in education. But the universal can be apprehended only where it lives in concrete embodiments. In the cases we are concerned with, these are elements or organs of a national culture; and the only national culture to which a child has direct and intimate access is his own. He should be taught to see, as opportunity permits, how much of it is derived from the common European tradition and how much it owes to the influences of

other national cultures ; but it should, in its concrete individuality, be the basis of his education.

Lastly, I have urged that among the strains or currents in a national tradition the highest value belongs to those that are richest in the creative element. These are themselves traditions of activity, practical, intellectual, æsthetic, moral, with a high degree of individuality and continuity, and they mark out the main lines in the development of the human spirit. Do we not rightly measure the quality of a civilisation by its activities in such directions as these? If so, must not such activities be typically represented in every education which offers the means to anything that can properly be called fullness of life?

If the force of the argument be admitted, the principles of the curriculum take a clear and simple shape. A school is a place where a child, with its endowment of sensibilities and powers, comes to be moulded by the traditions that have played the chief part in the evolution of the human spirit and have the greatest significance in the life of to-day. Here is the touchstone by which the claims of a subject for a place in the time-table can be infallibly tested. Does it represent one of the great movements of the human spirit, one of the major forms into which the creative impulses of man have been shaped and disciplined? If it does, then its admission cannot be contested. If it does not, it must be set aside; it may usefully be included in some special course of technical instruction, but is not qualified to be an element in the education of the people.

The same criterion may be applied to the methods by which the subjects of the curriculum are taught. We are constantly told that the "educational value" of a subject lies in the mental discipline it affords, and, from this point of view, a distinction is made between its educational value and its import as an activity in the greater world; thus geometry is taught as a training in logic, the use of tools as "hand and eye training," and so forth. From the point of view I adopt that distinction is unjustifiable and may be dangerously misleading; it has, I fear, often been a source of aridity and unfruitfulness in school teaching. The mistake consists in supposing that the disciplinary value can be separated from the concrete historical character of the subject as a stream of cultural tradition. The discipline of the school workshop consists in using the tools of the craftsman for purposes cognate with his and inspired by his achievements. Similarly the discipline of school geometry consists in steeping one's mind in a certain noble tradition of intellectual activity and in gradually acquiring the interests, mental habits, and outlook that belong to it. To say this is not to minimise the importance of discipline or to expel from school studies the austerity which the grave old word suggests. What is insisted on is that the several forms of mental discipline are characters of concrete types of creative activity, practical, æsthetic, intellectual, and that they influence the mind of the learner favourably only in so far as he pursues those activities as adventures of the human spirit, laborious yet joyous and satisfying, and pursues them after the manner of the great masters. In short, true discipline comes simply by trying to do fine things in the fine way.

The foregoing principles are open to misconceptions

against which it is desirable to protect them. In the first place, it may seem that I am designing the education of the people upon a scale which may be magnificent but is certainly impracticable. It is easy, no doubt, to form extravagant expectations, and by seeking to do too much to achieve nothing solid at all. But the argument is concerned far less with the standard to which school studies may be pursued than with their proper qualities and the spirit that should inspire them. In particular, it is directed against the attitude expressed recently by a public speaker who asked what good is poetry to a lad who will spend his days in following the plough and spreading manure upon the fields. Against this attitude it urges that a man's education, whatever his economic destiny, should bring him into fruitful contact with the finer elements of the human tradition, those that have been and remain essential to the value and true dignity of civilisation.

It may be objected, granted the soundness of the ideal, that the shortness of school life makes it impracticable. It is true that a study, to be of real value, must be carried far enough and followed long enough to make a definite and lasting impression. It is also true that some studies can scarcely produce their proper effects until a certain level of maturity has been reached. But what is to be deduced from these admissions? Surely the conclusion, which the public mind is slowly accepting, that so long as children leave school for good at fourteen some of the best fruits of education will be unattainable and the security of the others precarious. It is not merely a question of length of time, but also, and even mainly, of psychological development. The more carefully youth is studied the more significant for after-life the experience during the years of adolescence is seen to be. Its importance is not a modern discovery; for even the primitive races knew it, and the historic Churches have always taken account of it in their teaching and discipline. The case for universal education beyond the age of fourteen depends ultimately upon the importance of shaping the new capabilities of the adolescent in conformity with the finer traditions of civilised life. Public opinion, regretting the generous gesture of 1918, has not at the moment accepted the larger view of the mission of education; but as the nation learns to care more for the quality of its common manhood and womanhood and understands more clearly the conditions upon which that quality depends, the forward movement, now unhappily arrested, will certainly be resumed. For that better time we must prepare and build.

There is another objection to which I should think it unseemly to refer if it were not a stumbling-block to so many persons of good will. A liberal public education will, they fear, make people unwilling to do much of the world's work which, though disagreeable, must still be carried on. The common sense of Dr. Johnson gave the proper reply a hundred and fifty years ago. Being asked whether the establishment of a school on his friend Bennet Langton's estate would not tend to make the people less industrious, "No, sir," said Johnson, "while learning to read and write is a distinction, the few who have that distinction may be the less inclined to work; but when everybody learns to read and write it is no longer a distinction. A man

who has a laced waistcoat is too fine a man to work ; but if everybody had laced waistcoats, we should have people working in laced waistcoats."

Lastly, the ironical may ask whether it is an error to suppose that the education of the people should furnish them with useful knowledge and abilities. Now the test of utility which the plain man applies to education is, in principle, sound and indispensable : the only point doubtful is whether the test is always based upon a sufficiently broad idea of utility. The only satisfactory definition of the useful is that it contributes definitely and positively to fullness of life. From that point of view it is useful to teach a ploughboy to love poetry and not useful to teach a public schoolboy to hate Greek. This is not an argument against teaching a subject the disappearance of which from our education would be an irreparable disaster. It means merely that the literatures of the ancient world, when taught, should be taught in such a way as to contribute positively to the quality of a modern life. But the term "useful," according to the definition, certainly includes utility in the narrower sense. The daily work of the world must be kept going, and one of the essential tasks of the schools is to fit the young to carry it on under the immensely complicated conditions of present-day civilisation. The only limitation imposed by our argument is that what is conservative in purpose shall be creative in its method and, being so, shall embody some dignified tradition of practical, æsthetic, or intellectual activity. The condition may be satisfied by a technical education based upon many of the great historic occupations of men and women, provided that inspiration is sought from the traditions of the industry or craft at their noblest. To conceive "secondary education for all" as meaning "the grammar school curriculum for all" would be to make a most serious blunder. The only mistake more serious would be to exclude adolescent boys and girls, even of the humblest station, from any essential part of the national inheritance of culture. But this error may be avoided while full account is yet taken of the far-reaching differences in the talents and *ingenium* of individuals and the rich diversity of the valuable currents, intellectual, practical, and æsthetic, in the life of the community, of which any one may be made the basis of a course truly liberal in quality.

The last hundred years have greatly accentuated the gravity of a problem which was discerned by the poet Schiller and diagnosed in the famous "Letters on Æsthetic Education" he published in 1795. In Schiller's view the immense progress of the modern nations has been purchased at the expense of the

development of the individual soul, so that, in spite of the greatness of our achievements, we are, man for man, inferior to the various and well-rounded Athenians of the best days. It is the division of labour essential to a large-scale organisation of society which has at once made general progress possible and individual impoverishment inevitable, for it has cut individual men off from experiences that are indispensable to the full well-being of mankind. If this was true in the days of the French Revolution, how much more true it is to-day, and how much more grave the evil. We are told that before the era of industrialism the great mass of our people enjoyed a culture which, though simple, was sincere and at least kept them in touch with the springs of beauty. What truth there is in the picture I do not know, but it is certain that with what is called the industrial revolution the conditions that make it credible largely disappeared. Torn from the traditions of the old rural life and domestic industry and herded into towns where in the fight for mere existence they lost their hold on all that gave grace to the former life, the folk who now constitute the bulk of our population were cut off effectually from "sweetness and light." That was the situation when the task of public education was taken seriously in hand, and that, notwithstanding a great amelioration in details, is for far too many the situation to-day.

There are some who think that the only remedy is to cry halt to the modern movement and return deliberately to medievalism. That is a counsel of despair ; instead of indulging idle dreams it will be more profitable, assuming the unalterable conditions of modern life, to consider how the rest may so be modified as to place the true dignity and grace of life within the reach of all who are qualified to achieve them. That can be done only by a system of education which brings the things of enduring and universal worth to the doors of the common people. It is what has been done by many an elementary school teacher, sometimes with scant assistance from public opinion, simply because, face to face with his helpless charges, he was impelled to give them the best he had to give. It will be done with increasing happy results the more clearly it is seen that the proper function of the elementary schools is something much more than to protect the State against the obvious danger of a grossly ignorant populace or to "educate our masters" in the rudiments of citizenship. Unless it be done, unless the natural hunger of the people for knowledge and beauty be wisely stimulated and widely satisfied, no material prosperity can in the end save the social body from irretrievable dégradation and disaster.

New Discoveries and Paintings of Palæolithic Date in the Department of the Lot (France).

THE study of palæolithic man is many-sided. As a geologist, treating the tools and objects manufactured by prehistoric man as fossils, the prehistorian has determined an archæological sequence, and, by correlating this with the geological record of the earth's history, has been able to suggest a probable chronology. As an anatomist, the prehistorian has launched into the fascinating study of the evolution of man, and,

although hampered by lack of authentic material, has already been able to show that this evolution was by no means a simple straightforward affair. As fresh material comes to hand it will become possible to elucidate further this complex branch of the subject. As an ethnologist, the prehistorian has attempted to trace the migrations of prehistoric races, and to compare their cultures with those of primitive folk still surviving.