

the borderlines between geology and physics, or geology and chemistry. Advances in such fields as geophysics call for workers with more extensive training in the two subjects. The co-operation of geophysicist and geologist makes possible the interpretation of concealed structures: England south from the Wash requires special study in view of the possibilities of new coalfields. But on a wider front we may expect to learn more of submarine areas, of the structure and origin of mountains and of the larger features of the earth. Work in geochemistry, in the distribution of minerals, the origin of rocks and the nature of clays, promises rapid development. In the fields of geomorphology the problems are barely touched; in palaeontology the existing data only serve to illustrate the extent of the problems to be solved. But in all these extensions of knowledge it may be hoped that it will be possible to avoid the isolation of the fields of study, relating them all to stratigraphy and the study of the structure of the earth's crust which form the 'heart of geology'.

TEACHING ZOOLOGY IN THE UNIVERSITY

PROF. H. GRAHAM CANNON discusses "Undergraduate Zoology" in his presidential address to Section D (Zoology). After the First World War, he says, the interest in zoology became almost exclusively experimental. The more orthodox attitude of comparative anatomy became the one to be avoided. This was due to a variety of reasons, but largely because, for generations, zoologists had been teaching the comparative anatomy of dead animals without worrying about how these animals lived. As a result of this changed outlook between the two World Wars, a generation of teachers has grown up who are predominantly experimentalists, and our present undergraduates run the risk of becoming very knowledgeable about the latest developments of experimental technique while knowing very little indeed about the anatomy of the animals on which they work. Recently, but somewhat tardily, it has become recognized that there is such an aspect of zoology as functional morphology, that is, a method of treatment where structures are dealt with not merely in the way in which they are built, but also, and at the same time, from the way in which they function. It is this attitude which should form the basis of undergraduate zoology.

Two main difficulties present themselves in considering the teaching of zoology to undergraduates. First, there is the modern tendency to scorn any elementary teaching and to thrust the first year's university work back on to the schools. This misguided attitude may be excusable in the more basic physical sciences and mathematics; but in the biological sciences, which, after all, utilize the physical sciences as their tools, it is completely illogical. Moreover, it is essential that the more experienced teachers, preferably the professor, should always deal with this fundamental first year's introduction to university study.

Secondly, there is the tendency almost everywhere to introduce specialist courses into the undergraduate years: a tendency which is being encouraged by the efforts of the University Grants Committee to foster the establishment of readerships or even chairs in the most abstruse specialist aspects of biology. At the undergraduate stage the students are quite unable to

assimilate such courses. The sort of courses which are being established are those admirably suited for the second part of the Cambridge Tripos. But what is almost invariably overlooked is that the second part is entirely a postgraduate course. The honours degree is given on the first part of the Tripos, and this corresponds to the degrees in the 'Redbrick Universities' of honours general science. It is suggested that it would be a great advantage in all 'Redbrick Universities' to abolish the specialist honours degree altogether and insist on a first degree being taken in general science as at Cambridge. The more specialist attitude to the subject could then be left to a post-graduate year, leading preferably to a master's degree.

SOCIAL GEOGRAPHY

IN his presidential address to Section E (Geography), Lord Rennell of Rodd deals with the geographical environment of man as a social animal, and consequently does not attempt to consider the geographical circumstances of the origin of human species or prehistoric man. But the spiritual as well as the material consequences of geography on human society are considered rather by posing a series of questions, and stating a number of problems, especially in connexion with Africa, than by proposing conclusions or solutions.

Starting from the influence of geography on the spiritual as well as on the material development of society, Lord Rennell makes a strong plea, which he takes up again at the end of the address, for the teaching of geography in medium and higher education as a means of creating a bridge between the humanities and the natural sciences, which "except among the leaders of the latter group" have more and more tended to develop on independent lines divorced from each other. This tendency he dates from the decline in classical education; but he sees in geography, and especially in social geography, a new link which could be made between the two, in view of the manifold contacts which geography has with both the exact and the abstract realms of human thought.

From this point he goes on to discuss a number of problems arising in Africa. What are the reasons why Islam spread as far as the southern rim of the North African deserts but never affected the population south of the northern fringe of the forest belt? Why was the negro and negroid population of Africa antagonistic to outside civilization in spite of many opportunities of contact with more civilized people from Greek and Carthaginian times through all the period of Arab and Portuguese navigation until the European conquest? Why then, and only then, did a ferment of Western civilization begin, within say the last seventy years? Yet the civilizing influence of the Mediterranean found no difficulty in crossing the Sahara and following up the Niles until they came to a dead end against the unwillingness of the negro to adopt or adapt. Why is there no trace of writing or even ideography in Dark Africa? Why was there no true architecture, the wheel or the plough in Africa south of the deserts until the conquering European started the modern phase?

Lord Rennell goes on to discuss the anomalous and absurd consequences of the European conquest, the purpose of which, in spite of Lord Hailey's investigations, remains very obscure. He refers to

the ribbon development of colonies along the coastal routes, and the strange efforts of our Colonial Office to keep separate, contiguous British territories in eastern Africa, in spite of departing substantially in recent years from the dual mandate principle in favour of "colonies d'exploitation". He concludes with the suggestion that only the geographer with a foot in each of the camps tenanted by the humanist and the natural scientist, is fitted to seek answers to the problems he raises, and is unbiased enough to propose solutions which it is incumbent on European nations generally, and ourselves in particular, to find, in order "for the sake of our own good name" to remedy the administrative and social chaos which is Africa.

THE PRICE SYSTEM

IN his presidential address to Section F (Economics), Sir Hubert Henderson remarks that the idea of a return to the price system which is widely advocated to-day is marked by the same defects that marred the idea of economic planning which was so popular a year or two ago, namely, incoherence and wishful thinking.

In its most general sense, the price system is an inevitable outcome of the use of money. So long as goods and services are bought and sold for money, there must be prices; and these prices must always exert a powerful and pervasive influence. It is important, therefore, that this influence should be a healthy one, that the configuration of prices should be such as to pull in directions which accord with the public interest. We want price relations that are right, so far as that object is attainable. But we must be careful not to beg a major question. In the matter of price relations, as in many others, it is easier to be sure that certain things are wrong than to know at all precisely what is right.

According to current price system ideology, the right price is the theoretical equilibrium price. In times of large-scale economic maladjustments, however, this concept is ambiguous. The theory of value comprises two parts, short-term and long-term, each with its appropriate equilibrium price. These prices are seldom far apart in ordinary times, when the economic system has not been subjected to any recent large disturbance. But they are apt to diverge widely when the maladjustments to be corrected are very large. It is a mistake to suppose that in such conditions the theoretical short-term equilibrium price is either what we want, or what we normally get in a free economy. There are apt to be serious and injurious anomalies in price relations when shortages are widespread.

Shortages, or surpluses, are, of course, most widespread, and the consequential anomalies most serious, when there is a large maladjustment between aggregate demand and aggregate supply. It is therefore especially important to avoid disequilibrium here. In Great Britain at the present time it is rightly a main object of policy to remove the inflationary trend in our economy. Success in this might enable us to dispense with many of the controls that irk us to-day, and to simplify others. But it would not enable us to remove them all. The regulation of long-term capital expenditure would still be desirable for a fairly considerable time, and the regulation of imports indispensable for a much longer time.

If the consuming public were free to choose, there is no reason for supposing that imported goods would

represent a smaller fraction of their total purchases than before the War. Since our total rate of consumption is at about the pre-war level, this would imply imports at about the pre-war level; or an increase of more than one quarter in our present import-bill. The removal of every vestige of inflation in our internal economy, though helpful, could not radically alter this result. With a huge deficit in our current balance of payments, we are in no position to contemplate a largely increased expenditure on imports.

Price system ideologues believe that disequilibria in the balance of payments can always be corrected by variations in foreign exchange-rates. This belief is attributable to the pivotal role which they assign to the concept of equilibrium price. When, however, our import-export balance is so far from adjustment, there is a huge divergence between the short-term equilibrium rates of exchange and the long-term norm represented by purchasing-power parity. It might be disastrous to try to make our actual exchange-rates approximate to the former. It is better to keep them in the neighbourhood of purchasing-power parity; and to recognize that it will remain essential to regulate the volume of our import purchases as effectively as we now do by means of import restrictions.

More generally, the time-honoured theory of value endorses, and indeed enjoins, the humdrum practical proposition that, when large adjustments have to be made, regulation and deliberate direction may be useful or even indispensable.

THE YOUNG ENGINEER

IN the presidential address to Section G (Engineering), Wing-Commander T. R. Cave-Browne-Cave deals with the qualifications and personal qualities necessary in 'the young engineer', and treats the problem of engineering education from an unusual point of view because his experience has been in the application of engineering science to a wide variety of new developments, mainly in connexion with airships and aircraft engines. Since going to University College, Southampton, he has been dealing not only with students preparing for the external degree of the University of London, but also with apprentices following part-time courses for national certificates and still more practical qualifications. The review is based upon the knowledge and personal qualities which a young engineer should have acquired shortly after the end of his formal training, say at the age of twenty-eight to thirty, and may serve as a guide to those who are considering engineering as a career. It may also be taken as a background against which the various stages of engineering education are examined.

Mathematics is a limiting factor in the progress of a student along the main road of engineering science. It must, therefore, be of a really appropriate type and no harder than is necessary for each corresponding stage.

The general structure of engineering education should be revised so that it is possible for candidates to enter at any appropriate stage. Changes from one course to a more suitable one should be simpler than at present, and there must be fewer 'casualties' who fall out and go no further. Courses of instruction should be aimed, not at a final examination, but at the future useful application of the knowledge acquired.