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Science and Service in Universities Overseas

IT cannot be gainsaid that the inhabitants of England, and of London in particular, are prone to assume an air of superiority over visiting representatives of the Dominions, even when the latter are themselves engaged in the task of building up new universities at the outposts of the British Empire. Necessarily the Empire must have a centre, which can only be London, but acceptance of this postulate does not preclude first-class work on a particular subject being carried out at a university thousands of miles away. It is only required to mention the names of Rutherford and Soddy in connexion with McGill University to establish this point. Whilst it is desirable and indeed excellent to have a cultural centre for the Empire, it would be disastrous if the advantages of proximity to it had the effect of making the foremost teachers, old and young, reluctant to work at the circumference, where there is much educational work of the highest importance to be done.

Among those who take the view—and there can be few who oppose it—that never was the closest union with the Dominions as a whole more essential to the Mother Country and that indeed her future prosperity largely depends on strengthening the bonds which unite the Empire, there is a keen desire to see the best possible use made of the intellectual ability of the Empire to this end. Apart from those few philosophers who can only work under conditions which are to-day's equivalent of monastic seclusion, it would do all the good in the world to most of the younger scientific workers to spend a year or more out in the Empire making contact with life as it is lived under somewhat different conditions from those which prevail at home, conditions which are claimed by some to be nearer the actualities of life.

The basic ideas we desire to develop are, first, the need for the universities of the Dominions to be able to draw on the best brains in the Empire for their professoriate. The material to be taught there is worthy of the teacher; the problems, both pure and applied, to use the hackneyed terms, are there in plenty. Secondly, those who accept such posts should be placed at no disadvantage in their future professional career. As this is at the moment perhaps the crux of the matter, it may be considered in more detail. At the end of the nineteenth century and for a decade in the twentieth it was usual for the enterprising sons of large families to cross the

seas to find work under conditions of greater freedom than at home: for all classes the opportunities were greater than at home, and the rising man of science gained a professorship at a substantial salary years before he could have achieved this in Britain. To-day things have changed: the working man no longer emigrates, for a variety of reasons which do not concern us here; the young scientific worker finds sufficient opportunities, including some measure of financial security, to keep him at home and he is unwilling to sacrifice the advantages of scientific centralisation. It must be admitted that part of his reluctance to face life under new conditions in the Dominions is due to his womenfolk, who, however enterprising they may be in sensational sports stunts, are on the whole unwilling to face the different and possibly harder life in the Dominions. It is true the burden of this falls mainly on their shoulders, whereas the daily round of the husband in his laboratory is much the same as at home. The difficulties should be realised in the Dominions, and a specially warm welcome extended to the 'Frau Professor' until she is thoroughly acclimatised to the new conditions.

Although, as Prof. Stanton Hicks emphasises in a letter we are publishing elsewhere in this issue (p. 397), the inducements to attract and retain good men in the Dominions have to be greater than in the past, there is one factor working in the opposite direction which should help, namely, the ever-quickening of transport, which makes it possible to retain much closer contact with England. Eastern Canada is within a week of home, at least in the summer, and both South Africa and Australia are less remote than at one time, and even the cost of the passage is less onerous. Adding the fact that people in the Dominions are used to long journeys, it becomes possible, other things being equal, to visit the homeland much more often than has been customary in the past. Amongst other things we contemplate the payment of a passage to England and back every few years under the conditions of the professorship; this is usual in the case of commercial employees who are sent to the East by their employers. The principle of the sabbatical year is now quite established in the United States, and it should be possible to adopt it, with improvements, within the British Empire. Here the Royal Society might help. It could each year send out one or more of its research professors to the Dominions to take the place of the local professor,

who would come home to do a year's research in a British laboratory. We feel convinced that the effects of such exchange on both parties would be remarkable and would in a few years have a profound influence on the whole university movement in the Dominions.

There should be an unwritten law not to overlook workers in the Dominions when awarding scientific honours or making elections to vacant chairs. The Royal Society has always awarded its fellowship with liberality to overseas workers, but it is desirable that the feeling should prevail that the axiom 'out of sight, out of mind' does not apply to them. The difficulty of interviewing candidates overseas for a vacant chair might be overcome by the selection of a carefully chosen panel of seniors, who would meet and record their impressions of them before they first crossed the ocean and during every subsequent visit to the Mother Country. Such a panel would be able to make impartial reports when necessary.

We would go even further in encouraging a knowledge of Empire conditions among professors, by definitely giving preference when filling the senior positions at the universities at home to men who have had such experience. In their turn, the universities in the Dominions must accept the idea of a five years' tenure of their professorships. There will, no doubt, be strong objections to this suggestion because of its disturbing effect on the regular routine of the university, but in the long run there can only be benefit from the new ideas brought in by the new man and the new stimulus he will give to staff and students alike. It is in no way suggested that the term of office should be limited to five years, only that it should form a period after which a teacher would be considered to have discharged his obligations should he wish to return to England.

It is an open question, not suitable for debate here, whether some chairs should not be definitely limited to a five years' period; others again, after a period of probation, might well be for the period of active life. In those sciences which are in close connexion with the active industrial development of a Dominion, we believe there is much to be gained by a regular change in the occupant of a chair: we can even visualise the new man coming out of industry, the retiring professor entering or returning to industry, to the advantage of individuals, students, industry and the university. There must be a real contact between the university and the town and State in which it is

situated; it must play a part in the agriculture, in the industries, in the development and in the life of the community and be far, far more than a high school to which the citizens send their sons and daughters. 'Town and gown' must not be different and opposing unities; the gown must be thrown round the town and the townspeople made proud to wear it.

We have stressed this, the practical function of a university overseas, without any intention of minimising or detracting from the other functions it should have, that of teaching and that of pure research. The best kind of teaching is so much a matter of inspiration—a few words from the right man can make a dull subject an entrancing mystery—that this is largely a question of the individual teacher. Unfortunately, universities must grant degrees, and degrees involve examinations, which in their turn mean a syllabus and courses of instruction, none of which is really education for life's battles in the true sense of the word. There is no hope of changing this state of affairs at the moment at home, though overseas the authorities may perhaps be more enlightened since they are more closely in touch with the realities of life. So long as there are examinations, teaching in the main must be directed to covering the facts contained in a comprehensive syllabus and not to the presentation of a logical approach to the subject itself. Apparently the good students survive even the examination and its preparation, and the inferior might never learn the subject anyway, so the old bad ways are perpetuated.

There are several aspects of the research question at the overseas universities. A good man will prosecute the research in which he is interested anywhere, whatever the conditions. Sir Daniel Hall has reminded us that research proceeds from an artistic impulse, so that it is not under control. The best results in the past have not come out of the institutions with the finest equipment, witness Sir William Ramsay's laboratory in London and that of Emil Fischer in the Dorotheen Strasse, Berlin, both the scene of epoch-making discoveries. More difficult to overcome is the lack of stimulus resulting from the regular contact with other workers. However, the typewriter makes it possible to write lengthy letters with a minimum of effort, which, with the good postal facilities available, should enable the written to replace verbal intercourse. The work achieved in the laboratories of the British Empire—there is no need to mention names—makes it abundantly clear that the right

type of man can produce the best work in them and that he need not fear intellectual starvation. It should perhaps also be said that in many of the Dominion laboratories the equipment is of the best, even in advance of much of what we have at home. It is true that modern physics demands a super equipment, such as has just been installed at Cambridge, but there are many other fields of scientific endeavour where the apparatus and materials necessary for a research can be packed up in a few cases and moved from one laboratory to another. The prolific researches of the professors of chemistry at Oxford, for example, give no indication of having suffered as the result of their having worked in several laboratories in the Old World and the New.

The developments in the United States afford an illustration of how universities in cities in remote States, possessing a very inferior cultural background, have developed here and there under the leadership of individuals of the right type into first-class schools of research and teaching. It is true the distances from Yale or Harvard to these centres are small, but a decade or so back it was very difficult to persuade the best men to take up these positions in the Middle West.

We have still to consider our theme in relation to graduates of the Dominion universities who come, as indeed they should, to the Mother Country for post-graduate work. Should they stop in England or return to take up posts in the countries whence they came? The temptation must vary with the individual. Some will feel family ties and associations and the pull of the freer life and better climate, others will feel the beckoning finger of the academic atmosphere. Each must choose for himself in relation to his inclinations, but one thing is certain, that we at home, spectators in the auditorium, must applaud him who goes abroad as loudly as the man who stays at home. The success of the Empire depends rather on the deeds of the man on the spot than on speeches at Westminster, and no insular narrow-mindedness must be allowed to stand in the way of giving him the best men as his teachers.

It is perhaps trite to say the world is at the cross-roads. There are many who think that for Britain, one way points towards sterling and the Empire and the other towards gold and uncertainty, if not chaos. If we choose the former and build on the foundations laid at Ottawa, unite with people of our own blood and our own tongue into a closer union, leading, let us pray, to Imperial

greatness, then it must be remembered that we are all free men of independent habit of mind, so that Imperial unity means Imperial independence, a centrifugal force opposed to centralising everything intellectual in the capital of the Empire.

In the world as it is to-day, no unit is big enough to stand alone. Economic groupings are necessary, the most beneficial being that of a big industrial nation with a big agricultural nation. Just as some forms of agriculture are so uneconomic that their practice results in raising the cost of living, so also the costs of manufacture must be kept low if Britain is to be the great central industrial country. Success in attaining these ends lies in the advances that science can make, such as will enable, for example, the big agricultural business to compete with the one-man farm, the rationalised industry to meet the competition of the small business. As regards the Dominions, it is clear that when a country has great resources of raw material, it will certainly attempt to establish its own industries, but it should only afford them a protection by tariff when they are reasonably assured of sound opportunities for success.

If the industries of the Dominions, agricultural and otherwise, are to prosper, research at the universities must be fostered, for in agriculture there are no great corporations to endow research. Sheltered places must be provided for the research workers and the shelter must be of a nature that will attract the best. Only thus shall be established our claim to Imperial greatness.

Evolution and Philosophy

The Scientific Basis of Evolution. By Prof. T. H. Morgan. Pp. 286. (London: Faber and Faber, Ltd., 1932.) 15s. net.

THE present book, based on a course of lectures at Cornell University, represents the views of a leading geneticist concerning the present position as regards evolution. It contains little that is new to the geneticist, and its statements are apparently designed mainly for the more general reader. The earlier chapters are concerned with such topics as the cellular basis of heredity, Mendelian inheritance and the genes, variability, adaptation and natural selection, mutation, sexual selection, and the evolutionary significance of embryonic development. The last four chapters are essentially a critique of (1) the well-worn theme of inheritance of acquired characters; (2) the social evolution of man; (3)

the conception of the 'order of Nature', and (4) of metaphysical interpretations of evolution.

Although the work deals mainly with the more recent developments, occasional pages might have been taken from almost any textbook in the last fifteen years. There are a few inaccuracies, especially as regards plant genetics. For example, it is stated that *two* cases are found where interspecific crossing has produced new stable types with a higher chromosome number. The list of such cases in plants now extends to at least eighteen, and the most significant ones from an evolutionary point of view are not mentioned. Similarly, the statement (p. 44), "Whether this growth [of the chromosomes] takes place at the time of splitting, or after the halves have moved apart, is not certainly known at present", can only be regarded as a very inadequate statement concerning present knowledge of the growth and division of chromosomes.

In the chapter on mutations, the frequency of viable mutants in *Drosophila* is estimated at one in five to ten thousand flies. The discussion of the relation between the mutation theory and natural selection reaches the conclusion that some of the mutants will be an improvement, either on the old characters, or in a somewhat different environment and will therefore be incorporated into the species. It requires more than this, however, to show that mutations furnish the material for evolution. It would seem reasonable to expect that evidence on this head could be obtained in part by a comparison of the mutations in any group of organisms with the interspecific differences found in that group. Hitherto very little work of this kind, involving both mutational and taxonomic studies, has been done.

Elsewhere (p. 182) Morgan concludes that there may have been as many genes in the earliest organisms as at present. Such a view, if pressed to its conclusion, can only mean that the genic differentiation of the chromosomes of an amoeba is as great as in man, a conclusion which would certainly not be accepted by many biologists. It would seem that the gene theory can only be reasonably maintained on the assumption that the chromosomes of higher organisms are more differentiated along their length than those of the lower forms. The opposite view savours more of Bonnet's *embôitement* theory than of evolution in a real sense.

On p. 205 the extraordinary statement appears, that "Only a few strictly dominant mutational