UNIVERSITY STUDENTS AND THEIR ACADEMIC ORIGINS

WITHIN the past ten years there have been several valuable studies of student performance at universities in the United Kingdom, some concerned with 'wastage', or failure to complete a course of study; some with degree of success achieved by those who did not fall by the wayside; and some (of which the survey under notice is an example) with both. A variety of factors make it difficult to compare the results of such investigations. First, they usually relate to one particular university or college, where conditions affecting initial selection of students and their subsequent academic progress may differ materially from those obtaining elsewhere. Secondly, they are often based on the intake of a particular year (differing from the year chosen in other surveys), and year-to-year fluctuations in the quality of students are believed to be considerable, at least within one college, faculty or department. Thirdly, to serve the purpose of the inquiry, success or failure is analysed in terms of a limited number of characteristics, which vary from one survey to another.

The limitations imposed by these and other factors are well brought out if the survey relating to the Queen's University of Belfast (An Audit of Academic Performance: a Study of the Prediction of Academic Success in the Queen's University of Belfast. By Michael Forster. Pp. 75. Belfast: Queen's University, 1959. 7*s*. 6*d*.) is put side-by-side with another very recent one, undertaken by the Cambridge University Sociological Society (Academic Careers of Entry of 1955). There is no need to emphasize the importance of the different setting provided by the Queen's University of Belfast as compared with the University of Cambridge for a study of academic performance. In the Queen's University case the students concerned are those who entered in the four-year period 1946–49; for Cambridge, the intake of one session, 1955–56, was taken. For the purpose of the Belfast inquiry, degree of academic success was analysed in terms of four main possible associated factors: performance in the Northern Ireland Senior Certificate Examination (the main mode of entry), age at entry, whether educated at a Belfast or a non-Belfast school, and whether a scholarship holder or not. In the Cambridge inquiry the factors selected were two in number. The first was type of secondary school attended, and here the main classification separated Headmasters' Conference, Direct Grant, Grammar and other schools from each other (but did not, unfortunately, distinguish between predominantly boarding and predominantly day schools within these categories). The second analysis involved comparing the performance of entrance scholars and exhibitioners with that of commoners.

Although few comparisons can usefully be made between two studies with such very different settings and purposes, this does not, of course, imply that they were not worth undertaking. Their value lies, to begin with, in providing a factual basis for discussion of the topics with which, individually, they were designed to deal. Is the examination, on the basis of which entrance to the Queen's University is largely determined, a satisfactory index of probable future performance? Are Cambridge colleges admitting too high a proportion of entrants from certain types of school, at the expense, perhaps, of other entrants more likely to show good academic results? Another obvious value of these surveys is that, when further investigations are made in the same universities for later years, it will be possible to identify some of the changes that have taken place. Again, each new survey makes some contribution to the methodology of work in this particular field. Finally, where a number of inquiries relate to the intake of different universities in the same year, there is at least the possibility of fruitful inter-university comparison. The Cambridge survey, for example, has taken the year used in the study of admissions undertaken by me for the Committee of Vice-Chancellors and Principals, and this is also the basis on which Prof. D. V. Glass and his colleagues are conducting a large-scale follow-up inquiry which should throw considerable further light on the social factors influencing academic success among students at British universities.

R. K. Kelsall

PLANT–ANIMAL FOOD CYCLES IN THE SEA

MICROSCOPIC phytoplankton floating passively in the sea have proved a suitable field for the techniques of population dynamics. Gordon Riley and others have shown that when populations of plants, and also the herbivores that graze on them, are considered in terms of their content of organic carbon, it is possible to predict roughly the varying quantities in different areas in terms of the changes in the physical environment. The problem, however, from the point of view of fisheries studies, is that only one part of this generalized organic matter may be relevant. Thus, herring will feed on copepods but not on salps, both of which graze on the phytoplankton. In this way an area of high primary production is a necessary but not a sufficient condition for a commercial fishery.

A paper by Dr. D. H. Cushing, of the Fishery Laboratory at Lowestoft, is of interest because in a study of the organic production in the southern North Sea he has introduced details of the species of plants and animals involved ("On the Nature of Production in the Sea". Fish Invest., Lond., Ser. II, Vol. 22, No. 6. Pp. iii+40. London: H.M. Stationery Office, 1959. 10*s*. net). In place of the abstract idea of quantities of animal carbon eating quantities of plant carbon, he has developed an 'encounter' theory

of grazing relating the speed of movement of copepods and the density of plant cells. This gives grazing-rates which are realistic in terms of the experimentally determined food requirements of the animals and the rates of depletion of plants in natural environments. His other innovation is to compute the growth of the *Calanus* populations, which are the dominant herbivores in the area studied, in terms of: (1) relations between plant density and egg laying; (2) the times taken to pass through the naupliar and copepodite stages; (3) probable mortalities at the various stages. His theoretical model of the production during the spring outburst of phytoplankton then gives results in terms of the numbers of *Calanus* (and similarly other copepods) that will be present at different times. The usefulness of this analysis has been shown in Dr. Cushing's previous work, where his results suggested that the aggregation of herring shoals on *Calanus* patches and their subsequent disengagement depended on a threshold concentration of *Calanus* in the patches ("Production and a Pelagic Fishery." Fish. Invest., Lond. Ser. II, Vol. 18, No. 7. Pp. 112. London: H.M. Stationery Office, 1955. 12*s*. 6*d*. net).

These detailed advantages, however, have certain drawbacks. Analyses in terms of particular species do not permit the easy comparison with other areas which is an important feature of the more abstract methods. For example, by conversion from plant cell-volume, Dr. Cushing gets a value for basic production during the spring. This value is only about one-quarter of those usually calculated for comparable areas, but it is difficult to see reasons for this divergence.

Another disadvantage of Dr. Cushing's model is that the possible effects on the plants of low nutrient concentrations are not included. Theoretically, this factor is used to make the more 'conventional' models stable; practically, it allows them to deal not only with the spring outburst when nutrients are comparatively plentiful, but also with summer conditions when they are scarce. Dr. Cushing points out, however, that although nutrient supply finally determines the quantity of production, this supply may depend not merely on the rate of uptake by the plants but also on the rate of return of inorganic nutrients to the water through herbivore excretion—a factor about which we know far too little. This could be particularly important in tropical oceanic areas where nutrients are at very low concentrations and where the high water temperatures may accelerate the biological re-cycling. Dr. Cushing's suggestion that production in these areas may be higher than formerly supposed is borne out by recent evidence, given at the International Oceanographic Congress in New York in September by Menzel and Ryther, that a significant outburst of production can occur in the northern Sargasso when nutrients are extremely low. Thus, production may depend on a balance between the physical and biological rates at which nutrients are made available to the plants. In the richer temperate and arctic areas, production may be mainly controlled by the supply of nutrients from the deeper waters, but it is possible that in tropical areas the rate of production is largely independent of such features of the physical environment and depends on how fast the plant-herbivore communities can re-cycle their nutrients.

Dr. Cushing, by his individual approach to these questions, has shown up some of the failings of the abstract methods, and particularly the need to make use of information about species composition and behaviour.

J. H. STEELE

IMMUNITY OF MICE SURVIVING SYSTEMIC LEUKÆMIA (*L*1210) TO ANTIFOLIC RESISTANT VARIANTS OF THE DISEASE

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TWO of the halogenated derivatives of amethopterin, 3′5′-dichloroamethopterin and 3′-bromo-5′-chloroamethopterin, have been demonstrated to be markedly effective in the treatment of the transplantable acute lymphoid leukæmia *L*1210 in mice[1–4]. Employing these derivatives of amethopterin, it was possible to obtain extensive survival time and an appreciable number of survivors of systemic leukæmia *L*1210, even when treatment was initiated only several days prior to anticipated day of death.

With a relatively high level of inoculum (about 1,000,000 cells/mouse) injected subcutaneously, the *CDBA* mice employed in the above studies (*BALB/c An* × *DBA/2J*)F_1 male mice succumbed characteristically in 10–12 days with systemic leukæmia, and a local tumour at the site of leukæmic inoculation (10–12 mm. in diameter). On treatment of advanced leukæmia with the dihalogenated derivatives of amethopterin, the local tumour at the site of leukæmic inoculation usually regressed after several treatments, and survival times of 90 days and beyond were not uncommon[4].

The mice that survived systemic leukæmia following treatment with the halogenated derivatives of amethopterin showed immunity on reinoculation of the leukæmia[4,5]. Many of the mice appeared to be highly refractory, and the leukæmic re-inoculum showed no evidence of growth. Other mice showed partial immunity. In the latter case, the re-inoculum grew slowly, but progressively, and the animals