University News : London

MR H. J. GODWIN, reader in pure mathematics at the University College of Swansea, has been appointed to the chair of statistics and computer science tenable at Royal Holloway College, and Professor A. A. Walters, professor and head of the Department of Econometrics and Social Statistics in the University of Birmingham, has been appointed to the Cassel chair of economics with special reference to money and banking tenable at the London School of Economics and Political Science. The title of professor of immunology has been conferred on Dr I. M. Roitt, in respect of his post at the Middlesex Hospital Medical School.

Appointments

CAPTAIN W. E. MORRIS has been appointed director of Royal Naval Aircraft and Helicopter Development in the Ministry of Technology, in succession to Mr L. H. G. Sterne.

DR M. SHAFQAT H. SIDDIQI, chairman of the Pakistan Council of Scientific and Industrial Research, has been appointed the first overseas member of the Tropical Products Institute Advisory Committee.

Announcements

THE Council of the Royal Society of Edinburgh has awarded the Keith Prize for the period 1965–67 to Dr A. J. Haddow, senior lecturer in epidemiology in the University of Glasgow, for his paper "The Natural History of Yellow Fever in Africa" published in the *Proceedings* of the society during the period of the award.

THE Center for Theoretical Studies of the University of Miami has announced the establishment of the J. Robert Oppenheimer Memorial Prize for significant contributions to the fields of theoretical physics, chemistry, biology, mathematics and the philosophy of science. The prize, which consists of a gold medal, a citation and a cash award, is to be a tribute to the late Professor Oppenheimer, who, as a member of the Scientific Council, was instrumental in the founding of the centre. Further information concerning this prize can be obtained from the Scientific Council, Center for Theoretical Studies, University of Miami, PO Box 9055, Coral Gables, Florida 33124.

Meetings

VACUUM Congress, April 17–19, Manchester (The Secretary, Joint British Committee for Vacuum Science and Technology 47 Belgrave Square, London SW1).

PHYSICS of Thin Films, April 22–24, Southampton (The Meetings Officer, The Institute of Physics and The Physical Society, 47 Belgrave Square, London SW1).

ANNUAL Frequency Control Symposium, April 22–24, Atlantic City, New Jersey (Director, Electronic Components Laboratory, US Army Electronics Command, Fort Monmouth, New Jersey 07703).

THE Scanning Electron Microscope—The Instrument and Its Applications, April 30–May 1, IIT Research Institute, Chicago (Dr Om Johari, IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616).

TIME-DEPENDENT Effects in Polymeric Systems, May 10–11, University of Bradford (The Registrar, University of Bradford, Bradford 7).

MYELOPROLIFERATIVE Disorders of Animals and Man, May 20–23, Richland, Washington (Dr W. J. Clarke, Symposium on Myeloproliferative Disorders of Animals and Man, P.O. Box 999, Richland, Washington 99352).

CORRESPONDENCE

Geology in British Universities

SIR,—If geology is taken to mean the science of the Earth, then most university geology departments in Britain do not teach it. Instead they offer a range of semi-independent, specialized courses within the field, from which the student is expected to construct his own view of the Earth. The main reason seems to be repeated subject segmentation resulting from an accelerating increase in published data. Departments at time of formation have been traditionally divided into branches or subject segments, with one teacher for each. Examples are palaeontology, stratigraphy and mineralogy (Fig. 1). As data accumulate it eventually becomes clear that a segment will have to split, the original teacher taking one part and a new teacher the other. For example, palaeontology might split into macro- and micro-palaeontology. The process can continue indefinitely.

The system has three defects. First, each subject segment is usually, though not always, separated from its neighbours by a subject gap—or even a crevasse. In order to bridge this, those responsible for adjacent segments would need to be familiar with the topics covered by the other, and both would need to agree on a method of presenting the relationship. Such co-operation is rarely successful and is usually not attempted.

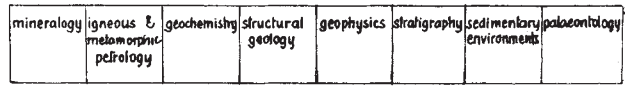

Fig. 1. Example of the traditional segmentation of geology.

The second defect is that the simple segment structure tends to be self-perpetuating. For most departmental heads the temptation to split an already existing segment rather than to create an entirely new one seems to be irresistible. The effect on departmental research, necessarily closely related to segment structure, is obvious. Hence, developments during the past fifteen years, and particularly since the IGY in 1957–58, which have altered the very structure of the subject, are relatively neglected. Geology as now usually taught is largely confined to the study of the exposed portions of the continental rifts. This was inevitable in the past when knowledge of the Earth was gained from direct examination of its land surface. Then, the only known way to link observations was to place them either in time sequence, or in descriptive groups (for example, minerals). But it is now becoming increasingly clear that at any given time events in the crust are closely connected both to one another, and to those in the upper mantle and probably also the core. They cannot any longer be treated in isolation as if they were parts of a series of independent Markov chains (for example, local stratigraphic columns).

The third and perhaps most serious defect of the present system is that virtually no research and little teaching is directed towards synthesis of geological information at any level above that of the segment. Even within segments the historico-descriptive approach is commonly regarded as adequate. The result is a rising mountain of undigested data. Hence the necessity for repeated segment splitting and increasing specialization. The necessity is largely illusory; the real need is for condensation of data into working hypotheses with a high degree of independence in space and time. The fallibility of such hypotheses is recognized, but it does not destroy their central importance to the development of the subject. Without them the recitation of geological history, with ever increasing precision, becomes an end in itself.

Two excuses are usually advanced for the lack of synthesis in geology. The first is the difficulty of dealing with the huge volume of data and the consequent danger of

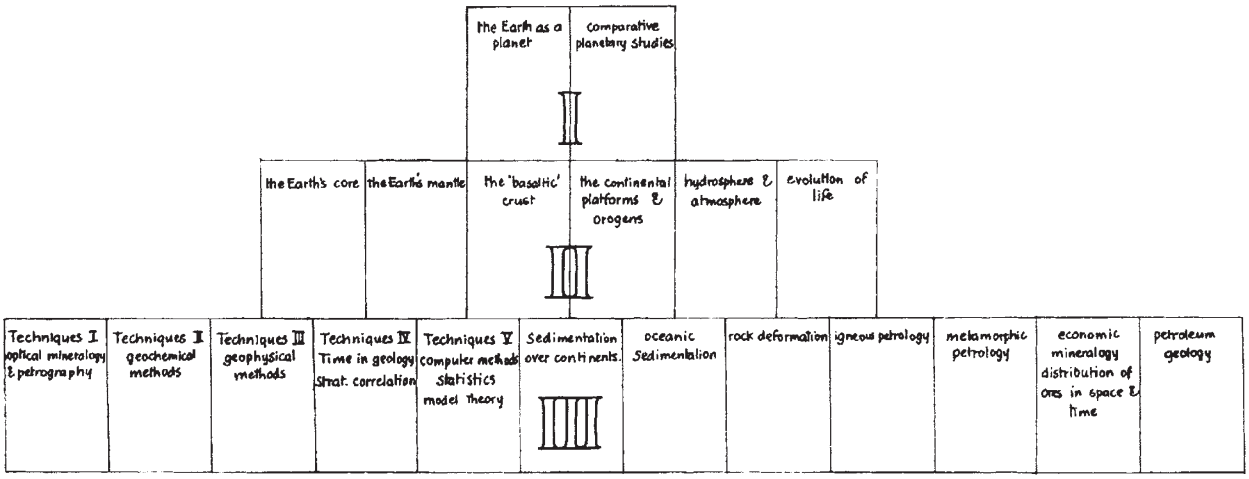

Fig. 2. Suggested three-tier hierarchy of subject segments. Subjects shown are merely examples. The number of tiers is variable, but two is a minimum.

superficiality. The second is the lack of suitable people to do the work. However, the need is not for synthesis in the encyclopaedic style of Suess[1] or Gignoux[2], but rather the use of codified data to derive such things as natural classifications of rocks and to define sedimentary, metamorphic, geochemical and tectonic crustal regions. The construction of a nested hierarchy of simple quantitative models ultimately embracing the whole Earth can then follow. A similar approach has been suggested by Kosygin and Voronin[3]. The contention of superficiality also overlooks the fact that the nature of problems changes with the scale of investigation (cf. Haggett *et al.*[4]). Thus, the petrographer working with a microscope does not dismiss field studies as superficial even though they are carried out on a scale at least five orders of magnitude greater.

The lack of workers experienced in synthesis is certainly real. However, there are probably more frustrated synthesists in British geology departments than might be suspected from listed research topics. The one certain way to utilize them and to generate new interest, and hence research, in synthesis is to create a demand for it.

As an alternative to the existing organizational structure in geology a three-tier hierarchical scheme is proposed (Fig. 2) in which scale plays a key part and teaching is process oriented rather than descriptive. The chief advantage of this scheme over the traditional one (Fig. 1) is that the relationship between subject segments in any tier is dealt with by teachers in the next higher one—without, incidentally, the need for detailed collaboration of teachers either within or between tiers. Such a scheme would provide an effective antidote to the cancer of specialization. It also puts much greater emphasis on the rapidly growing areas of the subject, which is essential if universities are to equip students for a working life during which the total amount of geological knowledge may be expected to increase sixteen-fold.

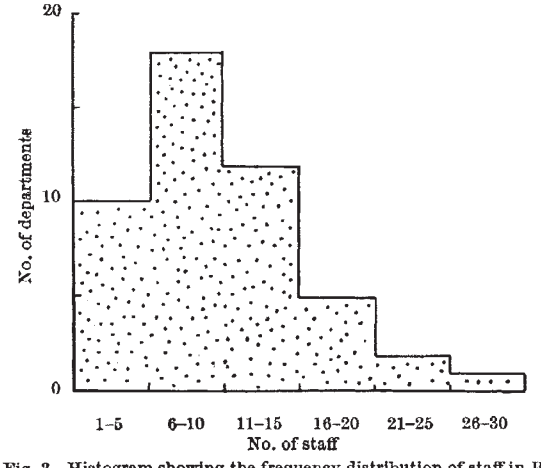

Fig. 3. Histogram showing the frequency distribution of staff in British geology departments. Total number of departments is 48 and staff 484.

An analysis of geological research in British universities and colleges[5] shows that only 2 per cent falls within tiers I and II in Fig. 2. Of this, almost half is accounted for by one university—the only one which, to judge from its calendar, has succeeded in establishing a viable Earth sciences department. An analysis of the number of academic staff in British geology departments[5] shows a skewed distribution with a mode in the range 6–10 (Fig. 3). This is almost certainly too small to support a three-tier hierarchy of the kind shown in Fig. 2. Such a scheme would, however, become a theoretical possibility if the number of geology departments was halved and their modal size doubled. Whether they actually succeeded in introducing the scheme would, of course, depend on their willingness and ability to reorganize. Better utilization and access to equipment and library resources could be an important by-product of the proposed concentration of geological effort.

Needless to say, the voluntary liquidation of half the geology departments in Britain baffles the imagination. It is more probable that geophysically oriented planetary science departments will spring up independently of classical geology. They will recognize that the crust of the Earth is the most sensitive meter of events in the interior over the greater part of geological time. And the geologists will find their data incorporated into planetary schemes which they have had no part in constructing, partly because they have declined to attempt large-scale synthesis themselves and partly because they have insufficient knowledge of pure science. Geology itself will then have been reduced to the status of a technique. A similar fate may be awaiting other subjects the conceptual framework of which is still historico-descriptive.

I am grateful to several fellow-workers for their thoughtful comments on early drafts of this communication.

Yours sincerely,

A. D. STEWART

Department of Geology,
University of Reading.

[1] Suess, E., *The Face of the Earth*, translated by Sollas, H. B. C. (Oxford University Press, 1904–24).
[2] Gignoux, M., *Stratigraphic Geology*, translated by Woodford, G. G. (Freeman, San Francisco, 1955).
[3] Kosygin, Yu. A., and Voronin, Yu. A., *Int. Geol. Rev.*, **9**, 828 (1967).
[4] Haggett, P., Chorley, R. J., and Stoddart, D. R., *Nature*, **205**, 845 (1965).
[5] Department of Education and Science, *Scientific Research in British Universities and Colleges, 1966–7*, **1**, 42 (1967).