CENTENARY OF THE GEOLOGICAL SURVEY IN SCOTLAND

On January 16 Dr. W. J. Pugh, director of the Geological Survey of Great Britain, and Dr. A. G. MacGregor, assistant director in Scotland, welcomed a distinguished company at a ceremony and exhibition of work, in the Edinburgh office of the Geological Survey, marking the completion of an extension of that office and of a hundred years of Geological Survey work in Scotland. Among the guests were Mr. D. L. Macintyre and Mr. J. MacMinn, of the Ministry of Works, who were responsible for the building operations; Sir Walter Drummond, chairman of the Geological Survey Board, Sir Edward Bailey and Dr. W. F. P. McLintock, former directors of the Survey; Dr. Murray Macgregor and Mr. T. H. Whitehead, former assistant directors in Scotland; professors of geology from the Scottish universities and representatives of Scottish learned societies, professional institutions and government departments, etc., with special geological connexions. The older generations of Scottish Survey geologists were represented by descendants of Dr. B. N. Peach, Prof. James Geikie, Dr. John Horne, Dr. C. T. Clough and Sir John Flett.

Geological Survey work in Scotland commenced in a small way in 1854, at the time when Scottish six-inch-to-mile Ordnance Survey topographical maps began to appear. The first worker, Sir Andrew Ramsay, mapped in Scotland for only a few months. In 1855 his work was continued in the Lothians area, Berwickshire and Fife by H. H. Howell (coalfield areas) and by Sir Archibald Geikie.

Work in Scotland has been successively under the direction of Sir Andrew Ramsay (1854–67), Sir Archibald Geikie (1867–82), H. H. Howell (1882–99), Dr. John Horne (1899–1911), Sir John Flett (1911–20), Dr. Walcot Gibson (1920–25), Dr. Murray Macgregor (1925–45) and T. H. Whitehead (1945–52).

The economic importance of six-inch-to-mile regional geological mapping was early in evidence, for in 1858 Geikie was able to indicate to James Young, founder of the Scottish oil industry, the general distribution of West Lothian oil-shales. The first one-inch-to-mile geological map (Edinburgh Sheet) was published (hand-coloured) in 1859 and the first memoir (Edinburgh District) in 1861. The first six-inch coalfield maps were also published in that year. One-inch maps were coloured by hand up to 1910, when the Edinburgh sheet was one of the first to be colour-printed. The Scottish coalfields were largely covered by 1880. By 1890 the whole of Lowland Scotland, East Highland coastal districts as far north as Dornoch, and part of the North-west Highlands had been published on the one-inch scale.

It was in 1883 that Geikie, in his second year as director general, brought the North-west Highlands under survey. His object was to test conflicting current hypotheses regarding the sequence and structure of the older Highland rocks by carrying out detailed regional mapping in the only area where fossils were known to occur in some of the rocks concerned. The brilliant work of B. N. Peach, J. Horne and their colleagues at once made the region internationally famous for its complex, but clearly demonstrable, tectonic structure. A summary of results was given to the Geological Society of London in 1888, and a monumental official memoir on the region was published in 1907.

Scottish work during 1882–1901 was almost entirely in the Highlands. From that time until to-day, except during the two World Wars, primary Highland survey and revision of coalfield areas have gone on concurrently. The wide knowledge, enthusiastic leadership and literary ability of Dr. John Horne, assistant director during 1901–11, led to a good output of Highland and Lowland maps and memoirs during that period. Sir John Flett's remarkable Scottish petrographic output while petrographer during 1901–11, and his delegation of some petrographic research to others, were of great assistance to Horne. Flett's initiative and drive while assistant director in Scotland (1911–20) and director in London (1920–35) ensured that good progress with the publication of Highland and Lowland maps and memoirs was maintained. The first revision of the main Scottish coalfields and of the West Lothian oil-shale area was complete before 1939; recent economic work has included a second revision of the Lothians coalfield.

During the first three decades of the twentieth century scientific discoveries of fundamental importance to volcanology were among the results of the Survey's Highland work. A. Harker in Skye and Rhum, C. T. Clough, H. B. Maufe and E. B. Bailey in Appin and Lochaber, Clough, Bailey, E. M. Anderson and others in Mull, and J. E. Richey in Ardnamurchan vastly supplemented previous knowledge of Scottish Tertiary and Devonian volcanoes and of volcanic mechanisms in general. Bailey and Maufe also revolutionized ideas on the tectonic structure of the schists of the South-west Highlands.

Pioneer British geophysical work with the Eötvös gravity balance was organized by Sir John Flett and carried out in Scotland by W. F. P. McLintock and J. Phemister between the years 1927 and 1931.

During the First and Second World Wars all available staff were employed on work of economic importance. One result of this activity was the gathering together, for the first time, of a great amount of information on Scottish mineral resources, additional to coal and oil-shale. Much of this geological and mining information has been made generally available by publication. The Survey's geological advice led to the exploitation of virgin deposits of bauxitic clay in Ayrshire, of iron-ore in Raasay, of silica sand in Morvern, of mica in Knoydart and elsewhere, and of potash feldspar in South Harris. These raw materials made notable contributions to the war-time economies of Britain, and in two instances still command a market.

The First World War saw the initiation of a long series of memoirs on the economic geology of the Scottish coalfields. Dr. Murray Macgregor, who was prominent in this undertaking, has done more than anyone else to convince Scottish coalmasters and National Coal Board officials of the practical importance of Geological Survey methods and work. For some thirty years, during twenty of which he was assistant director (1925–45), he encouraged and influenced the constantly expanding economic work of the Scottish Survey.

During the hundred years of Survey work in Scotland, seventy-two memoirs on general and scientific geology, thirty-eight economic memoirs and thirty-six pamphlets on mineral resources, and nine pamphlets on underground water supply have been published. In the thirty years between 1910 and the outbreak of the last War, sixty-nine one-inch maps and ten quarter-inch maps were colour-printed. Sales stocks were destroyed during the Second World War; but since 1945, in collaboration with the Ordnance Survey, every effort has been made to replace the lost maps, while continuing to publish new maps on the one-inch scale and many second revision coalfield maps on the six-inch scale.

As a result of growing recognition of the scope and national importance of the Geological Survey's work, increases of staff followed both World Wars. The most recent expansion is not yet complete enough to balance increased commitments. In Scotland, for example, extensive collaboration with the Scottish Division of the National Coal Board and with the North of Scotland Hydro-Electric Board, the annual incidence of some hundreds of inquiries from other government departments and the general public, and the work involved in republishing colour-printed maps destroyed by enemy action, have prevented the Survey from making rapid progress over the whole field of its activities. A. G. MacGregor

THE TRAINING OF UNIVERSITY TEACHERS

THE question of the advisability and possibility of providing new recruits to university teaching with some initial guidance in the technique of their calling has been examined by S. Radcliffe, lecturer in German at the University of Bristol (*Univ. Rev.*, 28, No. 1; October 1955).

Unlike France, little attention has been paid to the technique of lecturing in Great Britain. In general, lecturers are conscientious about the matter of their lectures, but give little thought to their form or their delivery.

That this can have a detrimental effect on students' work was borne out recently in the Vice-Chancellor's report for 1954-55 to the Convocation of the University of Liverpool. In examining the causes of failure among students taking university examinations, he includes, among "matters about which our consciences ought to be troubled", the following point: "the presentation of a subject in the lecture room, though impeccable as regards content, does on occasion leave much to be desired in the matter of elementary teaching techniques".

This is the most vital point of all. The cause of so much dissatisfaction quite often proves to be some fault in the technique of presentation, or even a mere mechanical shortcoming, which could in most cases so easily have been circumvented by some initial instruction and guidance of the lecturer concerned.

Radcliffe does not claim that teaching is a mechanical craft to be learned in a workshop, but suggests that an artist requires some basic instruction, at least in the rudiments of his craft.

The following are a few of the purely mechanical skills which might be considered desirable in a good teacher or lecturer. First, the adoption of a fitting speed and clarity of diction. Secondly, the clear formulation and appropriate stressing of the main points of the subject under review. Thirdly, the ability to use a blackboard successfully. Fourthly, the 'staging' of material to make it come 'alive'. The correct lighting and ventilation of the lecture room are of importance. A few weeks teaching in any school will bring these and many allied points home.

What is a fitting speed and clarity of diction? How many lecturers ask their students whether they can hear clearly, or whether they are speaking too quickly for them? A teacher can soon learn the correct measure in these instances with the aid of a little guidance. The undue dropping of the voice at the end of each sentence, for example, can produce both monotony and inaudibility. A person with a weak voice can be shown how to make the most of it by someone trained in these matters. This is a problem faced by teacher-training departments.

The clear formulation and appropriate stressing of the main points of the subject cover a large number of factors. Just as the potential teacher must learn how to arrange and present the various points he is intending to convey in a lesson, so must the lecturer have a clear and systematically arranged plan of what he intends to talk about. He must know which points are important or difficult enough to require particular stressing, either in the form of repetition or slower and more deliberate speaking, or even by the dictation of vitally relevant matter.

The extent to which the blackboard is used will obviously vary with the nature of the lecture; a statistical, technical or linguistic theme will call for more blackboard writing than, say, a literature or philosophy lecture. Titles of works, proper-names, unusual or foreign terms, dates—all these should be written up to ensure that students get the correct form. The writing must be clear and legible, and not scattered about in disorder on the board.

Lastly, Radcliffe elucidates his reference to the proper 'staging' of material. There is an element of the histrionic in all personal teaching; the teacher is to some extent an actor, who must make his material come to life. There are some generally recognized devices into the application of which the tyro could with advantage be initiated. A slight break before passing on to a new theme in a lecture can be most refreshing for all concerned. An occasional pause to receive questions from students will in certain cases add to the effectiveness of the lecture; it "draws the students in" more and gives the lecturer a chance to gauge their grasp of what he is saying. Learning the students' names is an essential requirement in establishing such closer contact with them. The prompt return of written work not only helps to keep up students' interest in their subject, but also gives the right to demand written work from the students within the time-limit specified.

MORPHOGENETIC STUDIES OF *DRYOPTERIS*

IN two studies, the growth, organization and morphogenetic activity of the shoot apex of *Dryopteris aristata* have been further investigated by experimental means. C. W. Wardlaw and E. G. Cutter (*Ann. Bot.*, 19, 76, 515; 1955) have observed that when the apical cell-group is damaged, leaf