

is a nineteen-page bibliography and the book is generally well produced.

G. MALCOLM LEWIS

Industry and Education

The Universities and British Industry, 1850-1970. By Michael Sanderson. Pp. x+436. (Routledge and Kegan Paul: London, December 1972.) £6.50.

OVER the greater part of the nineteenth century the ancient universities of England were indifferent to industry and did nothing to encourage graduates to take up industrial careers. On the other hand, the provincial universities, founded after 1850, began as science colleges and were always sensitive to the needs of local industry; this was also true of most of the London colleges. By 1914 the universities, including the appropriately reformed Oxford and Cambridge, were able to make considerable technological contributions to the war effort, and they were able to repeat this service during the Second World War. Since 1945 there has been a proliferation of new universities and a great increase in the number of subjects available for study.

Dr Sanderson has chronicled these developments, which I take to be fairly well known, in some detail and he has confirmed most of the conclusions we usually draw from them. He discusses the English university institutions in relation to industry and he has chapters dealing with the Welsh colleges and (particularly interesting) the Scottish universities as well as with special topics such as commercial education and the woman graduate in industry and commerce. He has studied the main sources of support of the universities and has examined the distribution among faculties and subsequent careers of the students. He has sifted an immense amount of material. But there are so many universities and so great is the scope of industry that his work has certain obvious limitations. Apart from Belfast and Coleraine, the Irish universities are not mentioned although they were in the United Kingdom for more than half Dr Sanderson's period. American, French and German institutions come only very marginally into the story, while technical colleges are mentioned only when they become universities. Unsuccessful attempts to found universities are ignored: there is no mention of, for example, the interesting proposal, a hundred years ago, to found a Western University in the Vale of Neath.

Universities, however, do not exist in a social void. The development of British universities, and hence their value to industry, was necessarily restricted by the unsatisfactory state of

primary and secondary education before 1902, the inadequate scholarship ladder and the expense of attending a British compared with a German university. Dr Sanderson does not mention these aspects of the story and he does not comment on the long debate about the role of examinations in university education, to which was related the nineteenth century failure to develop research training. These factors account, in part, for the domination of British industry, and even of British scientific education, by Germans in the early 1900s; a domination that Dr Sanderson notes but does not analyse. Parenthetically, it is notable that the phenomenon was most conspicuous in manufacturing areas of "high technology", such as the Manchester region. The contemporary response included the heroic efforts of Sir Norman Lockyer and the establishment of the British Science Guild.

I am, therefore, puzzled by Dr Sanderson's conclusion that the best British universities had, by 1914, caught up with their German equivalents. Many novel features of British universities in the early years of this century had been explicitly copied from German practice: Imperial College was called the "London Charlottenburg". By 1914 the great majority of professors of chemistry in British universities had German PhD degrees. And, if the situation was by then so satisfactory why was it later thought desirable to introduce the German PhD system into this country?

In fact the tenor of Dr Sanderson's argument is that, generally speaking, we may congratulate ourselves on the way things have gone. Indeed he is almost complacent in his comment that we have avoided the "dualism" of universities on the German model, divided as they are between the traditional and the technological. Surely we are not called on to commiserate with, for example, the Swiss since Zürich is lumbered with both a traditional university and the Federal Institute of Technology?

In short it is not easy to grasp the point of this book. It brings to light no serious problems, hitherto unnoticed, and because of the enormous range of the subject matter it cannot deal in depth with specific issues. I assume therefore that Dr Sanderson intends it as a pilot study and will now go on to make detailed investigations of individual topics. Certainly one hopes that this is the intention; there are, after all, enough problems of modern and of historical importance to deserve the attention of a scholar like Dr Sanderson who is not afraid of hard work and who is capable of dealing with great quantities of intractable material.

The minor criticisms of this book must reflect the interests of the individual reviewer. It is clear to me that Dr Sanderson overlooks the sharp distinction that Whewell drew between "established" sciences (astronomy, mechanics) and "progressive" sciences (such as botany, zoology); it was the latter, Whewell argued, that should not be taught to undergraduates. He is also rather less than fair to Mark Pattison, who became a progressive in his later years and played a part in the "endowment of research" movement. As an adoptive Mancunian I object to Dr Sanderson's cavalier spelling of Fairbairn's name. I think he exaggerates, at the expense of Harwood and Bateman, the part played by Roscoe in the Thirlmere scheme. And, much more serious, he does not mention George Davis, the pioneer of chemical engineering as an academic subject (see his *Handbook of Chemical Engineering*, 1901). Finally, it should be pointed out that only a part of the Royal Navy Signals School, later the Admiralty Signals and Radar Establishment, was moved to Bristol University during the last war; other portions went to places like Haslemere and Witley.

D. S. L. CARDWELL

ROMANIAN JOURNALS ON NATURAL SCIENCES

ROMANIAN REVIEW OF BIOLOGY
Summaries in English, French, Spanish,
German, Russian.
Ref. 292 6 p.a. £7.65

ROMANIAN REVIEW OF BIOCHEMISTRY
Articles in English, French, German,
Spanish.
Ref. 291 4 p.a. £8.50

ROMANIAN REVIEW OF GEOLOGY,
GEOPHYSICS AND GEOGRAPHY
Summaries in English, French, German,
Spanish, Russian.
Ref. 297 2 p.a. £8.50

ABSTRACTS OF ROMANIAN SCIENTIFIC
AND TECHNICAL LITERATURE
In English.
Ref. 284 4 p.a. £5.10

CELLULOSE CHEMISTRY AND
TECHNOLOGY
Studies in English on macromolecular
compounds and problems of chemistry.
Ref. 314 6 p.a. £10.20

ROMANIAN REVIEW OF VIROLOGY
Articles in English, Russian, French,
German, Spanish.
Ref. 289 4 p.a. £6.38

ROMANIAN REVIEW OF CYTOLOGY,
MORPHOLOGY AND EMBRYOLOGY
Articles in English, Russian, French,
German, Spanish.
Ref. 294 4 p.a. £6.38

Send for 1974 Subscription Catalogue.

Collet's

Denington Estate,
WELLINGBOROUGH,
Northants.