

the passage of time, growing indignation at the iniquities of selection at eighteen plus and a growing clamour for the autonomous sector to be integrated with the public sector and brought under 'social control'. As Dr. Brian Wilson says in his chapter on the needs of students, in *Eighteen Plus: Unity and Diversity in Higher Education*, "the real issue of the times is not whether we shall have more university education but whether we shall maintain university education at all".

The sixteen contributors to this symposium write mostly on topics which have already been extensively discussed. Most of the papers were, in fact, first given at a conference in September 1963, that is, before publication of the Robbins Report. They deal with a variety of topics within the field of higher education and express many different points of view. These are linked and co-ordinated by a series of interesting commentaries by Miss Marjorie Reeves, Fellow of St. Anne's College, Oxford, who also contributes a chapter on "Prestige". This unsolved problem of the relative esteem to be accorded to different institutions and courses probably does more damage to the cause of higher education than any other single factor.

Dr. G. Templeman describes the considerations which have led to increasing concentration on single-subject degree courses and makes a plea for the enlargement of our notion of university duty so as to cover wider educational responsibilities. "Do students need an ivory tower?", asks Miss Reeves in introducing Dr. Wilson's chapter on student needs. He paints a gloomy picture of threats to university values and refers to the temptation to project an image as a substitute for building a reputation; to dilution by new types of discipline; to the increasingly professionalized attitudes of academic staff; to pressure by clientele with its demand for a qualification and a good time; and to public demand, characterized by growth, status inflation and eventual devaluation. Prof. W. R. Niblett discusses further the influence of expansion on traditional values. Prof. H. Butterfield, in a chapter on the "Springs of Intellectual Vitality", describes the infectiously stimulating atmosphere of the Cavendish Laboratory of the 1920's and what flowed from this. Several contributors refer to the present gulf between the generations which is apparently less acute in the sixth form than at the university. In her chapter on sixth-form studies, Dame Joyce Bishop deplores the stultifying influence of pressure from the universities.

Mr. J. Maitland-Edwards describes the role of technical colleges in higher education, and Miss Monica Wingate the place of the training colleges (now renamed colleges of education). Mr. B. Gowenlock deprecates the "academic rat-race" of the university of to-day. Perhaps the most significant comment is by Mr. D. Jenkins, who points out that education, like war, has now become too important to be left to the experts. This is a stimulating and challenging book which merits study by all who are interested in higher education.

JAMES COOK

FRONTIERS OF CERTAINTY

Beyond the Edge of Certainty

Essays in Contemporary Science and Philosophy. Edited by Robert G. Colodny. (University of Pittsburgh Series in the Philosophy of Science, Vol. 2.) Pp. vii+287. (Englewood Cliffs, N.J., and London: Prentice-Hall, Inc., 1965.) 70s.

BYOND the *Edge of Certainty* is a collection of essays typical of much present-day thought in regions common to philosophy and science. The reader, however, will not be wholly at ease until he recollects what in fact happened to pure mathematics in the nineteenth century. During those years the modern concept of proof was born. To some it may have seemed like an almost endless proliferation of detail: nevertheless, such a view would be

wrong. What was emerging was a deeper grasp of fundamentals, and a severe tightening of the screw as to what constitutes validity. To-day, we are witnessing something of the same kind in the realm of physics, a ruthless quest for greater rigour. The search is probably more difficult than before, if only because at some stage Nature will present her bundle of brute facts, and as we try to untie it a number of intractable items always fall out. This is where the strain is greatest between those who, like Dirac, take beauty as the criterion (and indeed this is the more inspiring attitude), and those who maintain that agreement with experiment—although subject to change as technique advances—is at any moment of history the final court of appeal.

One thing is fairly clear: the progressive refinement of laboratory processes and instrumentation will not in itself resolve the dilemma, since the burden of proof lies in the nature of physical law, and the way in which we tend to interpret it. Yet the whole movement is historically conditioned: cosmic physics would be nowhere without Newton and Laplace. Equally, the quantum rises majestically from the matrixes of Hamilton, and the frustration of those who clung to the pattern of continuity to explain the behaviour of radiation. As the editor of this book observes, the pressure is now for 'fine grain', and the right to question everything.

The various authors react as follows: "Newton's First Law" (Hanson) is discussed as a means of entry into natural philosophy; it is not axiomatic in the sense of being self-evident. It needs, as it were, the constant vigil of experience to support its status as a principle.

"The Origin and Nature of Newton's Laws of Motion" (Ellis) reveals their probable Cartesian origin. They can scarcely, therefore, be claimed as a product of induction from experiment: indeed, we have some latitude of choice as is shown by the possibility of constructing different principles of natural motion. In "A Response to Ellis's Conception of Newton's First Law" (Hanson) comment is made on the contrast between kinetics and dynamics, a distinction concerned with how bodies actually move compared with how they would move in certain circumstances. "A Philosopher looks at Quantum Mechanics" (Putnam) finds no satisfactory interpretation as we know the subject to-day. It may still be necessary to go on searching for hidden variables. "The Thermodynamics of Purpose" (Hawkins) is a study in natural teleology; this includes an interesting reconsideration of the green planet Earth, envisaged as a unique heat engine. "The Physics of the Large" (Morrison) looks for a compact theory of the universe, and what constitutes the units of terrestrial life. "Problems of Empiricism" (Feyerabend) is by far the longest article in the series, and leads to the conclusion that the tenet is both incomplete and contains undesirable assumptions. The former limitation is removable if the relation between man and the universe is accepted as a cosmological hypothesis. Finally, "The Ethical Dimension of Scientific Research" (Rescher) brings us face to face with those moral problems which the success of the scientific method has forced on us. It amounts to a deliberate assertion that we are responsible for our talents, and for whatever may follow from their cultivation and deployment.

F. I. G. RAWLINS

ASPECTS OF LEARNING

How and Why do we Learn?

Edited by W. R. Niblett. Pp. 196. (London: Faber and Faber, Ltd., 1965.) 21s. net.

THIS series of essays springs from a series of public lectures given at the University of London Institute of Education. Publication in book form is perhaps a good way of making some of the lectures by this very distinguished, and very mixed, group of contributors available