someone who claimed to be a revolutionary socialist. The key to this apparent paradox can be found in what appears to be Haldane's preoccupation with religion.

In essay after essay in this collection Haldane returns to the subject of religion. It is not simply that the editor has chosen essays on religious subjects, such as "When I am Dead", "God-makers" and "Science and Theology as Art Forms". Haldane brings in Christianity, Hinduism, religious myth in general and an Egyptian fakir in particular as integral to the points he is making about history and science. To understand why this is so, we must realize that Haldane was born in the last years of Victoria's reign and his intellect was formed in the Edwardian period. The primary intellectual struggle in his view, a view shared by Marxists of the 1930s, was the struggle between materialism and

philosophical idealism. Marxism for Haldane, as for H.J. Muller, meant the fight to overturn the superstition, both scientific and social, that marked nineteenth century ideology, and its replacement by a materialist, scientific society. Part of that materialism was a belief that biological technology including eugenic measures could be instrumental in putting society on a better basis. The view seems naive to us now. If biology is to be relevant to reorganizing society, it must be the biology of what is in our heads, not what is in our gonads. Nevertheless, we must side with Haldane's desire to replace mystifying social myths by rational realities. □

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Schools of thought

Struther Arnott

Graduate Research: A Guide for Students in the Sciences.

By Robert V. Smith.

ISI Press, 3501 Market Street, Philadelphia: 1984. Pp.182. Hbk \$21.95 (North America), \$24.95 (elsewhere); pbk \$14.95 (North America), \$17.95 (elsewhere).

HERE is a programme instructing the ambitious mediocracy how to apprentice themselves to the trade of being a (US) scientific worker. It begins at the same inspirational level as it continues with the thought that "it is crucial for graduate students in the sciences to master this skill [in research] *because their advanced degrees depend upon it*". It concludes with the optimistic and self-congratulatory assurance that "you should expect to find a good position".

This is a "how to" manual with a vengeance: how to get started; how to choose a research field and a mentor; how to manage time and libraries; how to write dissertations and papers; how to get grant support and a job; even how to note rather than to take cognizance of and how to prepare a consent form for research on human subjects. Thank goodness the chapters on ethics and creativity are not "how to" ones. But there we are regaled with a re-run of Kekulé's reverie which produced the structure of benzene. Inexplicably absent is the crucial part of the dream where some of the dancing chains of atoms joined ends to form rings. Such persistence in missing the point is a general characteristic of this book.

There is a tidy-minded part of me which was impressed by Dr Smith's thoroughness in mustering many useful thoughts about our graduate schools. I and my colleagues surely would want our doctoral students,

potential and actual, to be aware of the management structures in our (usually very large) universities, to be familiar with the various opportunities for financial support, and to be chary of over-involvement in teaching and in passive attendance at courses and seminars. However, not all the wise saws and modern instances are as pleasing. Few of us would dispute that "excessive television is a deterrent to purposeful observation" but would any of us want to be saddled with protégés needing such banal advice or with disciples who would formulate the hypothesis that "sensory deprivation in human subjects is associated with increased alienation and manifested as loneliness" only after a survey comparing deaf and blind widows with widows having normal hearing and sight?

The author does assert at one point that "research... requires certain personal traits and practices. Some characteristics must already be part of the individual, some can be improved with practice". I agree completely. What strains my credulity is the implication that a beginning graduate student typically could have postponed until reading this book the acquisition and development of the traits of a successful scholar or researcher. Yet expectation of perpetual opportunity for educational rehabilitation has been a pervasive ingredient of public policy in the United States for at least a generation. Only recently has there been general recognition of the consequences, such as high schools staffed with inadequately rewarded — and therefore indifferent or demoralized teachers — graduating, not very discriminatingly, 75 per cent of their entering classes. Better paid college professors can thereafter, much more expensively, try to remedy ingrained habits of intellectual indolence. Professors condemned to ushers do not resist this marketplace philosophy nor strive to maintain system in national educational arrangements. The result is loss of rigour, in secondary and in higher education, and buffeting of both by fads and fashions. My own in-

stitution recently suffered from a neap tide of interest in computer science which briefly was the proclaimed major subject of more than half the freshman class in our School of Science. Today, that tide is receding, exposing a floundering population dismayed by its lack of quantitative training, analytical skills and capacity for sustained hard work.

A committee of the American Association of Colleges now has demanded baccalaureate programmes which would ensure that their alumni would reason well, would read, write and speak with distinction,

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would understand numerical data and the scientific method, and would have historical consciousness and knowledge of the language of the fine arts. Graduate schools, anxious for distinction, will demand at least this, as well as evidence of ability to study in depth which, as the AAC report describes, requires sequential learning, building on blocks of knowledge that lead to more sophisticated understanding and encourage leaps of the imagination and efforts at synthesis.

Now indeed may be the time for us to attend to the quality and configuration of our graduate schools. The main places of employment for holders of the PhD degree are colleges and universities. Population trends will ensure a 15 per cent fall in the traditional university student population by 1995. Scepticism about the value of some academic qualifications could accelerate this decline substantially. A shift in public policy towards investment in earlier stages of education could make the descent precipitous. Even without a revolution in public policy, there may be less than 100,000 academic positions to be filled in the next decade. Success will fall to those graduate schools which order their requirements and incentives so as to be able to recruit more discriminatingly. In such an environment, Dr Smith's book would be useful only to foreigners curious about some of the minutiae of the academic research environment in the United States.

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