sundry intellectual approaches fit together. The result is a much harder book that requires and encourages exercise. Here, for example, is an account of what association and gestalt might really have to do with one another. It is also a book that begins to be able to offend, or at least to engender disagreement. It seems to me that the early discussion of the "computer metaphor" fails to benefit from the still earlier discussion of the hardware–software distinction. The relevant comparisons are between subject and software, and so the disanalogies between wetware and hardware do not score their points.

Along related lines, I would complain about the message of the last chapter on the study of the brain's implementations. The chapter reveals two things: what little we do know about the brain comes because we have studied language functionally; and how little the study of the brain has taught us about the functional organization of language behaviour. But then this book puts at least the brighter students in a position to complain for themselves. □

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Traces of science

David M. Knight

Science and the Making of the Modern World.
By John Marks.
Heinemann Educational: 1983. Pp.507. Hbk £19.50, $23; pbk £9.50.
Science and Social Change 1700–1900.
By Colin A. Russell.
Macmillan Press, London/St Martin's Press, New York: 1983. Pp.307. Hbk £15, $25; pbk £5.95.

JOHN Marks's boldness in depicting world science from the ancient Greeks to the present has paid off. His lavishly-illustrated textbook, written in easy, didactic prose and based on secondary sources, describes how disciplines have changed and what is special about science. He picks out the stars: we have Lyell, Müller, Edison and the Royal Society, but not Murchison, Baer, Ohm or the BAAS. A genial tone of common sense pervades the volume, leading us to the conclusions that science is now indispensable, whether we like it or not; that its characteristics of open criticism, pluralism and tentativeness fit best with democratic societies; that government direction will not work; and that what the history of science shows is evolutionary rationalism and spontaneous ordering — that is, trial and error with piecemeal improvement, but no simple and universal method.

This tone might alarm those, to the left of Marks, who see science primarily as a method of social control, used to achieve or retain power and to generate deference in the working class. Especially for science during the Industrial Revolution, literary and philosophical societies have been seen as legitimizing élites while mechanics institutes produced "Uncle Tom" workmen. Colin Russell engages with this view — which can sometimes seem plausible — in his new book. In contrast to Marks, Russell concentrates on a 200-year period, and on Britain, the first industrial nation, though with chapters on France and Germany for comparison. Because of this narrower range, he can go deeper into questions, and his study is based on original material. It is particularly strong on chemists and naturalists, and their local and national societies.

Russell and Marks agree that early technology was a matter of trial and error rather than of science. Although the benefits of science were therefore hard to see much before 1850, Russell shows that the rhetoric of "useful knowledge" proved very powerful, not only with the mighty but also with Radicals and Dissenters. No distinction was made in the early nineteenth century between pure and applied science — to be applied, science had to be understood, which was (and is) difficult — but "science" and "trade" were distinguished. Elementary courses at mechanics institutes minimized theory, but did not confine themselves to awe-inspiring sciences such as astronomy: disorderly ones, chemistry and engineering for example, were also prominent.

Until recently we took government support for research and for universities for granted, but Russell shows how controversial this was a century ago. The (sometimes wealthy) amateur remained important; government money, as at Kew, meant control; self-help, using string and sealing-wax, was a living tradition; and private benefactions seemed a less sordid source of funds than politicking. The complexity of scientific institutions, and the impossibility of making easy generalizations about them, emerges from Russell as he charts the growth of specialization and of professionalization in its various senses.

For anybody wanting to know how scientists came to be the way they are, as science changed from a hobby to cultural leadership, his book can be unreservedly recommended. For the student, there is something to be said for the enormous canvas and broad strokes of Marks; but there are also good arguments for the close study of a briefer period, where we can see the normal as well as the outstanding and really come to grips with change and continuity through time. Both books well justify the view that to understand the complex activity called science we need an evolutionary, historical, perspective. □

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Practical ends

David Cohen

New Essential Psychology, a series*.
General editor Peter Herriot.
Methuen: 1984. Each book pp.150–200. Pbk £2.95, $4.95.
Learning Theory and Behaviour Modification.
By Stephen Walker.
Cognitive Development and Education.
By Johanna Turner.
Selves in Relation: An Introduction to Psychotherapy and Groups.
By Keith Oatley.

WHEN psychology developed into a distinct discipline around 1900, many of its early stars thought that it would blossom into the science to affect life. It was not long, however, before psychologists scurried back into the laboratory. Indeed, in the 1970s one social psychology journal published annual figures which showed that well under 5% of studies examined behaviour in the field. Since then, however, there has been a modest shift in attitudes, and many psychologists have again begun to take an interest in real behaviour in the real world.

The blurb for *New Essential Psychology* blazons the fact that it is out "to demonstrate the futility of [the] distinction" between pure and applied research. This sounds good. The next part of the blurb is, however, just untrue. We are told that "most major advances in psychology have resulted from its use for practical purposes". In fact, most work in learning theory, one of the most fruitful areas in psychology, has theoretical roots. And while one currently exciting field, developmental psychology, suggests that babies are born much more able than we have thought, there was no practical purposes to inspire the work. Much of it was a reaction to Piaget's ideas and yet another round in a long theoretical battle.

Having become suspicious about the philosophy of the series, I was pleasantly surprised by Stephen Walker's *Learning Theory and Behaviour Modification.* Walker gives a good account of the latest research, including that on the limits of animal intelligence. There are also entertaining chapters on how Watson affected advertising, on Skinner's behaviourist Utopia and on the way that learning theory did lead to behaviour therapy which may well be the best cure for phobias. But even Walker fails to comment on the fact that it was work with the rats in the laboratory — all of it stemming back to Pavlov — which led to practical help in the clinic.

The other two books covered here are

*Also available are *Social Interaction and Its Management,* by Judy Gahagan, and *Instinct, Environment and Behaviour,* by S.E.G. Lea.