ence. He blunders to the attack: "What we see in a painting, for example, is deeply affected by our cultural background" (p.135). But the level which is experience-free for Marr in no way corresponds to the kinds of processes involved in interpreting a painting. It is as if Rosenfield has mistaken the nature of Marr's 'primal sketch' and thought it relevant to art! In a similar vein, Rosenfield claims that anyone who learns a foreign language will "be able to categorize speech sounds in new ways" (p.111). But, for example, adult Japanese cannot learn the *ra-la* distinction which is missing from their native tongue. Some phonetic distinctions are fixed.

What does all this have to do with Edelman or Edelman with the psychology of memory? Not a great deal, I fear. If Edelman's neural groups have enough power to instantiate any one psychological theory of memory they will have the power to instantiate the others. Debates concerning the structure of cognitive processes cannot be decided at the level of the cell. This, final, reductionist error of Rosenfield's is a fitting climax to a wonderfully confused book.

Perhaps I have been too hard. The writing does have a certain gloss to it; Rosenfield writes of Sigmund Freud as if they had been chatting in a café only last week. And on the back of the dust jacket you may read Oliver Sacks: "A remarkable synthesis of the most important developments in neurobiology today". Jonathan Miller says "Israel Rosenfield has an admirable, imaginative grasp of leading issues in the neurosciences today". Finally, one John Marshall writes a short essay, ending with "The approach holds considerable promise of throwing light upon the psychobiology of human diversity and our exquisite adaptations to the ever-changing flux of individual experience. Read, reflect, enjoy!". At least he didn't say "Believe!". □

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Solid-state success

Andrew Holmes-Siedle

The Conquest of the Microchip. By Hans Queisser. *Harvard University Press: 1988. Pp. 185. $24.95. To be published in Britain in July, £19.95.*

HANS Queisser, then a young academic, left Germany for the United States in 1959. He observed the development of the microchip from two vantage points. First, that of a job with William Shockley, the inventor of the transistor, in California; and later as an employee of Bell Laboratories, where he distinguished himself with his research on electronic devices made of silicon. Spinoffs from Shockley's firm produced the research and business complex which has come to be known as Silicon Valley. Now back in Germany, Queisser has distilled his personal view into a short book. A narrative account of the history of semiconductors, it is interspersed with observations on the state of the semiconductor industry around the world and brief examples from the author's own experience.

The book was first published in German and I assume that Queisser himself has rewritten the text in English, while bringing the account right up to date. The result is a lively story which only occasionally suffers from compression of complex physical concepts into a couple of sentences. It is not an autobiography, and the author reveals little of his own life. He is, however, not afraid to draw lessons from what he has seen and to reflect on what might have been.

Queisser sees the period from 1910 to 1940, in which the vacuum triode was supreme in electronics, as a massive diversion from the inexorable march of solid-state electronics. There was a crucial time after 1910 when a solid-state triode might have been produced in Germany. The mind reels at the possible alternative courses of history.

As a European who has seen the development of electronics in many countries, Queisser can make valuable observations on why the United States and later Japan reaped many of the fruits of solid-state research which had originated in Europe. For example, Walter Schottky of Siemens in Germany gave a brilliant explanation of the current flow at interfaces between a semiconductor and a metal — a puzzle that had effectively held up solid-state physics for 30 years. Nevertheless it was at Bell Labs that the knowledge was exploited and then efficiently communicated to American firms. Queisser is merciless in criticizing the cultural traits of his own country which led to poor communication and lack of technical vision. For example, in German academic circles it seems that at one time it was almost unheard of for a theoretician to talk to an experimentalist.

Politicians, too, get their broadside: in describing the current attitudes of Japanese administrators, Queisser says "How different from American and European politicians who carefully and proudly try not to acquire the appearance of a scientific specialist or even an amateur!". This criticism is certainly valid in Britain, where politicians are rarely recruited from the scientific community. A recent speech by Ian Barron of Inmos, extracted in *Electronic Times* of 24 March 1988, criticizes the "failure of nerve" of British industrialists when investment is required. It is more than likely that the failure of nerve comes from lack of knowledge.

The sentence from the book just quoted illustrates a characteristic of Queisser's writing — the phrasing is blunt, and even inelegant, but never bereft of meaning. The author is looking for ironies and frequently finding them: the fact that an element called germanium was instrumental in the defeat of its namesake in the air war over Britain in the 1940s; and that the sublime study of the crystal has ended up making a tool for building computer games. In viewing recent history, the author senses tragedy for the West. He demonstrates that American industry, plagued by poor policy decisions, is withering inexorably under a brilliantly directed 'semiconductor war' pursued by the Japanese.

I have only mild objections to Queisser's image of the 'crystal' as the key to all success in semiconductor integrated-circuit development. We now buy, off the shelf, exactly the quality of silicon crystal we want. The leaders in the field of integrated circuits are there largely because they have developed better processing techniques. Of course good silicon is vital; but patterning of photoresist, etching, and oxide and nitride formation depend more on good apparatus and mask design than on silicon perfection. On the other hand, the author is right that no other substance, even water, has been more thoroughly investigated than the silicon crystal; silicon, as an engineering material, indeed has few rivals.

I read this book from the viewpoint of someone who once worked for a solid-state firm not many miles from Bell Labs; because of that I was able to follow the author's shorthand easily. Others may struggle a little but the significance of the subject (material for several books and hundreds of PhDs) and the penetration of Queisser's account make any such struggle richly worthwhile. □

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New in Britain

• *Bones of Contention: Controversies in the Search for Human Origins* by Roger Lewin, which demonstrates how scientists' preconceptions are at least as important to their interpretations as the fossils they are examining. Publisher is Simon & Schuster, price is £14.95. For review see *Nature* **330**, 277 (1987).

New in English

• *Murderous Science: Elimination by Scientific Selection of Jews, Gypsies, and Others, Germany 1933–1945* by Benno Müller-Hill, translated from the German by George R. Fraser. Publisher is Oxford University Press, price is £15, $24.95. For review see *Nature* **313**, 407 (1985).