be without mental powers. Most behavioral scientists cheerfully acknowledge that many animals can integrate a great deal of information flexibly, adaptively, and rapidly; we just do not know to which, if any, of these cognitive processes the animals themselves are privy.

Griffin assumes that animals are better off being conscious, that it has advantages over sleepwalking: consciousness appears important to us, so it must confer similar benefits on non-humans. Though Griffin does acknowledge that non-conscious processes appear to be our mental workhorses, he emphasizes the contribution of awareness to human behavior. Recent evidence, however, suggests that consciousness may be something of an afterthought even in humans. For example, an electrical change ("readiness potential") measured on the scalp occurs just before a voluntary movement. Libet *et al.* (*Brain* **106**, 623 [1983]) have shown that the conscious urge to make that movement occurs some 300 milliseconds *after* the readiness potential, not before. One interpretation is that consciousness is the explanation we provide *post hoc* for a subclass of neural events.

Our subjective experience of mental causality does not necessarily reflect accurately how mental and neural events are related. And the cognitive achievements of animals described by Griffin, as complex as they are, are no fancier than what humans can do without awareness. Philosophers, who are released from the burden of designing experiments, more readily agree with Griffin on the importance of consciousness to humans. Biologists, however, will be more receptive to hypotheses about animal consciousness that specify its adaptive function, the benefits that consciousness buys animals in terms of fitness. An example would be Nicholas Humphrey's idea (*The Inner Eye*, Faber and Faber, 1986) that conscious processes allow animals to model the minds of other animals and thereby better predict behavior that is of consequence to them.

There is merit in Griffin's straightforward argument that our own phenomenology tells us that consciousness is real. Because of our knowledge of our own consciousness, we are naturally curious about which other creatures might be conscious as well. Griffin does a marvelous job of encouraging and directing that curiosity. But appealing to continuity of mental experience between humans and non-humans is not enough for a science of awareness. Methods must be devised for trapping the ghost of consciousness in a bottle. It isn't a project I'd recommend to anyone without tenure.

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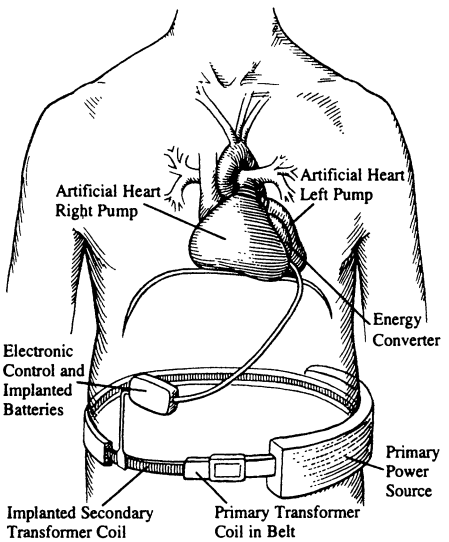
Devices and Incentives

Managing the Medical Arms Race. Public Policy and Medical Device Innovation. SUSAN BARTLETT FOOTE. University of California Press, Berkeley, 1992. xiv, 286 pp., illus. $35.

The United States spends more on medical devices—technologies that range from tongue depressors to multi-million-dollar CAT scanners—than any other industrialized nation, and the acquisition of costly and underutilized equipment has been identified as one of the drivers of escalating health care costs. At the same time, devices such as CAT scanners and pacemakers have dramatically improved the quality of life for thousands of patients, and technologies now under development promise further breakthroughs in medical practice. Grappling with the issues involved in framing public policy in the medical device industry is thus both central to the larger health care debate and a reflection of it. While on the one hand we lament the escalating costs of health care, on the other we demand open access to the latest technologies. We want our cake, but we don't want to pay for it.

Foote's book demonstrates the ways in which these incompatible demands have shaped a maze of federal policies whose full impact cannot be easily gauged. *Managing the Medical Arms Race* is a well-written introduction to the plethora of public policies that have shaped innovation in medical devices. Foote shows that public policy toward the industry has reflected the sharp divide that characterizes the current health care debate. On the one hand, the federal government—through agencies such as Medicare and Medicaid and the National Institutes of Health—has actively encouraged the development and dissemination of new techniques. On the other, regulatory policy and recent efforts to reduce reimbursement rates have sometimes severely hampered innovation.



"A fully implanted artifical heart system." [Reprinted in *Managing the Medical Arms Race* from *Artifical Heart and Assist Devices: Directions, Needs, Costs, Societal and Ethical Issues* (National Institutes of Health, 1985)]

For example, Foote suggests that through the 1960s and '70s government payment policies "promoted widespread diffusion of medical technologies regardless of cost." As one example she instances the case of kidney dialysis. In 1972 Congress amended the Social Security Act to provide for federal reimbursement for nearly all the costs of dialysis for virtually everyone with end-stage renal disease. In 1972 the program cost the government $242.5 million. By 1983 it cost Medicare $2.2 billion and supported a flourishing and profitable market in equipment such as artificial kidneys, delivery and monitoring equipment, and disposable equipment such as blood tubing and connectors.

Turning to the ways in which federal policy has restricted innovation, Foote suggests that in some cases the burden of meeting the requirements of the Food and Drug Administration may have kept innovation from the market or may have dramatically slowed its introduction. She also documents in some detail the effects of recent pressure to curb spending on Medicare and Medicaid on device innovation. In the case of cochlear implants, for example, a federal decision not to reimburse hospitals for full costs appears to have thrown the future of the industry into considerable doubt.

Foote's book is a welcome contribution to the health care debate and clearly demonstrates that there can be no easy answers to the questions it raises. Through a host of well-presented examples she shows that public policies affecting the industry have been shaped in widely differing arenas, that they have addressed quite different concerns, and that they have often had quite unexpected implications. She makes us fully aware of the complexity of health care policy and the difficulties inherent in framing a coherent response to the current crisis, and she raises a host of complex and disturbing questions that must be addressed.

The book's major weakness is its failure to provide us with a coherent framework for framing or evaluating policy. Has federal policy encouraged too much innovation? Too little? Foote shows us that some government policies clearly inhibit innovation while others encourage it—but since, as she demonstrates, inhibition is appropriate in some cases and inappropriate in others, the simple distinction between "inhibit" and "encourage" cannot be used as a guide to

policy. It is to be hoped that Foote and others will build on the richness of her description of the issues involved in medical device regulation to lay the guidelines within which appropriate public policy can be made.

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