

coveries in science are made by single-minded enthusiasts, not by debunkers. As Bernard Shaw observed, all progress depends on the unreasonable man.

Chapter 8 reviews the claims of Sasquatch-like creatures in other parts of the world. Krantz points out that only man and his accompanying domesticated animals are so widely distributed as these reports: "when it is suggested that a wild primate is found native to all continents, including Australia, then credibility drops sharply.... Beyond a certain point, ... the more widespread a cryptozoological species is reported to be, the less likely it is that the creature exists at all" (p. 197).

Chapter 9 tells of the hunters of Bigfoot and their motives. Krantz distinguishes novices, "tranquilizers," "recorders," and "'professionals,'" giving vignettes in which anyone who knows anomalists will recognize characteristic types. In Chapter 10, the attitude of science to this (and similar) matters is examined, and Krantz gives some autobiographical details of how he has been able to survive in academe while taking his quest so seriously.

Chapter 11, "Prospects" for settling the matter, is again worthwhile non-technical reading for everyone, with ingenuity, logic, and objectivity deployed toward what most people would judge to be a very unlikely prospect.

I recommend this book unreservedly to those interested in anomalies in general or Bigfoot in particular. Anyone is likely to disagree with Krantz at a few points, but no one will be disappointed to have read the book.

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**Striking the Mother Lode in Science: The Importance of Age, Place, and Time** by Paula E. Stephan & Sharon G. Levin. New York: Oxford University Press, 1992. 194 + xiii pp. \$29.95. ISBN 0-19-506405-4.

The explicit focus of this book, defined in its sub-title, may seem quite specialized but the book is worth reading by anyone interested in the nature of contemporary scientific activity. In particular, the last chapter offers sensible suggestions for a wide range of public policies about schools and universities. Moreover, the presentation is commendably readable and free of jargon.

The authors are economists, and some of their stand-points are a refreshing change from those usually taken by sociologists or philosophers. Thus one reason why a professor's productivity might decrease with age, they point out, is that the cumulative rewards to be expected from a given effort are less, the older one is. On occasion, though, the economist's viewpoint is more troubling

than illuminating, as when joint ventures between industries and universities are recommended for these fiscally difficult times without any hint that disadvantages brought in by the inherent conflicts of interest might outweigh the benefits. In my view, the most promising way to harness increases in knowledge to profitable application is not by unnaturally hybridizing universities and businesses but by making public policy that fosters the establishment of places like Bell Telephone Laboratories used to be, before arguably the most counter-productive anti-trust action ever pursued by the U.S. government. Overall, however, the authors' viewpoints and assessments will seem eminently reasonable and informed to empirically minded people who are knowledgeable about research and universities.

The book includes quite a large and rather an eclectic bibliography that will likely lead to further reading by people with a variety of interests. Thus my general interest in factors that distinguish the practices of the various scientific (and other scholarly) disciplines led me to follow up several references to differences in the effect that age has in different fields; as well as the finding by psychologists that "certain types of mental illness may foster creativity in fields such as literature and art [but] there is no evidence that this is true in science" (p.41).

The vexed question of what society actually gets from basic research is discussed on the basis of some recent studies by economists (pp. 84-88). It is perhaps heartening, for those who have been trying to sell science in terms of its spin-offs, to read the current best estimate that some 213 or 314 of basic economic growth can be attributed to gains in knowledge; they ought however to practice caution under the recognition that the relevant knowledge gains occur a couple of decades earlier than the pay-off, and that since knowledge is universal, economic growth in a given country does not require that the basic research also be done there — as the case of Japan illustrates perhaps most dramatically.

The book reports and discusses a number of studies about productivity and age, including a comprehensive and lengthy one carried out by the authors themselves. They analyze convincingly the various factors that might lead to decreased productivity with age as well as factors that, being age-related, might masquerade as such an effect. Different cohorts of scientists, similar in all other respects, might find themselves entering job markets varying from depressed to expanding, and with the availability of research funds anywhere between ample and almost non-existent; so that at any given time, scientists of different ages might show greatly differing records of achievement that have nothing to do with differences in their personal qualities or their ages as such but simply the societal circumstances under which they began their careers.

Again, the authors point out, cohorts could come in different vintages: those trained just as new breakthroughs are being digested might naturally feel in the swim of things for their first decade or two of research, and do very well; whereas other cohorts, trained in the old ways just before new ones take over, might be unable to re-train themselves or to adopt new viewpoints with full

success. Furthermore, the average quality of scientists in a given cohort will depend on the proportion of students who go into science rather than engineering, medicine, and so on. When the number of scientists expanded rapidly, doubtless there was a concomitant lowering of average quality and motivation. After employment opportunities had declined sharply, fewer students chose to study science but these were no longer the cream of the crop as, by and large, they had been just after World War II.

The last chapter of the book is a fine summary; and lazy or hurried people might well read this chapter first and then delve into the rest of the book as the mood strikes. Findings are summarized and policy suggestions made. There is indeed typically a decline in research productivity with age, but it explains only a small part of the total productivity; the time-line is different in different disciplines; the decline is clearest for the most notable discoveries and the most eminent people, whereas journeyman researchers may decline very little in output over the years. Vintage effects, though so reasonably to be expected, were not clearly found — though that could be because it is so difficult to separate them from the other factors. Cohort effects are clearly present, but not always in the direction at first expected. "RPRT" — being at the right place at the right time — is of prime importance in science, and many factors relevant to that come into play for every budding scientist.

Suggestions for national policy are so straight-forwardly germane and sensible that they are hardly likely to be adopted. The authors remind us that our elementary and high schools do far worse than schools in other developed countries in inducing competence in mathematics and science; and the colleges cannot make up for that. I also agree wholeheartedly with the authors that the apparatus of doctoral-granting universities and Ph.D.-producing departments has expanded far too much and should be thinned down. Surely there will be few scientists disagreeing with the authors that competition, desirable in itself in science as in other matters, has become so intense nowadays in basic research in the United States as to be clearly dysfunctional. Given that there is no prospect at all for significant increases in overall funding, just for that reason alone the size of the research enterprise needs to shrink. But the authors point out too that much of the present trouble stems from a history of large increases in funds followed by cut-backs, and that any major increases now or in the future will inevitably be followed again by cut-backs. Rather, they recommend that a steady increase of 4 to 5% annually, guaranteed over periods of decades, would be both affordable and also offer the best climate within which universities could readjust to a more manageable and appropriate regimen of research activity.

This is an enlightening, fresh, sound, well-written book.

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