existing ecocultural system. This kind of use of the concept of adaptation, in which the maintenance of the system seems to assume greater analytic reality than the survival of the population, seems particularly dangerous when applied to warfare. It is a weakness that can also be discerned in approaches used by some general systems analysts with regard to contemporary defense planning.

This problem aside, however, Vayda's book makes a significant contribution to our knowledge of primitive warfare by bringing together data of considerable interest. It must also be noted that his approach, however questionable its assumptions, has been instrumental in the gathering of important kinds of ethnological and ecological information that most other anthropologists either have overlooked or have investigated inadequately.

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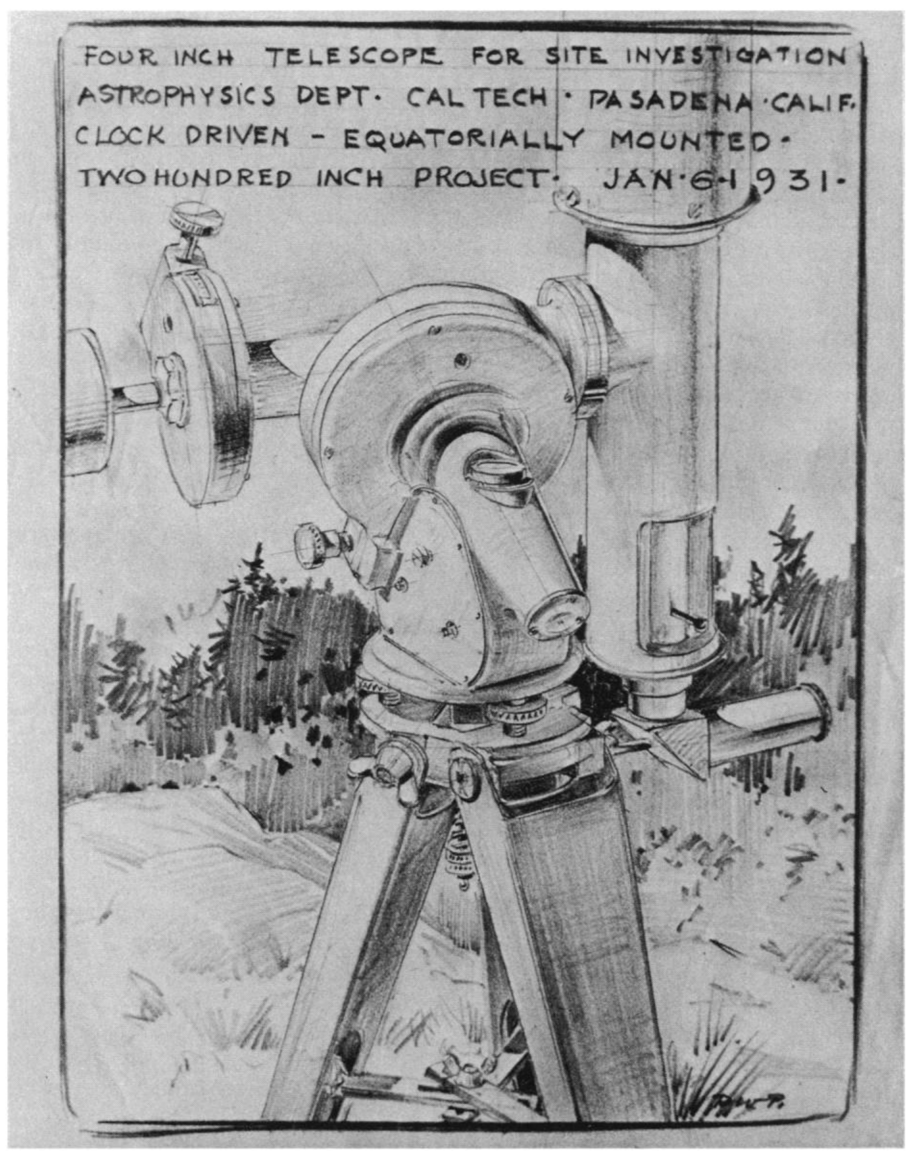
Adventure and Telescopy

Russell W. Porter. Arctic Explorer, Artist, Telescope Maker. BERTON C. WILLARD. Bond Wheelwright, Freeport, Me., 1976. xiv, 274 pp., illus. $12.50.

To many people Russell W. Porter is best known for his superb drawings for the 200-inch Hale telescope. Others remember him as the "patron saint" of amateur astronomers. Yet long before he became interested in astronomy, Porter, an architectural student at the Massachusetts Institute of Technology, was pursuing the "white goddess" that led him, as artist and surveyor, in search of the North Pole. His explorations took him from Greenland (with Frederick Cook) and Baffin Island (aboard Robert Peary's ship) to Franz Josef Land with the Baldwin-Ziegler expedition, then with Anthony Fiala on a whaler that was crushed in the arctic ice and sank, stranding the explorers for years. During those long winter nights in the "land of desolation," as he made astronomical observations to determine time and position, Porter gained an enduring love of the stars.

Berton Willard, an explorer and member of the Springfield Telescope Makers (an amateurs' club founded by Porter in Springfield, Vermont) has told well the story of his subject's varied and adventurous life. His account of Porter's polar explorations is based on Porter's own account, "Arctic Fever" (shortly to be published by the University Press of Virginia under the title *The Arctic Diary of Russell Williams Porter*), and is illumined by Porter's fine drawings, watercolors, and photographs. Willard tells how Porter, on his return from the arctic, became fascinated by the art of making mirrors and telescopes and, with his contagious enthusiasm, inspired countless others to flock to Stellafane, the Springfield Telescope Makers' headquarters. This story not only will interest those amateurs who have been caught up by this hobby, it should also inspire others to follow in their path. "Nothing," said Porter, "gives me more satisfaction than realizing that I have helped towards giving thousands of people the pleasure of creating with their own hands a tool to unlock the wonders of the heavens."

Through their common interest in telescope making, a friendship developed between Porter and Albert G. Ingalls, editor of the *Scientific American*. This led to the publication of the volumes of *Amateur Telescope Making*, edited by Ingalls, to which Porter contributed several chapters. This, in turn, led to a meeting in early 1928 with George Ellery



Drawing by Russell W. Porter of a telescope he designed for use in the 200-inch telescope project. Porter's first task as a member of the staff of the project "was to design a small telescope to be used for 'seeing tests'. . . . This was a four-inch refractor with a magnification of 750 diameters. A telescope with such a large magnification allows an observer to study the diffraction rings about a star image and to measure image motion due to the turbulent atmosphere. In this way he can assess the ability of the atmosphere to pass steady and sharp images at any desired site. As a matter of convenience Porter designed the refractor to look only at Polaris. Ten or twelve telescopes were finally made and used for testing sites throughout the southwestern United States in 1929 and 1930." [From *Russell W. Porter: Arctic Explorer, Artist, Telescope Maker*]

Hale, director of the Carnegie Institution of Washington's Mount Wilson Observatory, on plans for a 200-inch telescope, and soon after with Francis G. Pease and John A. Anderson of the Mount Wilson staff (who were not, as Willard suggests, Caltech astronomers). Through the agreement, by which the Rockefeller Foundation gave the initial $6,000,000 for the 200-inch project, the planning, construction, and operation were to be carried out jointly by the Carnegie Institution of Washington and the California Institute of Technology. (The observatories on Mount Wilson and Palomar Mountain have now been named the Hale Observatories.) Porter's connection with the project, originally expected to last a few months, lasted more than 20 years. His contribution as "Associate in Optics and Instrument Design" is graphically illustrated by his skillful "cut-away" drawings for the various instruments and buildings, including the 200-inch dome. The telescope was dedicated on 3 June 1948. Porter was ill and could not be there. He died on 22 February 1949.

Willard includes a bibliography but, unfortunately, no index. In general the details are accurate. This biography can be recommended to any reader who is interested, as Porter was, in the exploration of remote regions of the earth and distant regions of the sky.

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Tumors and Embryogenesis

Teratomas and Differentiation. Proceedings of a symposium, Nutley, N.J., May 1975. MICHAEL I. SHERMAN and DAVOR SOLTER, Eds. Academic Press, New York, 1975. xviii, 324 pp., illus. $16.50.

Nothing matches the development of an embryo for complexity, beauty, and elegance. Each cell of a very early embryo is like a ball rolling down a mountainside, with time taking the place of gravity. The descendants of each cell end up at the base as one or another irreversibly differentiated part of the organism. A teratoma is a tumor made up of levitating cells, poised at the top of the mountain, sending progeny down without losing the ability to send off more: the totipotent cell forever. Thus the teratoma is not only a tumor, but also a marvelously manipulatable travesty of normal embryogenesis. As such, it has been discovered by many different sorts of developmental and molecular biologists in the last few years. There are not many groups in modern biology who can summarize their work in less than 300 pages, as the teratoma workers have done in this book. I suspect this was their last chance to do so.

The book comprises the papers presented at a meeting at the Roche Institute. There is an introduction and a paper on terminology. The rest of the papers are assembled by topic: Embryo-Teratoma Relationships, Surface Antigens on Embryos and Teratomas, Teratoma-Host Interactions, Control of Differentiation of Embryonal Carcinoma Cells, Properties of Embryonal Carcinoma Cells, and Properties of Teratomas *in Vitro*. Both in vitro and in vivo studies are represented.

The laboratories of Boon, Sherman, Martin, Levine, and Ephrussi report on their success in harnessing the process of differentiation of the tumor cells in vitro. It has apparently become routine to select cloned teratoma cell lines showing various differentiated states. The biochemical characterization of these cultured descendants of the embryoid body is well under way. Interestingly, most, if not all, cultured differentiated lines of teratoma origin are unable to make tumors when they are injected into susceptible host mice.

Work in vivo has been concentrated on the antigenic and morphological similarities between normal early embryos and embryoid bodies. Although there are many such similarities, a major difference between these two cell masses remains: only embryoid bodies have the capacity to form tumors. Therefore the most surprising and novel contributions in the book must be those from Philadelphia. In separate studies, Mintz, Illmensee, and Gearhart, of the Institute for Cancer Research, and Brinster, of the University of Pennsylvania, have apparently shown that a normal embryo can normalize tumorigenic teratoma cells. That is, they have used Stevens's teratoma embryoid body cell populations to demonstrate that a teratoma is a form of cancer that has a totally reversible loss of growth control.

Mintz *et al.* and Brinster dissected embryoid bodies into their core cells and their rind of differentiated endothelial cells. The core cells are the germ cells that give rise to all differentiated types. By mating C57 white mice, they obtained blastocysts, into which they injected clumps of core cells from teratomas from black mice of strain 129. The hybrid embryos were then reimplanted in the uteruses of foster mothers (also white), and the pregnancies were permitted to go to term. Normal mice were born that were mosaic in coat color. Furthermore, the male mice born of these constructed hybrid embryos were fertile, that is, they made normal sperm and produced some F_1 black mice when mated to female hybrids. Since the mice were normal in every way, we must conclude that these descendants of tumor cells were normalized by the environment of the normal mouse embryo.

Beautiful as these results are, their potential importance lies in the possibility of combining them with the sort of studies that fill the rest of the book, those on the culture in vitro of the differentiated descendants of teratomas. If the implantation results are confirmed and other studies are carried out with cultured teratoma cells, one would expect future implantations to be carried out with cultured diploid cells that have received DNA sequences obtained by cloning in prokaryotic organisms. That would, it seems to me, be the technology for carrying a known DNA sequence directly through a prokaryote vector for amplification, then through a mammalian cultured cell for integration into the mammalian genome, and then through blastocyst injection and reimplantation of an embryo for stabilization in a whole mammalian organism. Although this bypass of evolution has not yet been accomplished, the book provides an experimental context for carrying out such work. I suspect that this context will become increasingly important to all biologists.

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Statistical Induction

Perspectives in Probability and Statistics. Papers in Honour of M. S. Bartlett on the Occasion of His Sixty-Fifth Birthday. J. GANI, Ed. Applied Probability Trust, Sheffield, England, 1976 (U.S. distributor, Academic Press, New York). viii, 424 pp. $21.

The first half of this century witnessed the major developments in the theory and methods of statistical induction. The pioneering contributions made in England by Karl Pearson, Ronald Fisher, Jerzy Neyman, and Egon Pearson are widely recognized and revered. One