The subject of solitons in proteins and nucleic acids is rather thoroughly discussed by proponents of the notion, with seven of the 29 papers in the volume devoted to the subject. I use the popular term "soliton" to encompass the broader phenomenon of nonlinear dynamics and solitary waves. A paper by D. W. McLaughlin gives an excellent introduction to solitons and describes the properties that a soliton must possess if it is to exist in any particular system. J. A. Krumhansl and D. M. Alexander lucidly continue the development of the subject and demonstrate how the theory can be applied to macromolecules, namely double-stranded nucleic acids. H. M. Sobell *et al.* go on to use these ideas in postulating mechanisms for some dynamic processes entailing nucleic acids.

The major problem with the idea that there are solitons in biopolymers is that no one has presented an experiment that would definitively prove that they exist. A. C. Scott has addressed this problem in the case of proteins at least to the extent of making a connection with quantitative experimental results. Specifically, published laser-Raman scattering results below 200 cm^{-1} from *Escherichia coli* K-12 cells are considered. Some of the spectral lines are ascribed to internal vibrations of alpha-helix solitons. However, there are so many lines in the spectrum, the majority of which are not attributed to solitons, that the evidence is weak. Furthermore, no attempt was made to rule out other potential sources of the lines.

A group of papers scattered throughout the volume explores the "breathing" motions of nucleic acids and protein. Breathing motions are the putative causes of observed hydrogen exchange experiments. Experimental studies of proteins are described in a paper by S. W. Englander and J. J. Englander on hemoglobin and one by C. M. Dobson on lysozyme. The paper by the Englanders discusses selective tritium labeling of a protein at functional sites as a means of investigating the validity and nature of local unfolding models. In a nice bit of work, P. A. Mirau and D. R. Kearns obtained the imino hydrogen exchange rates and activation energies for a series of DNA double helices using proton nuclear magnetic resonance relaxation measurements. The results permit some generalizations regarding the effect of sequence and conformation on the exchange process. G. S. Manning has developed an interesting model relating bending and breathing motions in DNA. In this model, the breathing motion of a single base pair predisposes the double helix to bend or kink at that point. It is demonstrated that the model is consistent with experimental results.

Among papers in this volume to be commended is an excellent presentation by R. E. Dickerson, M. L. Kopka, and H. R. Drew, who introduce concepts to be considered in searching for generalities of sequence-dependent DNA conformation and dynamics. Available x-ray crystallography results are examined to obtain some structural rules.

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Pioneering Computers

Reckoners. The Prehistory of the Digital Computer, from Relays to the Stored Program Concept, 1935–1945. PAUL E. CERUZZI. Greenwood, Westport, Conn., 1983. x, 182 pp., illus. $29.95. Contributions to the Study of Computer Science, no. 1.

Acting on the premise that if we know where we've been we can have a sharper perception of where we're going, the author examines in this partly technical, partly historical account four pioneering contributions to computer technology: the electromechanical computers of Konrad Zuse in Germany, that of Howard Aiken at Harvard (the Mark I), the relay computers of George Stibitz at the Bell Telephone Laboratories, and the electronic ENIAC of John Mauchly and J. Presper Eckert at the University of Pennsylvania.

The physical characteristics and the independent historical antecedents of each are presented. For each of the four, Ceruzzi describes the hardware components and how they worked; the keyboard and display (input and output) facilities; the ways in which each set up physical analogs of arithmetic quantities and "calculated" with them; the reliability and internal-checking features; the programming techniques employed; the peculiar research and development problems encountered and solved; and the special uses to which each computer was put.

Readers already knowledgeable concerning the machinery and internal functioning of computers will find satisfying details on these prototypes. Those unfamiliar with how computers can carry out typical basic chores or how basic computer-design problems may be met will find lucid introduction and explanation, supplemented by helpful glossaries, an appendix, and historically valuable chapter-end notes and bibliography.

The author's four examples present scientific creativity and mechanical invention as both personal and social phenomena, chancy and unpredictable in their occurrence and in their consequences. "The key concepts of computing were discovered independently in different places by different persons," Ceruzzi notes when reviewing Zuse's achievements (p. 40). Aiken's contribution to the mainstream of computer design progress was "an impressive first step" that had no consequences after 1950 (p. 69). AT&T was involved in computer technology from the beginning, yet it "stands outside the direct ancestral line that leads to the modern computer" (p. 101). The ENIAC machine, for all its importance as the first electronic digital computer, "never strayed far from numerical integration of differential equations" (p. 128), but the speed, power, and promise of its operation confirmed growing enthusiasm about the future of this new programmable machine.

Because Ceruzzi's major interest is historical, he subordinates the description of hardware and programs to the task of explaining how certain strategic creative efforts undertaken by inventors set the stage for the "computer revolution." In particular, he suggests (chapter 6) that toward the end of that first decade ideas of reckoning—that is, theory—provoked by the hardware became more important than the machines themselves and moved to the center of historical action as a consequence of the invention of the stored program. Turing in a paper of 1936 had already seen the advantage of the stored program that mixed data and instructions without confounding the operation of the machine. But, Ceruzzi argues, it was not until design discussions involving Eckert, Mauchly, and von Neumann stimulated von Neumann to issue his famous "First Draft of a Report on the EDVAC" in 1945 that "an understanding of the true nature of computing emerged" (p. 132).

This notion provides an appealing romantic climax to the decade: von Neumann—who "broke with Eckert and Mauchly," we are told softly (p. 139)—plays the genius hero, and Zuse stands in the wings as a backup with his *Plankalkul*, waiting for history to recognize him.

But Ceruzzi has so effectively presented the case that "it was against the background of those early machines that the theory first took form" (p. 147) that the thoughtful reader may well wonder what else was going on and whether

Ceruzzi's theme of the alternating dominance of machines and theory sufficiently accounts for what happened. Highly informative, this little book is the provocative, promising first in a new series, Contributions to the Study of Computer Science.

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Cancer Genetics

Inheritance of Susceptibility to Cancer in Man. W. F. BODMER, Ed. Oxford University Press, New York, 1983. vi, 192 pp., illus. $26.95. Originally published in *Cancer Surveys*, vol. 1, no. 1.

At the level of the cell, cancer is a genetic disease; but, like many genetic diseases—even single gene traits—in human populations, it is not conspicuously familial, especially in these times of small sibships. Further, in a fine overview to this slim collection of eight highly specific chapters, Bodmer shows how a postulated gene for susceptibility to Hodgkin's disease that increases the risk of the tumor to 5 percent in heterozygotes and 100 percent in homozygotes would give a chance of only one sib in 400 being affected. Such a gene may exist. Dusset and co-workers propose a major susceptibility locus in the HLA region of human chromosome 6, labeled *R-HOD* (dominant resistance to Hodgkin's disease), that is analogous to the locus near murine H2 that alters susceptibility to virus-induced tumors. Their evidence is based on the frequent occurrence of HLA identity in sibs with Hodgkin's disease.

Not at all encyclopedic, the coverage has, nonetheless, the great strength of illustrating interdisciplinary approaches to the cancer problem. A paper by King summarizes preliminary segregation and linkage analyses of 15 large kindreds with breast cancer by a team of clinicians, epidemiologists, and geneticists. In 11 of the 15, the analyses suggest the action of a major dominant gene with possible linkage to the locus for the red blood cell enzyme glutamate pyruvate transaminase. (The final analyses, reported in *J. Natl. Cancer Inst.* **71**, 455 [1983], weakened the evidence for linkage but not the utility of the approach.) The two best chapters are critical summaries of the literature, as one might expect in a review volume. One deals with constitutional deletion of chromosome 13 with retinoblastoma and of chromosome 11 with Wilms's tumor and the other with the diverse cellular abnormalities in xeroderma pigmentosum and ataxia-telangiectasia, the classic genetic disorders that linked in vitro radiosensitivity and DNA repair to human carcinogenesis. Other chapters are much less critical, summarizing individual research programs on, for example, the genetic epidemiology of prostatic cancer in Utah, in vitro markers of the polyposis coli genes, and cancer in Danish twins.

The chapters touch on much of cancer genetics—but as it was in 1981, before the discovery of the human oncogene, which gets one page of speculation without specifics. Those who want to own this volume, or suggest it to their librarians, will be glad they passed up the first issue of the journal *Cancer Surveys* at $29. Except for soft covers, the journal issue contains the same papers and production errors as the book. Some unfortunate purchasers may not discover this marketing ploy until they have in hand a second copy of identical, somewhat outdated material.

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Reptilian Biology

Advances in Herpetology and Evolutionary Biology. Essays in Honor of Ernest E. Williams. ANDERS G. J. RHODIN and KENNETH MIYATA, Eds. Harvard University Museum of Comparative Zoology, Cambridge, Mass., 1983. xx, 725 pp., illus. $69.

Reading this festschrift is much like reading straight through half a dozen issues each of the *Journal of Herpetology* and *Evolutionary Theory*. The diversity of subjects with which authors chose to honor Ernest E. Williams must surpass even Williams's broad interests. Studies of systematics, morphology, zoogeography, ecology, behavior, evolution, and conservation are included for protozoans, insects, salamanders, frogs, turtles, rhynchocepalians, lizards, snakes, crocodilians, birds, monkeys, and bats. The majority of papers deal with amphibians and reptiles.

The introduction by P. E. Vanzolini captures the sense of Williams as a person and scholar and of the ideological framework of the times in which Williams has been and continues to be an active scientist, curator, and teacher. The tone set by the introduction is not consistently maintained in the rest of the book. Most of the papers are of interest only to specialists. From my bias as an anuran systematist, the papers of general interest are few and scattered. A good example of how detailed morphological analyses can be used to answer questions of relationships is presented in Peterson's study of toe pad structure of the lizard genus *Anolis*. Scientists interested in population dynamics and experimental zoogeography will profit from the following: the article on the annual cycle of a lizard by Rand, Guerrero, and Andrews; the report of experiments on lizard dispersal by Schoener and Schoener; the reassessment of *Anolis*-bird competition by Moermond; and the account of studies of the social behavior of *Anolis valencienni* by Hicks and Trivers. Two of the papers of general interest would not have appeared in their present form in a normally refereed journal. McDowell presents an interesting interpretation of penial function in pleurodire turtles, which is a good example of how ideas can be generated from morphological observations. His paper uses the rationale of hypothesis testing to avoid the examination of important additional specimens readily available to him. In spite of that and an unedited pontifical style, McDowell's paper is of interest in informing us of his conclusions; the scientific community is served by its publication. Estes's paper on fossil lizard distributions is of similar importance because it represents his current interpretations, just after a period of intensive review and examination of all fossil lizards. His cladogram of lizard familial relationships, critical to his zoogeographic scenario, would require precise documentation in a rigorously refereed journal. A festschrift has the option of capricious review, and the cases of the Estes and McDowell papers argue for the continuation of the tradition. The price paid for this latitude is, of course, marginal or outright lousy papers, and some of these also occur in the Williams festschrift. In terms of evenness, this festschrift is not a fitting tribute to a scholar whose work has been an example of consistently high quality.

Those who maintain general herpetological libraries will want to own the well-produced, attractive book. Those interested in a few papers will do better to ask their institutional libraries to order a copy, because the Museum of Comparative Zoology did not allow separates for authors.

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