factions of this "revolutionary" movement. He has made significant contributions both to theoretical population genetics and to the analysis and interpretation of molecular data. To a great extent, *Molecular Population Genetics and Evolution* is a chronicle of his work and that of his colleagues in arms. It is also an up-to-date, albeit somewhat biased, introduction to the subject and to contemporary evolutionary genetics at large.

The book treats both the theoretical and the empirical aspects of population genetics. The relevant mathematical theory is presented in sufficient detail to give those not familiar with it a good notion of the major points and general flavor of this approach. As the author states, in most cases an effort has been made to minimize the difficulty of the mathematics presented, and it is possible to get a fair amount out of the book even if the two primarily theoretical chapters are avoided. However, the theoretical and empirical aspects of population genetics are so intertwined that a deep understanding of the subject requires at least some knowledge of its mathematical foundations. The book includes a lucid presentation of the logic behind the use of molecular data for population genetic studies and a good summary of the relevant aspects of molecular biology. Extensive consideration is given to the use of protein data for the analysis of gene differences among populations, a subject to which Nei has made a major contribution. In addition to the book's primary concern with microevolutionary phenomena, there is substantial consideration of speciation, evolution beyond the species level, and the evolution of genetic systems. Finally, and most significant, there is an extensive and up-to-date bibliography of the field.

I believe that this monograph can serve both as a reference for evolutionary biologists and as an introduction to this subject for advanced students. A word of caution is warranted, however. Currently "molecular population genetics" is in the midst of a controversy. Most of the protein polymorphism and molecular evolutionary rate data can be explained theoretically by two quite opposing hypotheses: (i) natural selection, and (ii) random genetic drift of selectively neutral and near-neutral alleles. Nei is firmly in the neutralist camp. This is most apparent in the book's concluding section on adaptive and nonadaptive evolution, a neutralist position statement which, I believe, will go a long way toward clearing up many of the misunderstandings of this hypothesis. Nei's bias is also reflected to a certain extent in the choice of material used, but most predominantly in its interpretation. He does, however, present the major selectionist arguments, acknowledges the action of selection when the evidence for it is unambiguous, and concedes the difficulty of distinguishing between these hypotheses with existing theory and data.

In no way do I believe that the biases detract from the significance or utility of the book. I just hope that the high price the publishers are charging will not preclude its reaching the large audience it deserves.

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The Biology of Cancer

Carcinogenesis as a Biological Problem. I. BERENBLUM. North-Holland, Amsterdam, and Elsevier, New York, 1974. xxviii, 376 pp., illus. $34.75. Frontiers of Biology, vol. 34.

Developmental Aspects of Carcinogenesis and Immunity. Proceedings of a symposium, Manhattan, Kans., June 1973. THOMAS J. KING, Ed. Academic Press, New York, 1974. xvi, 218 pp., illus. $8.95.

The seemingly obvious but complex relationship between neoplastic growth and normal cell differentiation has drawn biologists, and especially developmental biologists, ever closer to the cancer problem. These two books, one a monograph by a single author and the other the proceedings of a symposium, are attempts to integrate and put into perspective the new information that has resulted.

The first book takes the more comprehensive approach and treats neoplasia as a general biological problem; the second deals with the broad subjects of tumorigenesis and immunity but deals with them as a developmental problem.

The carcinogenic (chemical agent) approach and the oncogenic (viral agent) approach to cancer research have given it the character of a two-lane highway, both lanes traversing the same ground but often in opposite directions. Thus in *Carcinogenesis as a Biological Problem* Berenblum has chosen to treat the two approaches separately, for each giving a historical account of its origins, followed by a summary of contemporary studies, theories, and clinical implications.

Experimentation with chemical carcinogenesis "began" in 1918 as a result of the general observation that carcinomas arose in the presence of coal tar. It was not until 1933, however, when Cook *et al.* synthesized the first pure carcinogenic agent, that research models became applicable to clinical situations and cancer research was brought to the fore.

Speculation about viral origins of cancer, on the other hand, arose from theories of bacteriology that, as early as 1903, postulated the presence of microorganisms smaller than bacteria. Though researchers on viral oncogenesis were limited to light microscopy until after World War II, Rous's experiments with cell-free filtrates in 1900 gave strong impetus to the viral theory of tumor origin. One important difference between chemical and viral theories of oncogenesis is that the viral theory attempts to explain the process of cancer, whereas the chemical theory would explain only the onset of the disease. Perhaps the complexity of the disease justifies both approaches.

The major considerations of the book are contemporary studies of most known carcinogens, chemical and viral. The treatments of the many agents, influencing factors, and theories are necessarily brief, but the brevity is offset by extensive lists of references following each chapter. It must be mentioned at this point that unfortunately few of the references postdate 1970. Nevertheless, in this field where knowledge grows almost hourly, the monograph provides a thorough background up to the last few years' work.

The purpose of the 32nd symposium of the Society for Developmental Biology, of which *Developmental Aspects of Carcinogenesis and Immunity* is the proceedings, was "to bring into central focus recent advances in carcinogenesis and immunity and emphasize their relationship to fundamental processes of developmental biology."

Reflecting the divisions of the symposium, the book is divided into five sections, each presenting at least two reports. In the first section evidence for the multipotentiality of the tumorous state is presented by Pierce (benign cells within malignant tumors) and by Meins (tumor reversal in crown gall).

The second section considers cell proliferation, differentiation, and neoplasia. Included is a detailed report by Pitot which discusses neoplasia as a function of altered messenger RNA template stability. Temin and Kang complement this report in a later section with their evidence for RNA-directed DNA polymerase activity in normal cell differentiation.

In another section of the book, virus-mediated transformation in vitro is dealt with broadly by Rapp, and the curious failure of other viruses to cause proliferative transformation in vivo is discussed by Todaro. (However, one must bear in mind that although in vitro transformation may possess several similarities to tumorigen-

esis in the intact animal, fundamental differences do exist and these two processes cannot be equated.)

Todaro poses again the question why endogenous viruses have been able to persist throughout the evolution of their hosts (mice in this case). He gives as one possible explanation that the endogenous virus may provide a selective immunological advantage in protecting the host from similar but more virulent virus strains. An even more intriguing proposal, however, is that viral components might perform a necessary function during normal embryonic development. Could the viral agents stimulate normal multiplying cells in a manner related to neoplastic growth, and then cease to affect them after a certain state of development? This question is as yet unanswered, but the solution certainly rests in the domain of the developmental biologist. Again, the potentials shared by normal differentiation and carcinogenesis demand the attention of developmental biologists. The overlap is pointed up clearly by Coggins and Anderson, whose experiments show that under certain circumstances fetal antigens will protect hamsters against infection from doses of SV40. This and other suggestive findings cited in the book make the cancer problem almost irresistible to developmental biologists.

Each of the 14 thought-provoking reports carries a sizable bibliography, and there is a substantial subject index at the end of the book. Therefore this volume will also serve as a useful initial source and reference for all biologists interested in "cancer as a problem in biology."

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Aztec Ethnohistory

Sixteenth-Century Mexico. The Work of Sahagún. MUNRO S. EDMONSON, Ed. University of New Mexico Press, Albuquerque, 1974. xvi, 292 pp. + plates. $15.

This book, which derives from a seminar held in 1972, consists of 11 papers by recognized authorities in the field of Nahuatl studies. The purpose of the seminar was to take stock of what is known about the 16th-century missionary and ethnographer Bernardino de Sahagún and his works, rather than to attempt a survey of Aztec culture. The papers take as their starting points a random selection of topics, from native medical texts (López Austin), rhetorical orations (Sullivan), and architecture (Robertson) to the doctrines and

A scene of gold working from Book 9 of the Florentine Codex, Laurentian Library, Florence. [Reproduced from *Sixteenth-Century Mexico: The Work of Sahagún*]

controversies of the 16th-century church in Spain and Mexico (Baudot). Specialists will appreciate that many of these essays contain new information or new insights, but what makes the volume interesting and valuable for anthropologists in general is a theoretical issue that crops up in almost every paper: To what extent can any outsider ever understand, let alone convey to others, the essential nature of an alien culture? This problem is faced by every ethnographer, from the novice embarking on his first field project to a man like Sahagún, with more than 60 years' residence in Mexico, fluent in Nahuatl, with access to the best informants, and with a genuine sympathy for Aztec culture.

With all his advantages, Sahagún nevertheless emerges as a product of his times. Baudot uses hitherto unpublished documents to show that Sahagún was deeply committed to the Franciscan view of missionary ethnology, with its dream of "an autonomous native Mexico under a strong and substantially independent viceroy, structured and ruled by friars desirous of founding a New Church based on the pre-Constantine model—all of this probably with millennarian and apocalyptic ambitions." The ideology of the Indians was to be changed "by using the Indian's own cultural and subjective reality and originality" (Baudot's phrase). But what was this subjective reality, and how could a Spanish friar ever hope to grasp it?

Sahagún belonged to a well-defined "school" of anthropology, which had its own party line, just as have the functionalists, structuralists, or Marxist anthropologists of more recent years. If one accepts the suggestion, put forward in Wilkerson's paper, that Andrés de Olmos was the author of both the Codex Tudela and the *Historia de los mexicanos por sus pinturas*, Sahagún's questionnaire-informant methodology, and its underlying assumptions, may have been almost standard among Franciscan missionary scholars. Starting from Sahagún's particular philosophy and his fixed ideas about what ethnology was for, we move on to another set of problems. Working backward from the answers incorporated into Sahagún's *Historia general de las cosas de la Nueva España* through the Codex Florentino and other manuscript versions, López Austin attempts to reconstruct the original questionnaire, and—like any other questionnaire—it is seen to have its shortcomings and biases. Calnek's paper discusses informant bias, noting that Sahagún relied very heavily on nobles and merchants who had an aristocratic view of native society and a poor (if not misleading) idea of lower-class life and attitudes. The articles by Dibble and León-Portilla raise the problems of translation from Nahuatl to Spanish, though the underlying, and more serious, problem is one of cognition rather than of mere linguistics.

To give just one example, it can be argued that any attempt to explain the Aztec universe in terms of 16th-century European astronomy is doomed to fail, and that Sahagún's custom of writing down verbatim, and in the original language, the words of an informant is not the complete solution. The transcription may be accurate and authentic, but the problem is merely removed from the mind of the ethnographer to that of the reader, who still has to interpret the text. And, since much of Aztec culture withered under European dominion, we can no longer check in the field or repeat the experiment.

These theoretical issues are still alive, and at a recent academic party I heard the work of Lévi-Strauss discussed in much the same terms. Sahagún survives this scrutiny very well. Now that his philosophical position is more clearly understood, and his aims and methods reasonably well appreciated, he becomes a more useful source of information than ever before. The present book will revive the Sahagún industry, which had seemed to be running out of intellectual steam since the 1950–1969 publication of the Dibble and Anderson version of the Codex Florentino. Two participants in the seminar, with the apparent approval of their colleagues, have drawn up a list of problems requiring urgent solution. Several of their proposals require the collaboration of librarians, archivists, and scholars from many disciplines and countries. It is to be hoped that this initiative will not be stifled by sectarian interest or bureaucratic ineptitude.

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