other causes of polish can be envisaged and have not been refuted. But the strength of White's argument is elsewhere, solidly grounded in observations of cut marks, marrow fracturing, and burning.

Given the skepticism surrounding the topic and its sensitivity for Native American groups, it is unlikely that all scholars will view this work as a final demonstration of Anasazi cannibalism, settling the question once and for all. Indeed, a debate is already developing. Bullock (*Kiva* **57**, 5 [1991]) suggests that American Indian warfare practices, not cannibalism, could have caused the traces observed in these assemblages. Death by battering and subsequent corpse mutilation (from scalping to skull crushing, cutting of parts, and even burning) are documented by historic accounts, by soldiers' remains at the 1876 Battle of Little Bighorn, and by skeletal analyses of victims of prehistoric and post-contact intertribal wars, such as the Crow Creek and Larson Village massacres in South Dakota, which involved large numbers of individuals. In the Southwest comparable occurrences suggestive of interpersonal violence, although with fewer victims, are briefly discussed by White. Most involve partially articulated skeletons, a condition that is not found in the Mancos assemblage and that White includes as a diagnostic criterion of cannibalism. But secondary burial of the decomposed remains by survivors might explain the disarticulated condition of the bones. This hypothesis is less fanciful than it might appear if we consider that secondary burial was a common practice in the Great Plains of the central United States and was occasionally practiced by the Anasazi and that there is archeological evidence that burials of disarticulated bones of warfare victims did in fact occur (O'Shea and Bridges, *Plains Anthropologist* **34**, 7 [1989]). Although White could not anticipate Bullock's challenge, which was published after his manuscript was completed, his careful taphonomic analysis provides the reader with enough arguments to refute it. Numerous percussion marks show that the percussor contacted bones in a defleshed state and that bone breakage followed dismemberment and burning, instead of preceding them as required to support a hypothesis of death by battering. The very high degree of long-bone fragmentation also cannot be reconciled with Bullock's hypothesis.

The competing explanation of mortuary practices will not easily go away; other researchers have suggested that such practices might include deliberate bone breakage, which would mimic the effects of marrow extraction from animal bones, and cause loss of skeletal elements (Bahn, *New Scientist* **134**, 40 [11 April 1992]); reply by White, *ibid.*, 49 [20 June 1992]). There is no evidence that Anasazi and other American Indian burial practices ever included deliberate bone breakage; nevertheless White deals too briefly with that issue. Undoubtedly the question has never been properly addressed; contextual and taphonomic analyses of American Indian human remains are a recent development. But until the counter-argument is checked for correspondence to facts, it will persist.

The book is lavishly produced, almost without flaws; its masterful analysis of the Mancos assemblage and critical compilation of data from the literature are mandatory reading for taphonomists and archeologists on both sides of the Atlantic and will stimulate research for years to come. That it is the source of some unanswered questions is, I believe, a measure of its success.

Paola Villa
University of Colorado Museum,
Boulder, CO 80309–0315

■

The Return of the Fly

The Genome of *Drosophila melanogaster*. DAN L. LINDSLEY and GEORGIANNA G. ZIMM. Academic Press, San Diego, CA, 1992. x, 1133 pp., illus., + plates. $79. Revision of *The Genetic Variations of Drosophila melanogaster.*

The Genome of Drosophila melanogaster is the sequel to the 1968 bestseller *Genetic Variations of Drosophila melanogaster* by Dan L. Lindsley and E. H. Grell (Carnegie Institution of Washington Publications). The comparative anatomy of these two works speaks to the tremendous progress and information explosion that have occurred in the biology of this user-friendly fly.

The 1968 Lindsley and Grell is a dictionary of classical genetic information, interspersed with a few examples of gene characterization at the protein level. There was no molecular information available (except on the *bobbed* gene), no known transposable elements, no germ-line transformation technology. The first major section of the book was entitled Mutations, reflecting the fact that the predominant way that genes were identified up to this time was by classical phenotypes (morphological, viability, fertility, and the like). In this section there were about 3000 entries, with each allele constituting an entry and receiving at least a short paragraph of description.

Contrast this with the corresponding section of Lindsley and Zimm. This section is now called Genes and consists of about 4000 entries—and here an entry equates with a gene, regardless of how many alleles of that gene are listed. Quite a few "gene" entries have hundreds of known mutant alleles, and these alleles can only be afforded a single line in a tabular display. The change in title from Mutations to Genes reflects an operational difference in how genes are captured. Though many genes are still identified through classical mutations, many others are now first noted as homologs of other genes from the fly or other organisms, from enhancer trapping or from reverse genetics approaches. Hence there are now many genes still in search of mutant phenotypes. Molecular biological information is a substantial portion of the current volume. For example, this reviewer sampled all gene listings beginning with the letter *t*. Of 131 listings, 29 refer to genes for which the only mutant allele has been lost (usually lost several decades ago). Of the 102 "extant" genes, 31 have molecular biological information associated with them. Indeed, several of the others have been cloned in the past two years, past the general cutoff date for incorporation of data into Lindsley and Zimm.

In addition to the gene entries Lindsley and Zimm gives cytogenetic and occasionally molecular information on approximately 9000 chromosomal rearrangements. Together these two sections make up over 90 percent of the volume. Other important sections are devoted to special chromosomes, transposable elements, and, particularly, cytogenetic maps. The maps serve as the index for identifying possible loci of interest in a particular region of the polytene or recombinational map of the fly genome. In addition to the foldouts of Calvin Bridges's larval salivary gland polytene chromosome drawings, the photographic polytene maps of George Lefevre are reprinted here.

As with all databases, there must be a limit to the scope of Lindsley and Zimm. Though there is substantial molecular information, the compendium is still clearly focused on the classical genetics of the fly. Molecular information is provided insofar as it helps describe genes or, occasionally, rearrangements. P element insertions are listed only if they have insertionally mutated specific genes. Hence the reader will not find most enhancer trap insertions and modified transgenes included in the listings.

What role has Lindsley and Grell served, and will Lindsley and Zimm continue to serve it? Lindsley and Grell has been an invaluable reference to the drosophilist. Because so much of the work on the fly is tethered to genetic analysis, a comprehensive resource to help you in relating new genes to the existing information, to describe the phenotypes and genetic properties of mutations you are using, and to identify chromosome breakpoints to help you dissect a cytogenetic interval is essential. It was worth periodically thumbing through Lindsley and Grell, because you were likely to encounter a mutation or rearrangement of interest that you had previously overlooked. Clearly, Lindsley and Zimm provides a vital updated snapshot of the *Drosophila* genome. It is 2½ times longer and much more densely packed, and whether it will be as easy to thumb through isn't clear. That, however, is not a criticism of the text but rather a statement about the field.

A review of Lindsley and Zimm should not end without acknowledging the incredible effort that went into it. Compiling and curating all of the information contained in our new "red book" qualifies as a genuine *tour de force*. It will save the *Drosophila* community many thousands of person-hours in hunting down information vital to all of our research programs.

William M. Gelbart
Biological Laboratories,
Harvard University,
Cambridge, MA 02138

■

Cellular Structures

Molecules of the Cytoskeleton. L. A. AMOS and W. B. AMOS. Guilford, New York, 1991. xvi, 253 pp., illus. $50; paper, $25. Molecular Cell Biology.

When Theodor Boveri, the great cytologist of the late 1800s, first described some of the elements of the cytoskeleton, he certainly had no idea of the richness of molecular details awaiting future cell biologists. A century of research, and in particular the application of the molecular techniques of the last decade, has resulted in a vast amount of information about the proteins that make up the cytoskeleton and their effects on its role in cell growth, division, and differentiation. *Molecules of the Cytoskeleton* attempts to organize and discuss this information at a level suitable to graduate students of molecular biology. The book is unique in its focus, as many cell biology textbooks emphasize the phenomenology of the cytoskeleton, giving only cursory treatment to the molecules. Amos and Amos make it clear from the start that their aim is to acquaint the reader with the molecules and their functions. Their combined experience in the cytoskeletal field makes them well suited to the task.

The book starts with a brief introduction to the cytoplasm, the three major filament systems in it (actin filaments, microtubules, and intermediate filaments), and some of the general cellular functions of a cytoskeleton. A chapter on intermediate filament proteins follows, being given an oddly prominent position for the filament system about which we know the least, and the remaining chapters are evenly split between the actin and microtubule cytoskeletons. Each chapter is followed by a summary, a set of thoughtful questions, and an annotated list of references. All are concisely written and packed with useful tables and figures. I particularly liked the paste-together actin and microtubule models; they make it much easier to get a feeling for the filaments. The authors try to include all of the latest information, even that which is not readily interpreted, lending a desultory air to some of the chapters, but this is made up for by the comprehensiveness of the text.

It is when the authors go beyond cataloging proteins to discussing the molecular mechanisms of their action that *Molecules of the Cytoskeleton* becomes most stimulating. I was impressed by the treatment of the dynamics of actin and microtubule assembly, a topic that many find confusing. For both polymers, nucleotide hydrolysis by the subunits provides the energy for some interesting behaviors, such as treadmilling for actin and dynamic instability for microtubules. It is important to understand the properties of the polymers themselves, as they go a long way toward explaining the workings of the different filament systems in the cell, and the authors provide a clear analysis of the important issues. Similarly, the processes of cell locomotion and mitosis are covered in detail, and several of the more likely models that have been proposed are described. Locomotion is covered at the end of the section on actin and mitosis at the end of the section on microtubules, allowing readers to transform the knowledge they have gained about the molecules important to each filament system into an understanding of how they work together in a complex biological process. Because of the strict emphasis on molecules, some aspects of the cytoskeleton receive less attention than their importance would seem to warrant. For example, microtubule-organizing centers, which are the sites of microtubule initiation in vivo and largely determine the spatial localization of microtubules but which are not well defined molecularly, are only mentioned briefly.

Any book that makes a point of being up-to-date in an active field is certain to have some unfortunate omissions by the time it is printed. *Molecules of the Cytoskeleton* covers papers through late 1989, and since then the crystal structure of actin has been solved, alternative actin and tubulin molecules have been discovered, and major advances have been made on both actin and microtubule motors. At the least, readers whose interest is piqued by this book will be well prepared for consulting the most current literature. The stated purpose of this book is to provide an authoritative text on the molecules of the cytoskeleton that can be digested in a postgraduate or advanced undergraduate course. In this it succeeds admirably, and I would recommend it to anyone interested in the details of how cells are organized.

Tim Stearns
Department of Biochemistry,
University of California Medical School,
San Francisco, CA 94143–0448

■

A Need in Astronomy

An Introduction to Astrophysical Hydrodynamics. STEVEN N. SHORE. Academic Press, San Diego, CA, 1992. xvi, 452 pp., illus. $49.95.

Is hydrodynamics really necessary?

Theoretical astrophysics is a field full of people using concepts drawn from other fields, which they learn only when it's absolutely necessary, and frequently later. This is particularly true when it comes to the application of hydrodynamics and magnetohydrodynamics to astrophysical problems. It is therefore somewhat surprising that although the answer to the opening question is clearly "yes," there are few astronomy departments that give their students a general introduction to the topic and even fewer books about it aimed at the beginning student. The consequences of this omission include not only the occasional embarrassing mistake but a general difficulty in communicating work to astrophysicists researching other topics.

This problem is compounded by the fact that most standard texts on hydrodynamics or magnetohydrodynamics are aimed at imparting an understanding of laboratory experiments or, somewhat more rarely, terrestrial phenomena.

These examples are apt to seem irrelevant to the budding astrophysicist. In fact, sometimes they are as irrelevant as they seem, largely because the physical parameters applicable to a realistic astrophysical problem may be many orders of magnitude different from those found in the laboratory (or even in a computer simulation). It is therefore a pleasure to read a book aimed at an astrophysical audience that gives an introduction to the topic laced with astronomical examples. I can only hope that the publication of this book will encourage more departments to offer a course on astrophysical hydrodynamics.