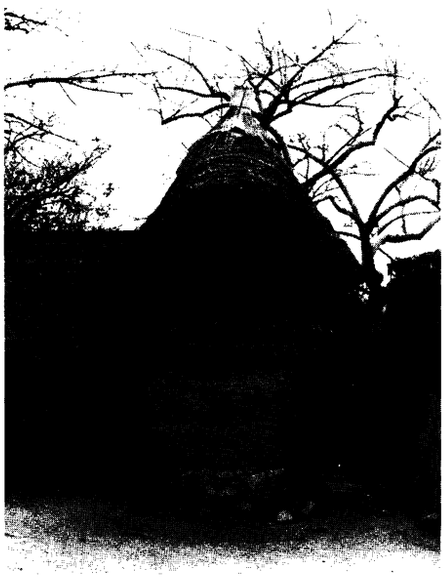

Cuexcomate, or structure for storing food supplies, from present-day Chalcatzingo. The occurrence of such structures "should mark an important shift in the strategy and capacity of the subsistence system [but] no definite examples have been found archaeologically." *Cuexcomates* are still made at Chalcatzingo, "although there are now only two men who are considered to be experts in their construction." [From *Ancient Chalcatzingo*; reprinted by permission of the University of Texas Press, © 1987]

ing a few shortcomings in its lack of direct archeological evidence of prehistoric diet, an eschewing of statistical sampling in a number of the analyses, the lack of microscopic study for the purpose of determining stone tool function, and the almost inevitable discontinuity between the separate, independently written, mostly narrowly focused chapters.

It is to this last listed concern that Grove addresses himself in the book's final two chapters. Serious Mesoamerican scholars will be well rewarded by careful reading of these offerings, for in them he pulls together the diverse data from his project toward a succinct but critically comprehensive survey of current knowledge about Chalcatzingo as an early agricultural village, as a regional center, as a sacred shrine, and—probably of most general interest—as a community somehow related to Olmec culture. Grove and his collaborators are still uncertain about why Chalcatzingo, of all places, came to produce such a prodigious array of monumental art and architecture, but they are agreed that its location under the awe-inspiring twin hills, along a major avenue of commerce and communication, drew Olmec attention to the site.

The many detailed cultural similarities to the Middle Formative Gulf Coast ceremonial center at La Venta suggest direct Olmec contact, but Grove stresses the underlying autochthonous character of Chalcatzingo. If there were Olmec artisans and traders actually in residence, they were few and probably only transient. The special "frontier Olmec" art they introduced to outlying sites such as Chalcatzingo may have been directed, Grove suggests, at communicating the legitimacy of Olmec presence or, alternatively, may have served to enhance the authority of local rulers by demonstrating their ties to the prestigious Gulf Coast lowlanders. In either case, when other local centers throughout Mesoamerica, such as Cuicuilco in the Basin of Mexico, finally developed to the point where they could successfully compete in long-distance commerce and cultural prestige, the Olmec presence faded, and with it places like Chalcatzingo.

Grove and his colleagues are to be commended for their well-documented, carefully considered report on the rise and decline of what is, in its own right, a most important Formative period Mexican settlement. The results of their efforts stand as further testimonial to the admonition that only by studying the nature of intersocietal interaction can we fully comprehend the processes that produced the great pre-Columbian civilizations of Mesoamerica and, in a broader sense, begin to understand how civilization got started in the first place.

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Teratogenesis

Developmental Toxicology. Mechanisms and Risk. JOHN A. MCLACHLAN, ROBERT M. PRATT, and CLEMENT L. MARKERT, Eds. Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 1987. xviii, 362 pp., illus. $70. Banbury Report 26. From a meeting, Cold Spring Harbor, NY, Oct. 1986.

Academic developmental biologists, who seek basic mechanisms, are usually little interested in toxicology. Toxicologists for their part understand that completely effective human risk management will be possible only when underlying mechanisms of toxic phenomena are fully understood, but at present they must rely mainly on empirical testing. The Banbury Conference that gave rise to this book was convened in an attempt to promote interaction among leaders of these two endeavors.

In keeping with the tradition of this series, the authors are all authorities in their fields, and the 23 short chapters are, with few exceptions, clearly written and of some interest. The common theme is teratology, the aspect of developmental toxicology of greatest potential relevance to academic biologists. The book is divided into five sections: In Vitro Approaches, Molecular and Experimental Embryology, Nonmammalian Models, Experimental Animal-Human Comparisons, and Risk Assessment. The papers actually fall more naturally into three different groupings: basic mechanisms in development, in vitro systems for study of teratogenesis, and human effects and risk assessment. Viewed in this way, the book is an interesting if unusual addition to toxicologists' bookshelves.

Six papers in the first category illustrate how modern technology teamed with clever minds is beginning to resolve some traditionally recalcitrant developmental questions. The topics range from use of congenic chimeras and computerized pattern prediction for analysis of organogenesis (P. Iannaccone *et al.*) to in situ hybridization of cDNA probes following expression and interaction of genes during *Drosophila* development (C. Rushlow *et al.*). These papers offer a brief selective visit to the frontier of mechanistic developmental biology. They do not relate directly to, or comment on, toxicological effects.

The meat of the book for toxicologists, who will be its main users, is in the eight papers on in vitro systems for the study of teratogenesis. Models utilizing both mammalian embryos and cells and nonmammalian material such as fruit fly and frog embryos, and even hydra, are presented. All of these test systems appear to have potential for analyzing mechanisms of action of toxicants at the cellular level, as well as for screening, though most seem to be still at the stage of system characterization. Eventual integration of academic embryology and practical teratology is likely to be facilitated through such approaches; these lucid presentations of the models serve as a useful reference for all those interested in accomplishing this goal.

Notably absent from the book are chapters on animal teratogenesis in vivo, obviously a necessary bridge between in vitro experimentation and extrapolation to humans. The one paper in this category, by J. M. Rice *et al.*, addresses transplacental carcinogenesis and mutation and emphasizes that the consequences of prenatal genotoxic insult may be modified by postnatal exposures. One may conclude from this that experimental, as well as descriptive, studies with whole-animal models should not be neglected.

Finally, the eight papers related to human effects and risk assessment provide a well-balanced overview ranging from specific description of retinoic acid teratogenesis in

humans to discussion of teratogen information services. Of particular interest to reproduction toxicologists are the papers comparing diethylstilbestrol teratogenesis in animals and humans (M. D. Hogan *et al.*), summarizing what is known about the etiology of human birth defects (R. L. Brent), and addressing the complex biological considerations that must go into accurate empirical human risk assessment (J. M. Manson).

The purpose of the conference notwithstanding, interchange of ideas among the three functional sections of the book is not notable. An important exception pertains to retinoic acid, which is mentioned or discussed in ten papers. Observed teratological effects of retinoic acid in humans and in vitro have been plausibly postulated to be caused by functional derangement of the cell adhesion molecules that constitute part of the normal mechanism of morphogenesis (discussed in papers by G. M. Edelman and W. J. Gallin and by R. M. Pratt *et al.*). However, the reader must search for this integrative thread. The value of the book is mainly in the quality of the individual contributions and the intrinsic interest of the three components.

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Morphology and Function

Axis and Circumference. The Cylindrical Shape of Plants and Animals. STEPHEN A. WAINWRIGHT. Harvard University Press, Cambridge, MA, 1988. x. 132 pp., illus. $22.95.

Although biology has one universal law in Darwinian evolution, the diversity of organisms arising from the operation of that law makes further generalizations difficult. Therefore any well-argued case for a major generalization must be taken seriously.

Wainwright makes such a case with respect to the form and structure of all multicellular animals and plants. Their shape is essentially cylindrical or their supporting and connecting structures are cylinders. The properties of cylinders and the materials from which they are made permit certain functions, and hence the possible habitat range of an organism. Communities are composed of organisms selected from among those with certain sets of form, structure, and hence functional properties. Wainwright's thesis thus has extensive explanatory and predictive capability.

Wainwright briefly documents the ubiquity of cylindricity in plants and animals. The bulk of the book considers explanations in terms of functional attributes of biological cylinders composed of various materials in numerous structures. Wainwright starts by carefully defining basic terms and then builds on these to examine the mechanics of shape. An important component of this discussion is beam theory. He then considers the physical properties of the materials making up structures. This is opposite to the usual presentation sequence but works well. Wainwright then identifies and defines three structural stystems, branched cylinders, hydrostats, and kinetic frameworks, that underlie the form of animals and plants. An especially interesting chapter suggests how the diversity of structures based on cylinders could have arisen as a result of a mere five simple and plausible evolutionary steps.

Having argued for a fundamental structural element in multicellular organisms, the book concludes with a brief consideration of some of the consequences for organismic shape and circumstances where exceptions occur. I felt this discussion detracted from the main thesis, because the topic far exceeds the scope of a short book such as this and the reader will already have been stimulated to consider the issues raised in it.

Wainwright not only seeks to make a sweeping generalization on form and function, he clearly illustrates the analytical approach that has proved so successful in modern functional morphology—to describe systems in terms of their properties, subsequently deducing functions that are subject to experimental test. Many of the principles of materials and structure have never, in my opinion, been suitably presented for a non-expert biological audience. For example, Wainwright provides the best explanation I know of for the novice of the term "second moment of area," which can be heard bandied about at meetings. Furthermore, the principles covered by the book constitute one of the foundation areas in the modern study of organisms. Therefore, teachers of functional morphology, who for years have had to use handouts in this area, will welcome the book. Their task will be further eased because Wainwright's style makes the book easy reading. Researchers will find an opportunity to review essential principles in the midst of numerous opportunities for further work. The general reader will be educated in principles and processes of a dynamic and exciting area of biological thought.

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Shattered Stars

Supernova Remnants and the Interstellar Medium. R. S. ROGER AND T. L. LANDECKER, Eds. Cambridge University Press, New York, 1988. xii, 540 pp., illus. $59.50. From a colloquium, Penticton, BC, June 1987.

One hundred and seventy thousand years ago, a supernova exploded in the Large Magellanic Cloud. Its light and other radiation (including neutrinos) reached Earth with the news at the beginning of 1987, three months before the colloquium of which this book is a record. The stellar event SN1987A and the 620 supernovas known prior to it have served to define the $t = 0$ initial conditions for the development in the interstellar medium of the large explosive structures called supernova remnants. Perhaps 200 supernova remnants are known, mostly in our Galaxy, but with handfuls in the nearest external galaxies, picked out by x-ray, radio, and optical studies. Only in half-a-dozen cases can a supernova remnant be connected with a particular supernova.

For the first few thousand years the explosion of a supernova is high-speed. What astronomers see is mostly produced by the ejecta from the shattered star. The ejecta appear as optical, ultraviolet, and x-ray emitting filaments that manifest the peculiar compositions appropriate to a dismembered thermonuclear fusion reactor (that is, the star). There are three sorts of supernovas, corresponding to the explosions of white dwarf stars (Type Ia supernovas), of massive stars (Type II), and of a third kind of star not well identified (Type Ib); there are three sorts of supernova remnants too, which seem to correspond to these types, and they show compositions with the expected kinds of anomalies.

The overall behavior of the explosion at its outset is dominated by the free expansion of the ejecta, but there are interesting side effects arising from the interaction of the ejecta with any material surrounding the exploding star. Stars are the sources of effluent blown into space by the stellar wind. The circumstellar material has been deposited around the progenitor star by the star itself. (My mental image is of Charlie Brown's playmate Pigpen.) The material forms a circumstellar cocoon that is ionized by the ultraviolet and x-ray emissions from the supernova. As the circumstellar material recombines, ultraviolet emission lines are detected. The magnetic fields embedded in the circumstellar material and in the lumps of ejecta are compressed in the explosion and become detectable by radio astronomers. A pulse of synchrotron radio emission was seen in the first few days from