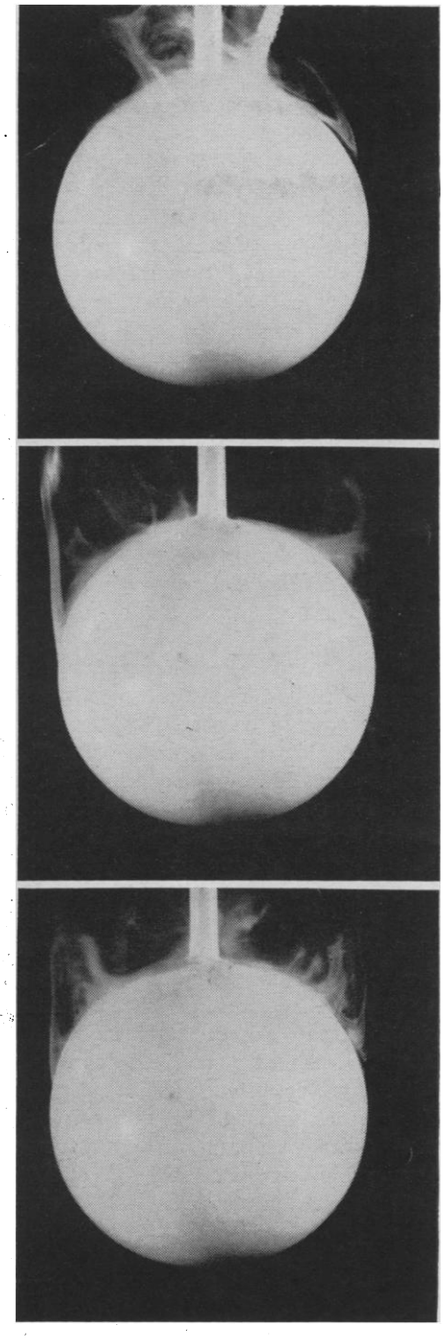

Successive frames from a motion picture illustrating back flow in the stalled boundary layer. Air flows vertically upward past the sphere. Top, A drop of titanium tetrachloride is placed near the support rod on the rear by means of a pipe cleaner. Note smoke beginning to move upstream (that is, downward in the photograph) toward shoulder and then curling around. Middle, Smoke from aft end of sphere has reached the shoulder and, on the left-hand side, is flowing downstream in the interface between the main flow and the wake. Bottom, All the smoke here seen in the wake originally came from the rearward position of the sphere, thus verifying the existence of backflow and showing that there is a good deal of mixing in the wake. [From *Shape and Flow*]

stand theoretically are only demonstrated, and briefly. We must note, however, that this particular combination of film sequences and the parallel "film in print" is designed for pre-college students and others with little background in mathematics. For physicists and engineers a subsequent film on vorticity, already available, will tend to allay doubts on the appropriateness of level.

For the sequence on the fluid dynamics of drag, it is the "package" of book and film which is significant. The demonstrations are magnificent in the film, but they go by quickly, and the availability of the printed page for repeated reference is invaluable.

MELBA PHILLIPS
Department of Physics,
Washington University, St. Louis

Preformation or Epigenesis?

Oogenesis. The storage of developmental information. C. P. Raven. Pergamon, New York, 1961. viii + 274 pp. Illus. $8.50.

Again the question of preformation versus epigenesis is raised, this time by C. P. Raven, who, armed with a primer on information theory, succeeds only in distracting the reader from the central issues of development. In the first and in the last two chapters, which sandwich the meat of the book but remain organically unrelated to it, Raven contends that the egg holds a set of instructions "encoded" in the nucleus, cytoplasm, and cortex, which is read out during development.

Although many recent as well as early contributions to the study of oogenesis are assembled in the middle chapters, the author adduces no evidence from them to support his theory.

Is there within the egg a set of self-contained causes from which the various steps of embryogenesis are predictable (in the sense of being understood, rather than simply occurring), or is development in part the result of emergent rather than coded causality? To say yes to the second question is to lay oneself open to Raven's charge: "vitalist." Risking the charge, the reader might reply that since the egg first and then its descendent cells undergo self-replication, a community is created within which an individual cell or a group of cells may be treated as "open systems." Thus, without violating the laws of physics, he may invoke emergent or epigenetic causality to contend that the relevant causes for any given phase of development may not be predictable from the single-cell egg, but only from the elaborate complex of interactions in a community whose genetically similar members are at once protagonist and antagonist, individual and environment.

Is the egg as unique as Raven would have us believe? One wonders why he has not, for example, considered the striking similarity of planula and planuloid in the coelenterates. Both develop into polyp but, while the former derives from a zygote, the latter stems from somatic cells. Raven might well have tackled the question asked by N. J. Berrill, ". . . how many of the more general developmental phenomena of the relatively specialized types of eggs . . . are inherent in the egg cell as a cell rather than as an egg?" [Berrill, *Growth, Development, and Pattern* (1961)].

Aside from feeling compelled to defend those who have not abandoned material causality despite their disagreement with the author's argument, the reader will wince when Raven formulates *ex cathedra* a theory of development in the notation of information theory which, although useful for computer design and network analysis, has so far not found a significant place in biology.

EUGENE BELL
Department of Biology,
Massachusetts Institute of Technology

Crystal Measurement

Crystallometry. P. Terpstra and L. W. Codd. Academic Press, New York, 1961. xv + 420 pp. Illus. $12.

Much of this book, which is a modernized version of Terpstra's *Kristallometrie* (1946), was translated from the original volume, and most of its approximately 250 figures were also used in the earlier version. The aim is highly specialized: to provide thorough instruction in the mathematical and graphical techniques associated with crystal measurement, by means of the two-circle reflecting goniometer. The book begins simply enough with the description of an experiment for dem-

onstrating the constancy of interfacial angles, but this is followed immediately by discussion of the gnomonic projection; the unprepared student will have to look elsewhere for instruction in elementary crystallography.

The 12 chapters are untitled, but the numerous section headings are assembled under appropriate chapter numbers in the table of contents. The scope can be roughly indicated by listing the principal subjects discussed in each chapter: (i) gnomonic and stereographic projections; (ii) stereographic and gnomonic nets; (iii) axial elements; (iv) symmetry, crystal systems, and classes; (v) polar and reciprocal lattices; (vi) the Barker method of identifying crystals from morphology; (vii) crystal calculations; (viii) matrix algebra in crystal calculations; (ix) crystal drawing; (x) reflecting goniometers; (xi) the latest designs of two-circle goniometers; and (xii) the interpretation of Laue photographs. The book concludes with a set of 51 questions, covering 11½ pages, to which answers are given (3 pages). For additional problems the reader is referred to the senior author's *A Thousand and One Questions on Crystallographic Problems* (Wolters, Groningen, 1952). The index (only 3 pages) is a bit skimpy.

The revised treatment in this book was determined by several important developments since 1946. R. L. Parker's (1956) gnomonostereographic projection is emphasized in chapter 2, and a net is provided for it; the authors state, "It seems almost certain that in the reasonably near future Parker's net will replace the well-known Wulff net for crystallographic purposes." In view of the appearance of *The Barker Index of Crystals*, in 1951 and 1956, to which the junior author contributed, chapter 6 has been revised and shortened; the reader is referred to the *Index* for details of the method. Chapter 8 is an entirely new chapter, based largely on the methods introduced by W. L. Bond. The brief chapter 12 is also new.

Though no mathematics beyond spherical trigonometry and matrix algebra is required, parts of the book will seem formidable to many. Matrix methods are used extensively, not only in chapter 8 but elsewhere as well. Many examples are given in detail, but easy ones are avoided. The particulars used to work out the first example in chapter 7, determination of the axial elements of anorthite, occupy 13 pages. In spite of such burdens, the book has the fine style one expects from the senior author, and it is enlivened by many forceful expressions of his opinions.

In the preface Terpstra and Codd write, "If this book should lead to an increase in the number of young investigators taking up the practice of crystallometry, the authors would feel themselves richly rewarded." In view of the competition offered by the many new fields of physical investigation, no such reward seems likely, but any who do plan to practice crystal measurement and the auxiliary techniques will find Terpstra and Codd's *Crystallometry* an excellent guide.

A. PABST

Department of Geology, University of California, Berkeley

Monumental Synopsis

Geology of the Atlantic and Gulf Coastal Province of North America. Grover E. Murray. Harper, New York, 1961. xvii + 692 pp. Illus. $24.

Grover Murray has compiled a monumental reference work on the geology of the Coastal Plain from Newfoundland to Honduras. He considers this entire area to be an active, growing geosyncline filled with Mesozoic and Cenozoic sediments that rest on a subsiding trough of Paleozoic and Precambrian rocks. The volume is primarily an orderly review of data fully documented by references to original articles; only in rare places has Murray "taken the liberty of theorizing about a particular topic or setting down ideas that known data suggest."

In plan, the discussion first considers the geology and geography of the highlands adjacent to the Coastal Plain and of the rocks that underlie the coastal-plain sediments, and then the general structural geology of the rocks within the Coastal Plain, with special reference to the fault systems and salt structures. A chapter on the stratigraphy and age relations of hundreds of lithologic units, ranging in age from pre-Jurassic to Recent, is followed by summary chapters on mineral resources, on physiography, and on climate, vegetation, and soils.

The chapters on faults and salt structures are particularly valuable because they bring together for the first time a wealth of information obtained in exploration for petroleum. Also especially interesting are thickness and facies maps for many of the geologic stages, as well as a series of maps showing the regional distribution of fuels, metals, and nonmetallic mineral resources.

The volume is illustrated with more than 100 photographs and nearly 400 maps and cross sections, most of which, the author says, were specially prepared for this volume. Many of the illustrations are not keyed to the text, and some include symbols that are not explained either in the legend or in the text. I wish Murray had discussed more fully the problem of the age and mode of origin of the Gulf of Mexico; some of the rocks and structural complications in the southern part of the Gulf province seem more closely related to the Cordilleran and Antillean geosynclines than to his postulated coastal geosyncline.

Murray presents here the first reasonably complete compilation that summarizes existing information on the Atlantic and Gulf provinces of North America, and he has documented it with a very valuable bibliography of more than 3400 references.

WATSON H. MONROE

U.S. Geological Survey, Box 803, Roosevelt, Puerto Rico

Freud and the Iroquois

The Science of Dreams. An analysis of what you dream and why. Edwin Diamond. Doubleday, Garden City, N.Y., 1962. 264 pp. $4.50.

It is a curious fact that, although dreams have always fascinated people, they have been shunned by science. Not even Freud's monumental study, which may prove to be one of the most influential books of the 20th century, made the dream scientifically respectable. It remained for a chance observation that occurred in Kleitman's sleep laboratory at the University of Chicago in 1952 to make a science of dreams possible. The chance observation was the moving eyes of a sleeping infant. When Kleitman and his graduate student, Aserinsky, checked for the same thing in adults during sleep they found periods of rapid eye movements throughout the night. Kleitman guessed