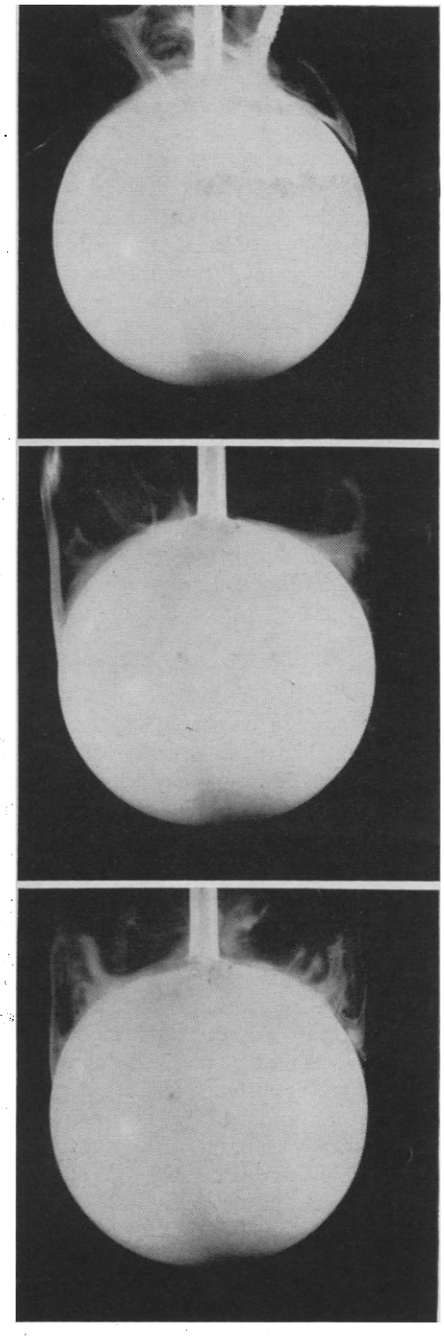

Successive frames from a motion picture illustrating back flow in the stalled boundary layer. Air flows vertically upward past the sphere. Top, A drop of titanium tetrachloride is placed near the support rod on the rear by means of a pipe cleaner. Note smoke beginning to move upstream (that is, downward 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.

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## 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.

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## 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-