a democratic family—in either sense: democratic in itself or calculated to produce lovers of and competent practitioners of democracy? Clearly it cannot be "authoritarian"—meaning practically all the bad things we mean in the political sphere by "totalitarian" or "fascist." But is the only alternative a family with no one in charge, a family that virtually assumes the parents have no "superiority of . . . knowledge, perceptions, attitudes and skills," that entails (without reservation) that "the products of earlier education become debris that chokes off later growth," so that there cannot be at any time in any matter a valid and legitimate authority? Should not this be called the anomic family? And is it not precisely the children of such families who jam our clinics, anxiety-ridden to the point of panic, at the lack of valid, protective authority with which to identify, in which to partake, and in measured increase to which to succeed? And do we not have working models of quite other genuinely democratic families the hallmark of which is rational, legitimate authority, first given, then granted, then redistributed, families whose life is in dialogue so that "rulers" and "ruled" are continuously mutually educated, families where there is full and firm rule so far as possible by and on behalf of all, a genuine expression of a common good of a family that thus genuinely exists *as* a family? And is it not such families, as expectable in theory and confirmed in experience, that generate in the children precisely the inner "democratic character" that continues the knowledge and love of democracy into other, more public spheres of life?

I believe that the failure of the authors explicitly to relate their definition of democracy ("a system of values . . . [that] include: 1. Full and free *communication* . . . . 2. A reliance on *consensus* . . . . 3. The idea that *influence* is based on technical competence and knowledge," etc.) to the demands of democracy in the classic sense vexes and bedevils the argument at every point through an otherwise most stimulating and interesting book. But equally serious, I think, is their taking of present mindless, technology-led, rapid social change as a datum, a permanent datum, accepted or espoused. I think it exceedingly doubtful that any trace of democracy can long survive it, and I believe we now see such democracy as we have tottering punch-drunk in the face of it. Indeed, I should have thought, as do many of my colleagues, that the "constitutionalization," the bringing under democratic control, of the twin pythons—the science that brought us Hiroshima and the technology now polluting biosphere and noösphere beyond recall—would be the first order of business for a democratic society that has sufficient strength to see to its own survival.

The questions raised by the book are of the first importance. It deserves careful reading. If the authors are right we are on a paradisiacal path where this reviewer sees only and wrongly a well-paved road to hell. The issue deserves the weightiest discussion.

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Directional Guides

Animal Orientation and Navigation. Proceedings of the 27th Annual Biology Colloquium, Corvallis, Ore., May 1966. ROBERT M. STORM, Ed. Oregon State University Press, Corvallis, 1967. x + 134 pp., illus. $5.

These six papers on animal navigation result from a colloquium held at Oregon State University. No claim is made to comprehensive coverage of the subject. For instance, the extensive migrations of insects are not mentioned. But the book does provide a useful and authoritative review of six major areas in which important investigations are in progress.

Arthur D. Hasler reviews his own extensive work and that of others on the migration and homing of salmon, and the olfactory orientation and sun-compass orientation of freshwater fish. Most of this material is also available in Hasler's own book *Underwater Guideposts: Homing of Salmon* (University of Wisconsin Press, 1966). The four pages of detailed discussion of Hasler's paper provide a helpful indication of the unanswered questions in this field.

Although Denzel E. Ferguson's review of "Sun-compass orientation in anurans" has broad coverage, including, for example, the impressive work of Twitty and his associates on the homing abilities of newts, the emphasis is understandably on the work of the author and his colleagues. This work has convincingly demonstrated that anurans learn the direction of the shoreline along which they live. When captured and released in a circular enclosure filled with water, these frogs tend to swim consistently in a direction which would bring them back to their home shoreline were they swimming near it. The directional tendency persists when they are transported in light-tight containers and released at any hour of the day or night, but only if the sun, moon, or stars are visible.

The migrations of turtles are discussed in characteristically stimulating fashion by Archie Carr. First Carr describes the basic reproductive cycle of sea turtles (*Chelonia*), along with the results of an extensive tagging program that has documented their lengthy migrations. Then he turns to the navigational problems posed by their open-sea migrations, with specific reference to the population of green turtles that nest on Ascension Island in the mid-Atlantic but feed along the coast of northeastern Brazil. The chapter concludes with Carr's views on the possible evolution of island-finding by sea turtles. He is inclined to be open minded toward all possible hypotheses concerning the sensory basis, or bases, of these remarkable feats of long-distance navigation. He considers that inertial navigation and sensitivity to terrestrial magnetism are worthy of renewed attention despite negative evidence that has discouraged most zoologists.

William J. Hamilton III discusses what may prove to be a significant new facet of bird orientation behavior. This is the possible role of social stimuli and interactions between birds in groups or flocks. Although necessarily preliminary and speculative, Hamilton's idea is an intriguing one—that members of a flock share orientation information and thereby improve upon the capabilities of any one individual. This might help explain the increase in flight calls of nocturnal migrants that has been reported to occur late at night and under conditions of poor visibility. Hamilton presents data indicating that the sun is used by starlings to help orient their daily foraging flights from concentrated roosts to distant feeding areas. He also finds that large flocks are better oriented than small ones, and he goes on to consider the possibility that the characteristic V formation of geese may be related to this postulated pooling of directional information. While no conclusive proof is advanced for any of these suggestions, their presentation is a significant con-

tribution to our arsenal of ideas to help explain orientation behavior.

Kenneth S. Norris discusses migration and orientation in seals and whales. Both groups certainly display lengthy migrations, as demonstrated both by observation and by recovery of tagged animals. But no direct evidence is available concerning the sensory basis of their orientation. The migration of the California gray whales is largely coastal from the Arctic Ocean to the Gulf of California, and hence is known in greater detail than those of other species. While there is considerable evidence that these whales use both bottom topography and visual landmarks from the coastline, most other whales migrate long distances through the open ocean. Norris discusses the possibility that sounds may be important cues, not only those of fish or other marine animals that may well be characteristic of a given locality, but also echolocation or active sonar, which is known to exist in most if not all species of whales. He is forced to conclude that much remains to be learned about the orientation behavior of these fascinating creatures.

Frank C. Bellrose discusses "Orientation in waterfowl migration," bringing together many lines of evidence. He and his colleagues have observed many flocks of migrating ducks and geese from a light airplane. These extensive first-hand observations of large and readily visible birds in the course of actual migration have been supplemented by experimental releases of ducks captured during migration and displaced by hundreds of miles to areas almost certainly outside their experience. After such releases, both with and without displacement over long distances, many waterfowl have been observed from the ground, visually and by radar, by day and by night, and under both clear and overcast skies. Some results of radio tracking of ducks are also reported. These extensive and varied studies show that conspicuous features of the landscape such as rivers and lakes are sometimes used as local landmarks or as "guidelines" during seasonal migration. But ducks also use the sun and stars for directional orientation under clear skies. The initial orientation of mallards after release in strange surroundings is likely to be northward, regardless of season, in what Bellrose calls "goalless" and Matthews "nonsense" orientation. This orientation does not necessarily last for more than a few miles, but it is apparently one of a large number of cases in a wide variety of animals of sun- or star-compass orientation.

Most exciting is substantial evidence from radar observation that waterfowl, and other birds as well, sometimes migrate at night under thick layers of cloud when astral cues cannot possibly be used. Bellrose concludes that when neither landmarks nor the sun or stars are available as directional cues, waterfowl use the wind as a source of directional information. This conclusion is based in part on evidence that migrating birds appear to compensate for the wind and maintain approximately the appropriate direction of flight even in cross winds. Sometimes this occurs even in the apparent absence of visual reference points in the sky or on the ground below. Bellrose believes that patterns of turbulent air currents correlated with wind direction provide this sort of directional information. Some will remain unconvinced that correct orientation of migrating birds over long distances really occurs in the absence of visual cues, or that turbulent air currents have sufficiently predictable patterns to provide useful guidance. But the evidence marshalled by Bellrose in this chapter and in several papers cited in its bibliography clearly deserves thoughtful consideration. It is important that this work be followed up by further observations, and perhaps even experiments, to explore its evident implications and ramifications.

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Melanin and Melanocytes

Advances in Biology of the Skin. Vol. 8, The Pigmentary System. Proceedings of a symposium, Portland, Ore., 1966. WILLIAM MONTAGNA and FUNAN HU, Eds. Pergamon, New York, 1967. xxii + 659 pp., illus. $27. Oregon Regional Primate Research Center Publication No. 183.

Twenty-eight of the chapters in this volume represent work reported at a symposium held at the University of Oregon Medical School in 1966. Seven more papers were included in the book for completeness. During the last 20 years several collections from symposia on pigment cell biology have been published. Perhaps for this reason, not much new information stands out. Nevertheless, this book is useful for people interested in different aspects of melanin pigmentation.

The most exciting chapters are Mason's review on the structure of melanin and the papers that follow expressing different opinions. Mason strongly supports the concept that melanin is a homopolymer resulting from the polymerization of subunits of a single type, indole 5,6-quinone, held together by identical linkages. Nicolaus and Hempel present separate papers which support a theory of random polymerization according to which both the subunits and linkages vary throughout the polymer. Blois offers a good compromise. The lively controversy brings the reader up to date on the structural problems of melanin.

A second interesting subject is described separately by McGuire and by Hadley and Quevedo: epidermal melanocytes in frogs. In the past most work on amphibian pigment cells has concerned dermal melanocytes. But the different responses of dermal and epidermal melanocytes to a variety of agents are important. For example, both types of cells darken in the presence of melanocyte-stimulating hormone; and both will lighten when the hormone is removed. However, only the dermal cells, when darkened by melanocyte-stimulating hormone, will lighten in the presence of melatonin and noradrenaline. Controversy exists about whether or not acetylcholine lightens epidermal melanocytes as well as those in the dermis. In some ways epidermal melanocytes of frogs behave more like pigment cells in mammalian skin than do the dermal melanocytes of frogs. Epidermal melanocytes in both frog and mammal share the property of being able to transfer melanin to surrounding epidermal cells.

Among the reports updating research on the enzymic process of melanin formation and the fine structure of pigment cells is a lucid review by Fitzpatrick.

Montagna's paper on melanocytes of subhuman primates is intriguing. For example, in the rhesus monkey, melanogenic activity increases upon exposure of skin to ultraviolet light and reaches a peak after one month of irradiation. Yet with continued treatment there is a steady drop in active cells. Montagna also introduces the problem of different populations of epidermal melanocytes in the chest and the thigh of primates.

Hormonal control of pigmentation is