tempt, in closing, to redress that injustice. *The Basin of Mexico* is, in our opinion, a landmark study of sociocultural evolution, a synthesis of grand scale dealing with a phenomenon of intimidating complexity. The reader may agree or disagree with the reasoning concerning how and why civilization arose in the Basin, but one cannot help admiring the vision and doggedness that led the collaborators in this research endeavor to acquire the massive amount of information upon which their interpretations rest. We finished reading the book feeling that the authors intended to both enlighten and provoke their colleagues with the model of evolution they argue. There is no doubt that they have succeeded in both respects and that future research into the processes of evolution in the Basin of Mexico and elsewhere will benefit from the rich store of data and ideas they have given us.

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Nuclear Collective Motion

Interacting Bosons in Nuclear Physics. Proceedings of a symposium, Erice, Sicily, June 1978. F. IACHELLO, Ed. Plenum, New York, 1979. x, 192 pp., illus. $29.50. Ettore Majorana International Science Series, vol. 1.

We have known for more than a quarter of a century that complex nuclei can have nonspherical shapes and rotate like a (quantum) top. Almost independently their relatively well defined surfaces can be set into definite modes of vibration. Such restricted states of motion, representing only a tiny fraction of all the conceivable motions of such complex systems, were first described phenomenologically by the famous Bohr-Mottelson theory of collective motion, which continues to this day to be a serviceable vehicle for the interpretation of a wide range of data. From the outset, theorists took up the challenge of deriving the model from the more fundamental shell model of neutrons and protons, an enterprise that has generated a number of qualitative and even quantitative successes.

Though not a restriction of principle, the phenomenology has emphasized the quadrupole degree of freedom of the nucleus, either "frozen in" as an ellipsoidal nuclear shape or alternatively taking the form of time-varying surface distortions, because these are the excitations that dominate the low-energy behavior of the nuclei in question. Because such nuclei have also been known since 1957 to be superconductors, it has usually proved convenient to incorporate in the working out of the fundamental theory methods borrowed from the theory of metallic superconductivity. Thus the (monopole) coherent motion responsible for superconductivity is differentiated sharply from the coherence manifested in the quadrupole degree of freedom, the former providing a substrate and the latter excitations on that substrate.

About five years ago Akita Arima and Franco Iachello suggested a new phenomenology in which the monopole and quadrupole degrees of freedom were treated on an equal footing, as interacting components of the nuclear fluid. In their model, as in the Bohr-Mottelson model it aims to supersede, the fundamental entity is the boson, but now there are two kinds, which interact and influence one another. In the interacting boson theory, as opposed to the previous theory, the finite number of particles plays an essential role because the bosons are identified with pairs of nucleons; we regain the Bohr-Mottelson model only as the number of particles is imagined to increase without limit.

The volume under review contains a complete and authoritative account of the status of the theory as of June 1978. The interacting boson model has gone through two versions during its short existence. The first model, by being couched in suitable group-theoretical language, was able to call attention to certain limiting "dynamical symmetries" of classes of nuclei, at least one of which had been completely neglected previously. Without losing sight of these symmetries, a second version, in which neutron and proton bosons are given separate recognition, led to improved quantitative agreement with experiment. The first half of the volume is devoted to a confrontation of these models with a wide range of experiments. The results are truly impressive and herald a new era in the theoretical interpretation of nuclear collective motion.

Once more theorists must face the challenge of tracing the genesis of the interacting boson model in more fundamental theories. As I previously remarked, in broad terms this genesis has been clear from the beginning; the constituent bosons are really pairs of neutrons or protons in one of several highly correlated states of relative motion. These pairs, acting as units, also interact with one another. The parameters measuring this interaction vary slowly from nucleus to nucleus and account for the gradual change of symmetry class, only a few nuclei exhibiting anything resembling a limiting symmetry in pure form.

In the second half of the volume a number of generally interesting and informative papers deal with these issues, with limited success at best. A fundamental, perhaps the fundamental, problem, that of deriving the observed bosons, remains unsolved. Remarkably, there is a similar problem in the interpretation of the Bohr-Mottelson model, where it has been dealt with more by fiat than by cogent deduction, though there too it is the heart of the matter. In the reviewer's opinion these difficulties are not insuperable, and one may soon expect substantial advances in the theory.

The beautiful new developments, well described in this volume, remind us that nuclear physics is still a young subject.

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Primate Socioecology

Primate Ecology and Human Origins. Ecological Influences on Social Organization. Papers from a conference, Burg Wartenstein, Austria, Aug. 1977. IRWIN S. BERNSTEIN and EUCLID O. SMITH, Eds. Garland STPM Press, New York, 1979. xviii, 362 pp., illus. $24.50. Garland Series in Ethology.

In 1957, Paul Fejos, the ingenious first director of the Wenner-Gren Foundation for Anthropological Research, Inc., negotiated the purchase and supervised the modernization of a 12th-century Alpine castle to which exclusive groups of scientists were invited and where they were incarcerated for a week or more while they intensively discussed a wide range of anthropological topics. The Burg Wartenstein conferences on human evolution were particularly successful. Some of them provided major impetus for paleoanthropological and primatological research over the past two decades.

The stresses of confinement in the castle were mollified somewhat by gracious hostesses, a substantial Viennese cuisine, an evening cocktail bar, and a Heuriger near the end of each conference. Bernstein and Smith must have struck the right balance between the

bookish and the bacchic, since some very sobering thoughts about the state of the art in primate socioecological studies have come down from the mountain.

Primate Ecology and Human Origins is thoroughly and intelligently edited. It contains 14 chapters by 20 contributors. Bernstein and Smith preface each chapter with a summary of its salient points and link it to preceding chapters. They also provide a brief overview of the results of the conference. This constitutes the final chapter of the book. These editorial endeavors increase the utility of the volume for upper-level undergraduate and graduate seminars on primate behavior and ecology.

Ten chapters are focused on nonhuman primates, and Birdsell contributes a fascinating account of the persistence of the Australian aboriginal social organization over a very wide range of natural habitats. Only two chapters concern problems of human origins and evolution. Bernard Campbell's contributes little new information and no novel ideas about human paleoecology and behavior. Indeed, Campbell's conclusion that human linguistic ability and "power of symbols" evolved largely in response to the demands of the icy north should be received coolly by colleagues who thought that such notions had passed away with W. D. Matthew, H. F. Osborn, and other cultivated northerners. C. Loring Brace's attempt to milk the dentition for ecological information falls considerably below the quality of other chapters in the book.

In the main, the book underscores the impossibility of relating the social behavior and organizations of nonhuman primates to particular features of their habitats on the basis on one- or two-year studies, even those in which available resources have been sampled thoroughly and the behavioral data have been recorded exhaustively. While many mathematical and mental models posit optimal relationships between the subjects and their habitats, most field behavioralists are soon forced to search for tolerable adaptations vis-à-vis current ecological conditions.

Rowell points out that primatologists really have not tried to reject the null hypothesis that particular patterns of sociality are not adaptive. Several other authors (Altmann and Altmann, Dunbar, Baldwin and Baldwin, Bernstein and Smith) also stress the importance of random factors versus environmental selective forces in altering the social behavior and patterns of primate groups. For example, Altmann and Altmann report that a chance superfluity in female births in a group of Amboseli baboons led to chaotic perturbations when the cohort matured and challenged the adult females' superordination to them. For several years prior to this event, it was supposed that the adult females provided stability in the group whereas the rowdy, sometimes transient males were the chief troublemakers. Dunbar also had to revise his portrait of gelada social dynamics and organization after observing the effects of chance fluctuations in male versus female births. These demographic changes seem to be free of Darwinian selective influences.

In general, *Primate Ecology and Human Origins* perpetuates the fine tradition of Wenner-Gren symposia. This redoubles our regret that the Western economic dip has forced the closure of Burg Wartenstein.

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Island Dynamics

Barrier Island. From the Gulf of St. Lawrence to the Gulf of Mexico. Proceedings of a symposium, Boston, March 1978. STEPHEN P. LEATHERMAN, Ed. Academic Press, New York, 1979. xiv, 326 pp., illus. $19.

A decade ago when the National Park Service was beginning to formulate its "hands off" policy for the management of barrier islands, serious disagreement existed among barrier island scientists about whether the islands were actually migrating. The debate was important because if islands were not migrating then the ubiquitous front-side beach erosion meant we would soon lose our islands unless we stopped the erosion. It is apparent from this volume that island migration (largely in response to a rising sea level) is a completely accepted fact. Rates of migration range from a high of over 20 meters a year for some of Louisiana's Chandeleur Islands (Otvos) to more typical landward movements of less than a meter a year for most American barriers.

The focus of most barrier island research has now moved on from documentation of migration to probing the mechanisms and history of migration. A particularly important development is bringing to bear the results of closely spaced shallow drilling on the question of island Holocene history (Moslow and Heron). The various papers in this volume make it startlingly clear that the mechanisms of island movement are highly complex and variable. No two barrier islands work the same way, a fact that should be of considerable significance to planners and developers. For example, differences in mean grain size of the sand on adjacent North Carolina islands play a major role in island storm response and recovery (Cleary and Hosier). The superior water-retentive properties of islands made up of fine sand promote rapid vegetative repair of storm dune damage relative to repair on coarse-grained islands. Along the Atlantic coast of the United States north-south changes in the species makeup of beachfront plant communities are responsible for important differences in sand dune shape, dune growth rate, and even island elevation (Godfrey *et al.*). On a larger scale, waves and tides exert major control on barriers (Hayes). Islands are not present on trailing-edge coasts with high tidal ranges. Intermediate tidal ranges produce short, stubby ("drumstick") islands. Islands migrate as a result of sediment removal on the front side and sediment deposition on the back side. Several authors (Halsey, Oertel, Kraft *et al.*) emphasize the role of underlying Pleistocene topography in determining rates of island migration. Some islands are virtually hung up on preexisting topographic highs.

A number of symposium volumes treat beaches, but here for the first time an overview of entire islands systems is presented. In this volume the beach is viewed as one of several important components of a larger system. The majority of active North American geologists specializing in barrier islands contributed to this volume, and the reader will learn where island research is today. Most of the papers contain a significant review component; more than half of the information in this volume has been discussed previously. Editor Leatherman in the foreword emphasizes the importance of understanding barrier island mechanics for the sake of barrier island management and development. Quite true. My only disappointment is that little more is said after the foreword concerning practical application of island studies.

This well-balanced volume is an essential addition to the library of any scientist even peripherally interested in barrier island studies.

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