

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