create (primarily through use of sympathetic mass media) for Governor Carey of New York and President Carter.

This book provides a powerful lesson on these matters and more. I found it flawed by a periodic absence of important relevant information and by a lack of empathy for the health bureaucrats trapped in their own maze of dilemmas. I was also put off by the tone, sometimes bordering on the ingenuous, in which the virtues of "citizen participation, a central concept in our democracy" (p. 56) are extolled. But these amount to minor matters of complaint for the official evaluator; there is much rich material here—resulting from the dogged pursuit of issues and evidence that are effectively investigated all too rarely.

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## Inferences from Artifacts

**Symbols in Action.** Ethnoarchaeological Studies of Material Culture. IAN HODDER. Cambridge University Press, New York, 1982. x, 244 pp., illus. $39.50. New Studies in Archaeology.

Most archeologists would accept that societal and ideational aspects of culture are underdetermined by the economic infrastructure. The most salient aspect of much material culture is, however, stylistic, relating directly to social patterning and pervasive ideological themes. Archeologists thus, technical and methodological problems aside, have to be continually working back and forth from one analytical level to another, while attempting to control inference by reference to expectations generated through analogy. Hodder often fails to differentiate between style and culture-in-general, but it is with the interpretation of stylistic aspects of material culture that *Symbols in Action* is concerned. The currently dominant approaches to style in archeology fall into two broad categories. In the normative view, the degree of stylistic similarity between bodies of material culture reflects the extent of interaction between social groups, of whatever scale; in the systemic approach, style is seen primarily as a vehicle for the exchange of information about social identity, especially employed between groups at intermediate social distances. Hodder demonstrates that the reality is far more complex.

In a series of ethnoarcheological studies in Kenya and Zambia that involved the, undoubtedly exhausting, inventorying of hundreds of compounds, Hodder argues that, far from passively reflecting social differences, style is strategically manipulated to symbolize and justify inter- and intrasocietal relations. Among the mainly pastoralist Njemps, Tugen, and Pokot of the Lake Baringo region in northern Kenya, for example, stylistic differences in many types of object, whether produced by specialists or domestically, are correlated with the degree of competition between the societies for pastures and cattle and, within these societies, with the tensions between gerontocratic elders and men of the warrior age grade. Hodder even claims to detect in the decoration of womens' gourds their silent revolt against male domination. In the Zambian Lozi state, the elite manipulate material culture as symbols of power to legitimate their rule and to create a mystique of unity among unequal citizens of diverse origin. These studies are crammed with fascinating detail, and although we may wish to quarrel with certain inferences or to complain about a lack of ethnographic depth and, in some cases, of documentation, there is no doubt that, besides providing a rich source of analogy, they significantly extend and develop this aspect of theory.

The second half of the book, even if ultimately less successful, is more ambitious and even more stimulating. The relations between style and society are extremely subtle, and it is not possible to predict in any simple or direct way which items of material culture will be chosen for elaboration as vehicles of expression, or in what way. Why, we may ask, are Tugen and Njemps spears identical even in zones where the two groups are in competition? The answers to such questions require a more profound understanding of ideology and cognitive processes, and, in Hodder's view, a structuralist approach. In chapter 8, provocatively entitled "Dirt, women and men . . .," he attempts to show through a study of three "tribes" of the Nuba Mountains, Sudan, how the stylist component of "each material trait is produced in relation to a set of symbolic schemes, and in relation to general principles of symbolic meaning which are built up into particular arrangements as parts of social strategies." The primary principles in this case are taken to be concepts of purity (pure/impure = male/female = cattle/pig, and so on) and of the insider/outsider dichotomy that "structurally transform" social relations into material culture.

One of several difficulties here is that, although we may agree that, within any one "simple" culture, expressions of style are likely to be unified by reference to an underlying conceptual scheme, this is very hard to demonstrate—even ethnographically. Once a hypothesis has been set up, it is by no means easy to decide what sorts of evidence militate for and against it. For example, "Purity and fertility can be assured either by safeguarding the entrance to the granary with the clean, or by confronting impurity with the unclean." Negative evidence, by a sleight of inversion, becomes positive. Hodder does not seriously address this epistemological question, nor in a sketched application of his approach to the Late Neolithic of the Orkneys does he convince. A year or more's fieldwork among the Nuba and monographic treatment of the question would be needed to investigate the flow of causality from infrastructure to "social system" (that is, structure) and "social structure" (that is, superstructure) and its implications for stylistic expression.

This is an exciting book with wide-ranging implications, and it is well produced save for the critical but often illegible distribution maps. The author deserves only praise for raising far more questions than he is able to answer, and for providing a wealth of ideas and data that materially advance the discipline and will fuel productive controversy.

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## The Leguminosae

**Advances in Legume Systematics.** Papers from a conference, Kew, England, July 1978. R. M. POLHILL and P. H. RAVEN, Eds. Royal Botanic Gardens, Kew, 1981. In two volumes. xxii, 1050 pp., illus. Paper, £30.

Biological systematics has lately come into its own again, as the need and the materials for synthesis have built up. Intellectual discipline is entering a subject in which the predominant conservatism has meant unwillingness to think and the radical countercurrent has owed more to idiosyncrasy than to insight.

Insight distinguishes the first two introductory chapters of this symposium on the legumes, "one of the great lines of dicotyledonous evolution," as E. J. H. Corner puts it. Those chapters (by Polhill and Raven, with the collaboration of C. H. Stirton) show what modern syn-

thetic taxonomy ought to be about. Yet I take issue with them on some conclusions; in particular, the biogeographic assertion that "there is no reason whatever to suppose that there were any legumes in Australia prior to the Miocene" is highly arguable. Inferred phylogenetic patterns and distribution suggest that "*Acacia* subgenus *Heterophyllum*" (a good genus by any reasonable criteria), *Castanospermum, Bossiaeeae* (both of its disparate moieties), *Mirbelieae*, and perhaps *Barklya* were in Australia long before the Miocene influx of odds and ends of other legume groups, all with close relations in Asia.

Part 1 of the work presents discussions of all subfamilies and tribes as recognized by the various authors, with enumerations of all genera (500 or more). Part 2 consists of 30 chapters on special topics. Among them are a fine chapter on cytology by Goldblatt and accounts of many aspects of phytochemistry, of varying value but none useless. Also treated are root nodules (Corby, Sprent), wood anatomy (Baretta-Kuipers), and petal sculpturing (Stirton), the last representing a new field that will help us understand in adaptive terms why some flowers are glossy, some velvety, and so on. Several chapters are devoted to the taxonomically and adaptively important albeit sometimes obscure subject of pollen morphology and fine structure, with a superb introductory chapter by Guinet that has significance for all flowering-plant families. Among the other chapters are ones on breeding systems (Arroyo) and defenses against herbivores large and small (Janzen), one of the best things in the book. Some of the chapters not mentioned here are equally good, though a few are rather formalistic (for example, Dudik on pod classification) or report work as yet too sketchy to have much synthetic value (for example, Weder on protease inhibitors). All are of some use, even if only in leading us to think of future elements in the phylogenetic-dynamic synthesis that justifies systematic study.

Editorial flaws in the book are few; among them are: "*Nemicia*" for *Nemcia* and "Dipteryxeae" throughout for a new tribe that must on etymological and grammatical grounds (and therefore under the International Code of Botanical Nomenclature) be corrected to Dipterygeae (Greek: *pteryx, pterygos*).

The systematic value of understanding of inflorescence structure is sadly neglected overall; the few attempts at such analysis in limited groups are intriguing but imperfect.

Illogical and sometimes indefensible systematic placements are too many, though they are few in proportion and the evidence for correcting them is in the book. To mention only a few: *Parkia* and *Pentaclethra* have only superficial and symplesiomorphic features in common and should be separated; Swartzieae and especially Sophoreae are messes of diverse elements; *Erythrina* (as Raven points out) should be in a tribe by itself; *Glycyrrhiza* is out of place in Galegeae and belongs in or near Psoraleae; *Pickeringia* does not belong in Thermopsideae, nor *Anarthrophyllum* and *Sellocharis* in Crotalarieae, nor I suspect *Lupinus* in Genisteae; and certainly the Australian pseudotribe Bossiaeeae (this spelling is correct under the Code) must be a mixture with two diverse origins. Such foul-ups in an otherwise phylogenetically reasonable system reflect the immanent curse of taxonomy, excessive respect for the past.

Admirable are the words of Irwin and Barneby in their chapter on the Cassieae: "We have encountered a prejudicial belief that a tribe is by nature extensive and that the proliferation of tribes within a family must inevitably devalue tribal status. We hold, to the contrary, that this must depend entirely on the nature of the taxa under review. . . . The hallmark of any taxon should be quality, not mass." But even they have partly yielded: "We should have accorded tribal rank to the five subtribes if not dissuaded by others!"

But the most striking deficiency in this grand work is that it almost ignores cladistics. I could not find a mention of this term until p. 620, hidden in a chapter on phytoalexins. Certainly Polhill, Raven, and Stirton put forward a reasonable phylogenetic scenario of the family as a whole and summarize abundant evidence that convinces even this reviewer that the legumes are best treated as a single family, not three. This view is founded on a mass of evidence and the absence of marked extinction gaps in the array of contemporary genera arranged for convenience in three fuzzy subfamilies, one of them (Caesalpinioideae) including relict groups not too different from the ancestors of all legumes as well as lines just as "advanced" as the other two subfamilies.

Throughout the book, probable phylogeny is fascinatingly illuminated, but no consistent methods of phylogenetic analysis are employed (except in some chemical chapters, where the data are limited and the suggested detailed phylogenies rather incompatible with those derivable from other or broader databases).

There are chapters, notably one by Watson, that feature phenetic analyses. This technique should be sufficiently discredited by now on logical and practical grounds, so far as taxonomy above the interbreeding level is concerned. Of course, phenetics will tend to show some correspondence with cladistic analysis—the messages of that part of the basic data that represents synapomorphic character states are not always drowned out by the noise inherent in the phenetic input and the effects of analyses unrelated to any biological model. But to have included phenetic analyses while ignoring sensible (as opposed to doctrinaire) cladistics is a major blemish on this fine work. The data are there for cladistic analysis, tempered by functional interpretation as so well treated in this symposium. How one would love to do it on such a glorious family, and one of such ecological and phytogeographic importance, to say nothing of its vital role in the past, present, and future of the human species' encroachment on the biosphere.

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## Cellular Regulation

**Calcium and cAMP as Synarchic Messengers.** HOWARD RASMUSSEN. Wiley-Interscience, New York, 1981. xiv, 370 pp., illus. $39.50.

The theme of Rasmussen's monograph is the relationship to cell homeostasis and to one another of the two most clearly established biological "second messengers," calcium and cyclic AMP. Rasmussen was one of the first to call attention to the relationships between these second messengers in an important review appearing over ten years ago (*Science* **170**, 404 [1970]). This monograph serves to illustrate how experimentation during the '70's has added substantially to our knowledge of this topic.

Historically, our appreciation of the biological importance of calcium dates back almost a hundred years to Ringer's original observation that muscle contraction requires calcium. Only in the last 20 years, however, has the general role of calcium as a mediator of other cellular responses (such as secretion and metabolism) come to be fully realized. The discovery in the 1950's by Sutherland of cyclic AMP and its role as a mediator of hormone action in the liver subsequently spawned a considerable quantity of re-