been done with greater effort, a larger staff, a bigger budget, a deeper problem, and a keener sensitivity for the whole social and cultural context of its problem than the work of Alan Lomax reviewed here. This book is a massive attempt to correlate song and dance styles with various other aspects of culture. Lomax reports correlations between level of cultural evolution on the one hand and on the other hand song complexity, song wordiness, song explicitness, song repetitiousness (the more complex the social development the less repetitious the songs), narrowness of melodic intervals, rhythmic organization, consonant complexity, and phonation areas (chapter 6). These findings would echo those of Fischer's study of the graphic arts. Lomax reports a correlation between stability of work teams and cohesive song groups; that is, song groups and work groups tend to have similar social structures (chapter 7). He reports a correlation between several aspects of child training and several elements of song style (chapters 8 and 9). He reports a marked association between several elements of dance style and level of cultural evolution (chapters 10 and 11). He also, with less assurance, suggests a possible correlation between frequency of certain types of concepts in song texts and level of cultural evolution (chapter 13).

Lomax even finds clear associations between the voice quality of the songs of a tribe and its style of subsistence production. "Noisy" voice styles—raspy voices, narrow voices, nasal voices—tend to be especially common among irrigation farmers and not nearly so common among foraging tribes or simple gardening or herding tribes. Furthermore, "tense" voice styles—narrow voices or nasal voices—are most common in societies where food production tends to be predominantly the work of men rather than women. Lomax explains these two associations as reflections of the male dominance and female sexual repression. That may be, but his evidence supports equally well a variety of other explanations. There are a wide variety of traits associated with level of social development—including, as Lomax here shows, a number of elements of musical style. To single out certain of these traits as causes and certain others as effects requires more evidence than mere correlations. In general, his associations seem well documented, but his theories of causality lack greater support than raw correlations.

Lomax's work goes farther even than these tests of theory. It offers many novel and evidently useful categories of musical performance—types of song and dance styles. Lomax has studied not merely single musical traits but complex patterns of traits and has mapped their distributions in considerable detail.

An underlying theme of Lomax's book is the linkage between different orders of complexity or of elaboration of folk song and dance styles on the one hand and of successive stages of social development on the other. Simple foraging peoples tend to prefer contrapuntal and interlocked singing. Tribal farming people without any real city life are the people who have developed most highly musical polyphony, musical polyrhythm, and musical integration. And so on.

The formal solutions which Lomax offers in this book to the difficulties pointed to by critics of earlier cross-cultural surveys are not good enough to silence all of *his* critics. Indeed, Lomax is publishing further documentation elsewhere. His many dozens of correlations clearly show important associations between musical styles and social and material culture. These correlations are there, and the carping of his critics will not get rid of them. As the decades pass, and other studies independently confirm his findings, this study will thus stand forth as a monument of our time. As of now, however, Lomax's cause-and-effect explanations of the associations remain no more than the hunches of a sensitive and learned musicologist.

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The Reconstructing of Prehistoric Societies

Settlement Archaeology. K. C. CHANG, Ed. National Press, Palo Alto, Calif., 1968. x + 229 pp., illus. $8.95.

Archeologists have, over the past decade, become increasingly interested in describing aspects of prehistoric societies that were formerly thought impossible to elucidate. The focus is on reconstructing social organization—residence patterns, task organization, integrative institutions, statuses, and so forth. Argument over how such organizational features can best be discovered and their existence confirmed empirically is increasingly heated; and since this book is an attempt to present an appropriate methodology, it will provoke further healthy escalation of the argument.

Chang's purpose in assembling the 11 very diverse papers in this book is at least threefold: to present some of the basic theoretical and methodological tenets of a fashionable new "approach" in archeology—the "settlement approach"; to present some of the kinds of problems the settlement archeologist must face; and to provide further substantive examples of this so-called "new archeology." While the first of these goals is only partially met, the others fare much better. The book, taken as a whole, is a comprehensive and illuminating discussion of the programs and practices of the settlement "school" of archeology.

A most provocative paper is Chang's own contribution, "Toward a science of prehistoric society," in which he sets forth a rationale and proposed methodology for a settlement approach. A paper by Irving Rouse expresses strong disagreement with Chang, especially with regard to the priority of research procedures. The other papers are all stimulating products of noted professionals, including James Deetz (artifact typology), Robert Ascher (stages of structural decay in contemporary villages), Bruce G. Trigger (determinants of settlement patterns), Sherburne F. Cook and Robert F. Heizer (relationships of floor-space and site area to population size), John W. M. Whiting and Barbara Ayres (architectural and sociological inferences based on dwelling shapes), William Sears (settlement models indicating levels of organizational complexity), Evon Z. Vogt (Zinacantan organizational model as applicable to the prehistoric Maya), and William Y. Adams (inferences from the changing settlement plan of a Nubian village). The final paper is an appraisal by Gordon R. Willey, including an adjudication of the disagreements between Chang and Rouse.

Chang's claim that settlement archeology is a new archeology, although not without merit, is somewhat exaggerated. In the first place, no new theory is presented. The major premises are left implicit, and they represent no departure from traditional eclecticism. Further-

more, there is little new in a methodological sense. Chang's statement of methodology is essentially a series of definitions of concepts, lacking clearly specified guidelines as to how one might actually go about discovering the organizational features of prehistoric societies. Trigger's paper, though more clear in this regard, reaffirms the traditional method of simply applying inferences drawn from ethnographic data to the archeological record, without adequate test. Methods of analysis also remain unchanged, since the implication is that, once sociological traits have been described, the analytical goal is to place them into foci, phases, and so forth—as has been done traditionally with artifacts. One must conclude, in agreement with Willey's appraisal, that the newness of this endeavor lies primarily in the nature of the data being examined. Instead of making inferences solely from the traditionally considered kinds of artifacts, settlement archeologists are making inferences from a previously inadequately examined class of artifacts—the structures, village plans, and site distributions of prehistoric peoples.

It is also important to note that although Chang conceives of the settlement approach as a beginning toward a science of society, there is little indication in the primary methodological papers (Chang and Trigger) that what are generally accepted as goals and methods of science are being advocated or employed. There is, for example, no indication of interest in explaining variability and change in social organization. Thus far, the goals appear to be primarily descriptive. Science attempts more than this; it involves a commitment to the search for nomothetic principles—laws or generalizations of process. In addition, this book lacks an awareness of accepted hypothesis-testing procedures; this too is fundamental to a science.

Nonetheless the book is important. It is important because of the continuing claim that settlement studies represent a new approach. It is also important, however, because it does present a departure from tradition—it provides a further demonstration that settlement data are indeed useful in drawing inferences about the ways in which past human societies were organized. The many specific examples (both real and expected) of the relationships between social organization and settlement characteristics are stimulating and useful. And further, these relationships are frequently presented in the form of descriptive cross-cultural generalizations. Such relationships are just beginning to be discovered, and the effort to find them must be encouraged.

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Heterogenetic Organisms

Plant Chimeras. W. NEILSON-JONES. Second edition. Methuen, London, 1969 (U.S. distributor, Barnes and Noble, New York). viii + 124 pp., illus. $4. Methuen's Monographs on Biological Subjects.

A chimera is defined as an individual organism composed of tissues of more than one genotype or plasmotype, the difference being maintained by continued growth of a terminal meristem. Thus unique to higher plants, chimeras are properly distinguished by Neilson-Jones from such other heterogenetic forms as grafts, transplants, and mosaics. The modern spelling has been adopted to avert confusion with the elasmobranch genus *Chimaera*. Of various types, the periclinal chimera, in which each cell layer is genetically homogeneous, is the most stable and most useful experimentally. Numerous varieties of vegetatively propagated horticultural species exist in a periclinal condition.

The general subject is presented skillfully according to its historical development. It is revealed how the early "graft hybrid" hypothesis was supplanted by Baur's chimera concept, now verified in scores of examples. As is typical of science, the exceptional cases often prove to be the most interesting ones. The composition of mature organs of periclinal chimeras was clarified by the discovery that the subepidermal layer, initiated as a layer of single-cell thickness, can thicken by anticlinal divisions. Anomalous variegations in certain monocots revealed extensive invasion of one layer by another even though the periclinal chimera maintains its integrity near the meristem.

Paraphrase of the contents of the first edition constitutes two-thirds of the new edition, updating being restricted almost entirely to the remainder of the text. The early portions are belabored and redundant examples of chlorophyll variegation presented at the expense of important new developments. For example, the classical research by Satina and her colleagues on *Datura* cytochimeras is treated briefly; although these workers successfully traced the origins of all parts of the leaf and flower to the respective histogenic layers, reference is made only to their research on the ovule. Also missing are accounts of: the demonstrations by Asseyeva, Crane, and Simmonds that mutants and established varieties of potato are periclinal chimeras with cores of other known varieties; Howard's x-ray-induced reconstitution of entire meristems from the epidermal layer in periclinal chimeras; and Günther's chimera of *Lycopersicon peruvianum* and *L. esculentum*, which breeds as the former but displays the self-compatibility and interspecific compatibilities of the latter. The extensive research on various problems in chimeras from induced mutation is scarcely mentioned.

For proper balance the book should have included additional applications of chimeras. Michaelis revealed how chimeras can be utilized to trace the origin of plasmon mutants and to discriminate between various hypotheses of origin. Fascinating mechanical discontinuities are known between component tissues of certain chimeras, and interactions of a nutritional or regulatory nature might be envisioned from the wealth of combinations that can be effected between species or between genotypes within species. Clearly a subject of such broad biological interest deserves a general treatment. Neilson-Jones's book provides the closest available approximation.

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Tools in Biology

Glass Microelectrodes. MARC LAVALLEE, OTTO F. SCHANNE, and NORMAND G. HEBERT, Eds. Wiley, New York, 1969. xviii + 446 pp., illus. $22.50.

Since the papers of Ling and Gerard 20 years ago, the glass microelectrode has been constantly used and abused by biologists in their attempts to ascertain the internal conditions of cells and the properties of the membranes. This collective volume is of practical help to experimentalists who make and use electrodes; some of the 19 contributions are of as much relevance to macro- as to microelectrodes, notably the chapters dealing with the choice of