various technologies devised by these hunters, fishers, and gatherers, and what effects such substantive factors had on Aboriginal patterns of residence, mobility, and interaction, including intermarriage. In short, almost from the start of his investigations Tindale was tackling the kinds of problems that only recently have become central for many anthropologists who study small-scale "tribal" societies, whether of relatively nomadic hunters and gatherers or of sedentary horticulturalists.

These interests led Tindale early in the 1930's to what has been his major undertaking and perhaps his most significant contribution to Australian anthropology—a meticulous analysis of the determining characteristics and the distribution of the 600 or so Aboriginal tribes that occupied the Australian continent at the time of European settlement. The problem of tribal identification and location has plagued investigators, whether anthropologists, historians, missionaries, or administrative officials, ever since the first European explorers and settlers began describing the Aborigines. Each writer tended to impose on his observations (which often were exiguous in the extreme) his own definitions of the various kinds of local groupings he encountered, and these denominations were frequently the unexamined products of the literary or scientific fashions of the time. In consequence, as the quantity of published or archival accounts grew, confusion was steadily compounded, to the point where later inquirers often felt they were drowning in a sea of ambiguity and could make little or no sense of earlier descriptions of Aboriginal local arrangements. Did a particular proper name refer to a given tribe, or to one of its constituent bands, or to a nonlocalized descent group within it? What was the extent of its territory? Were there demarcated boundaries? Who actually lived there? Moreover, what were the relationships among the several names given by independent observers to what appeared to be one community? These are the kinds of questions that Tindale set out to answer, and *Aboriginal Tribes of Australia* is the culmination and synthesis of his labors, both in the field and in the archives.

The book comprises two distinct parts. The first, entitled The People and the Land, is more than a prolegomenon to the second, which is essentially a gazetteer. In the first section Tindale carefully describes what he takes to be the fundamental local groupings found among Aborigines everywhere in Australia—the family hearth group, the clan and horde, and the tribe. He then shows how these units are set in the context of regional variations in the Australian environment, together with the ranges of foodstuffs available and of the indigenous technologies of food procurement. He goes on to indicate the significance of these substantive differences for the size and stability of tribal groups and for the frequency and nature of their interactions, whether in armed encounters or for the circulation of commodities and of women. At the same time, he does not underestimate the importance of Aboriginal moral values and religious beliefs, or of totemic rituals in maintaining local arrangements. That is to say, nonmaterial, ideological facts are as much a part of these ecosystems as are the material elements.

Obviously, given that Tindale has ranged over a whole continent and across almost two centuries of records of uneven reliability, anthropologists with special knowledge of individual groups or localities may take exception to certain of his assertions or interpretations, and I have no doubt that some will do so in the appropriate journals. Nevertheless, I consider the first part of the book to be not only a solid, reasoned justification of Tindale's methods and opinions but also an excellent overview of the important characteristics of Aboriginal societies and of Aboriginal culture in general. It should impel Australian fieldworkers to reexamine their own material and arguments, and at the same time it provides a valuable introduction to Australian Aboriginal life for other anthropologists and social scientists.

The second part of the book lists and locates geographically all the known tribes, points to specific problems of identification, and cites the relevant authorities. There is also a list of all the variant tribal names, keyed to the master list. In addition, in a separate case, there is a large and detailed map of Australia on which the tribal territories are delineated. In an appendix Rhys Jones pulls together what is known or can be inferred about the tribal organization and distribution of the extinct Tasmanian Aborigines.

As Tindale remarks, in an enterprise of this magnitude there will inevitably be some errors to be corrected and some misinterpretations to be amended. But, as it stands, the gazetteer is unambiguous and easy to use. It is a reference work of enduring value, not simply for Australian specialists but for anyone interested in the study of hunting and gathering societies. Anthropologists, archeologists, historians, all of us will remain greatly indebted to Tindale for undertaking such an onerous task and for bringing it to so successful a conclusion.

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Differentiating Cells

Cell Cycle and Cell Differentiation. J. REINERT and H. HOLTZER, Eds. Springer-Verlag, New York, 1975. xii, 334 pp., illus. $29.70. Results and Problems in Cell Differentiation, vol. 7.

That some correlation exists between cell division, cell determination, and the expression of specific differentiated properties has been recognized for decades, and the papers in this volume document that relationship in a variety of systems. Some of the papers present potential model systems, some are detailed reviews of a particular system, and some are highly speculative presentations focused on the cell cycle and differentiation.

Of the first type are papers by Wood and Shapiro on the prokaryote *Caulobacter* and by Nelson *et al.* on the fungus *Neurospora*. They describe organisms that hold great promise for the genetic dissection of the cell cycle and cell differentiation, but in which analysis of these processes is still at a relatively primitive stage.

Papers that are basically reviews are those by Hunt on neuronal specificity, King on the *Drosophila* ovary, Braun on tumorigenesis in plants, Tsanev on liver function, and Borun on histones. Hunt establishes the plausibility of a role for cell cycles and cell lineages in the establishment of neuronal specificity and defines a framework for further experimentation. Typographical errors mar Hunt's paper and Borun's otherwise interesting account of the history of the histone problem and of possible roles of histones in regulating cell activities. Tsanev's very detailed review is informative and focuses mainly on correlations between proliferative activity and the functional states of already differentiated liver cells both in vivo and in vitro. King's review of the cell cycle and cell differentiation in the *Drosophila* ovary presents what is currently the clearest example of the relative roles of cell lineage and cell environment in differentiation and is perhaps the most stimulating paper in the volume. The only other paper on insects is one by Lawrence on cuticle development; its superficial, almost casual nature is unfortunate, since Lawrence is the only author in the volume who seriously questions the nature of the evidence on "quantal" cell cycles.

Largely speculative papers are those by Dienstman and Holtzer on myogenesis, Weintraub on erythropoiesis, Phelps and Pfeiffer on neurogenesis, Gurdon on cyclic reprogramming of gene expression, and Meins on cell determination in plants. Dienstman and Holtzer present a very clear statement of Holtzer's rigid cell lin-

eage view of differentiation and the quantal cell cycle concept. This is an appealing paper, but it goes far beyond what the reported data on myogenesis actually demonstrate. Weintraub's and Gurdon's papers are interesting in that they present rather different mechanistic models for genetic reprogramming, Weintraub's involving S-phase cells and Gurdon's involving chromosome condensation and decondensation accompanying mitosis.

It is once again apparent from this volume that cell differentiation and the cell cycle are intriguingly coupled, but experimental evidence so far provides no mechanistic basis for choosing between the relatively cataclysmic model of quantal mitosis and a model of more gradual reprogramming accompanying cyclic changes in the state of the genetic material. The volume brings together a wide variety of approaches to this fundamental area of developmental biology, and I strongly recommend it to investigators interested in this field, either directly or peripherally.

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Cell Biophysics

The Physiology of Giant Algal Cells. A. B. HOPE and N. A. WALKER. Cambridge University Press, New York, 1975. xiv, 202 pp. + plates. $24.95.

This small volume is mainly devoted to membrane and transport phenomena in giant algal cells. The limited scope of the book is not entirely an arbitrary choice of the authors, both physicists; a great deal of the available information is biophysical in nature. Included in the treatment are chapters on excitability, protoplasmic streaming, and photosynthetic carbon fixation, but growth and culture methods are given a quick hello and goodbye. Among the organisms, center stage is generally held by the freshwater charophyte genera, *Chara* and *Nitella*, but Raven's extensive work on *Hydrodictyon* is duly covered, and some important results on a few marine species are also included.

Hope and Walker have done a commendable job of putting into coherent form a large body of information on ionic and molecular fluxes, electrical properties of membranes, and water relations. Where the data are extensive they are organized into tables. The basic theoretical aspects of diffusive movement and electrophysiology are rigorously presented, but the treatment is not sufficiently detailed to entice the novice. In fairness to the authors it must be stated that the book is not intended as a basic textbook, but as a current guidebook for researchers and graduate students.

Difficulties begin where attempts are made to interpret material fluxes and membrane potentials in terms of simple models. These cells are far from simple: compartmentation into cell wall, cytosol, cytoplasmic organelles, and vacuole render the kinetics anything but clean. The influence of light remains a tantalizing enigma. The authors are forced into a cautious and tentative posture on almost every major issue. They have chosen, wisely I think, not to pile hypothesis on hypothesis, but to let the empirical data stand juxtaposed to the simple theoretical framework available. Helpful here are reproductions of many original figures.

Despite the inconclusiveness noted above, this is a welcome publication. It documents the considerable biophysical achievements in the field and, by its omissions, points a finger at the sadly neglected state of research on the organized biochemistry of these cells. True, large cells offer relatively little membrane material to work with, but surely a few surplus bathtubs are available for mass cultures. Biochemical studies including transport catalysis by membrane proteins should now be given top priority in research on giant algal cells. I hope that in a few years a second edition of this book will be able to record appreciable progress in this area; the field of membrane transport will be greatly enriched by such progress.

International System (SI) units are used in the book, and several attractive black-and-white photographs are included. A historical sketch of the electrophysiology of plants includes appropriate recognition of its pioneers.

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Sexual Diversities

Intersexuality in the Animal Kingdom. Papers from a symposium, Mainz, Germany, July 1974. R. REINBOTH, Ed. Springer-Verlag, New York, 1975. xvi, 452 pp., illus. $41.80.

When the primordial germ cells migrate into the germinal ridges of vertebrates or settle in the presumptive gonadal zones of invertebrates they are presumed to be undifferentiated. A hormonal milieu will then be established that ensures the differentiation of these gonia into one of two types—ova or spermatozoa. In the vertebrates and many higher invertebrates the presence of a particular chromosome or chromosome set ensures proper gonadal differentiation and therefore hormone production. The hormones act both on the nervous system to fix a neurosecretory axis in the male or female direction and on the gonia themselves to stimulate maturation of the germ cells. The gonadal secretions also act on the somatic tissues, producing the proper secondary sexual characteristics that are so important in regulating gamete transfer and care of the offspring.

The gonia appear to be intricately enmeshed in the processes described above, but their role as initiators or evocators is small. A stimulating effect on the size and form of the gonad is certainly present, but beyond this they appear merely to be products of two complex differentiation pathways. One leads to a cytoplasm-free cell, designed for rapid motility and for cell fusion and nuclear transfer, the other to a nutrient-filled cytoplasmic mass, specialized for rapid cleavage and the distribution of "factors" required for subsequent cell differentiation during embryonic development.

If these end points of differentiation are based on proper hormonal stimuli, in turn derived from the proper somatic-gonadal milieu, all derived from proper sex determination, then what are we to make of the subject of this volume? For here are 39 papers on natural and artificial intersexes (one on cnidarians, three on platyhelminthes and nemertines, six on annelids, five on arthropods, three on mollusks, one on echinoderms, nine on fishes, two on amphibians, two on reptiles, three on birds, and four on mammals). In these organisms chromosomal sex determination appears to be absent or autosomal, the hormonal milieu of one sex is not antagonistic to the germ cell differentiation of the other, and gonads are often found containing ova and spermatozoa differentiating side by side. The vertebrates (with the exception of the fishes) seem pallid in their sexual diversities by comparison with some of the invertebrates, which can be permanently bisexual and often self-fertilizing (urochordates, ctenophores, chaetognaths), be both sexes at once (annelids, mollusks, platyhelminthes, crustaceans) or alternately (crustaceans, annelids), or be half and half (arthropods). It appears that for the lower forms immutable sexual fixation is not as crucial to the functioning and survival of the species. Not only does this provide endless headaches for taxonomists and evolutionists, it also provides unusual experimental material for studies in genetics, population biology, endocrinology, behavior, and cell biology.