class women move away from an exclusively domestic role. In the process such women might be expected to be eagerly attentive to professional pronouncements liberating them from the taint of maternal deprivation. But this does not indicate that they have given up the cultural faith in the long-term import of early experience. To determine this we need inquiry into the present cohort of working mothers.

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Medical Self-Help

Medicine without Doctors. Home Health Care in American History. Papers from a symposium, Madison, Wis. GUENTER B. RISSE, RONALD L. NUMBERS, and JUDITH WARNER LEAVITT, Eds. Science History Publications (Neale Watson), New York, 1977. x, 124 pp., illus. Cloth, $7.95; paper, $4.95.

The present day is not the first time in American history that conventional medical practice has come under the gun of social criticism. It happened before, during the middle of the 19th century, and this book, the outgrowth of a seminar on the subject, is an attempt to describe and explain that earlier movement. With an eye half cocked on the present the authors have tried to understand what it was about the American character or the particular historical conditions of the time that produced such massive disaffection.

The book consists of five articles and an introduction by one of the editors. (What, incidentally, are we to make of a book that has almost as many editors as authors?) Since the five authors do not differ from each other in methodology or theoretical stance they seem, as it were, to be speaking with one voice about different aspects of the same subject. John B. Blake discusses domestic medical manuals, most of them written by "regular" physicians who believed that the informed patient was the best patient. Ronald L. Numbers describes the "irregular" self-help movements—herbalism, homeopathy, and hydrotherapy in particular—that were explicitly opposed to the norms of medical practice, and James H. Cassedy attempts to explain what made those movements so popular. Regina Markell Morantz assesses the relationship between medical self-help and the changing role of women, and James Harvey Young describes the producers of patent medicines, purveyors of yet another form of self-help. Guenter B. Risse's introduction attempts to tie the five pieces together, not a terribly difficult task considering how similar they are in tone and how well articulated in content.

All the articles are based on standard published sources, principally the books and articles written by proponents of self-help. None of the authors has attempted the considerably more difficult task of assessing the movement from the users' rather than the purveyors' point of view; none of them has gone to the letters and diaries that exist for the period (in other words to the unstandard and largely unpublished sources) to find out what people thought about home remedies, patent medicines, and "irregular" practitioners or, more crucially, how often people made use of them. This leads the authors to make sweeping judgmental pronouncements about what the self-help movements offered (for example, "a means of coping with an imprecise, undependable, and often hostile environment"; Morantz, p. 81) without giving us any idea whether the offer was ever taken up. Cassedy points to this and other failures when he writes (p. 47), "We are unfortunately almost totally ignorant of the various dimensions of domestic medicine. . . . We have hardly the slightest idea of its numerical extent and we know little of its distribution," but unfortunately for us those sentences appear at the very end, not the beginning, of Cassedy's article.

Most of the descriptions offered by Numbers, Blake, and Young can be found in other places, often in greater detail, and most of the explanations offered by Cassedy and Morantz (rise of democracy in the Jacksonian period, failure of "heroic" medicine to cure effectively, lack of physicians on the frontier, general popularity of no-nothingism in this period, disappearance of traditional feminine roles after industrialization, and so on) are also much bruited about. Historians who specialize in the development of American medicine will perhaps find it convenient to have the descriptions and the explanations lodged in one, fairly inexpensive place, but they will otherwise find very little that is novel in this volume, except perhaps Morantz's discovery that many 19th-century feminists were health reformers. Other readers may well find it a useful brief introduction to the subject.

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Communication Between Cells

Intercellular Junctions and Synapses. J. FELDMAN, N. B. GILULA, and J. D. PITTS, Eds. Chapman and Hall, London, and Halsted (Wiley), New York, 1978. x, 246 pp., illus. $35. Receptors and Recognition, Series B, vol. 2.

By the late 1950's there was substantial evidence for chemical transmission at synapses. It therefore came as a surprise when in 1957 Furshpan and Potter reported that at the giant motor synapse of the abdominal nerve cord of the crayfish transmission was "electrical," that is, the local currents generated by an action potential in the large presynaptic fiber directly depolarized the smaller postsynaptic motor fiber. This was the first clear demonstration that apparently separate excitable cells were "electrically coupled," and it suggested that a mechanism existed to allow ions to move directly between the cytoplasms of adjacent cells. (The synaptic junction studied by Furshpan and Potter had the unusual and interesting property of being asymmetric or rectifying, with ionic currents in the prefiber easily spreading to the postfiber but not vice versa. Most "electrical" junctions that have since been found are symmetric.) Today electrical coupling, mediated by what are called low-resistance junctions, is known to occur not only between excitable cells in both invertebrates and vertebrates but, surprisingly, between nonexcitable cells as well. Furthermore, in some cases coupled cells have been found to transfer not only ions but also large molecules (up to molecular weight 1000) such as intracellularly injected dyes or biologically relevant molecules such as nucleotides. The transfer of normally present intracellular molecules between cytoplasms of adjacent cells has been termed metabolic cooperation.

It is with electrical coupling, low-resistance junctions, gap junctions, metabolic cooperation, and chemical synapses that this book of nine chapters by ten authors deals. Although the editors state that they planned the book to draw attention to the similarities and differences in structure and function between gap junctions and chemical synapses, it is not obvious that this was achieved. The book can be divided into two roughly equal parts: the first five chapters deal with the structure and function of gap junctions, the remaining four with chemical synapses. It is surprising that there is practically no mention in either group of the material in the other, let alone any discussion pointing

out similarities, differences, or relationships between the two classes of cell contacts. For example, N. B. Gilula ("Structure of intercellular junctions") discusses gap junctions as seen in freeze-fracture, but the corresponding chapter by A. Matus ("The chemical synapse: Structure and function") contains no discussion of the freeze-fracture image of chemical synaptic junctions or of the size of membrane particles, types of particle arrays, and the like. Some discussion tying the two parts together would have given the volume more coherence and might have forestalled the question of why these particular classes of intercellular contacts were chosen for it.

On the other hand, the individual chapters are well written and nicely organized. The chapters on the structure and function of gap junctions offer a good summary of current knowledge, from the freeze-fracture appearance of gap junctions of vertebrates and invertebrates and junctional permeability properties to the properties of newly established junctions and evidence for transfer, presumedly via the gap junctions, of endogenous intracellular molecules. In addition, the chapter by M. V. L. Bennett contains a welcome discussion of the evidence that gap junctions mediate the intercellular transfer of ions and molecules.

Interesting topics such as turnover and regulation of gap junctional particles, junctional specificity, and the use made of antibodies against isolated gap junctions are discussed only minimally because of the lack of information about them. Although the ubiquity of low-resistance junctions between nonexcitable cells of both embryonic and adult animals would suggest a fundamental role in cellular processes, the function of these junctions has yet to be demonstrated.

Other chapters deal with selected topics in the broader areas of synaptic physiology and ultrastructure, transmitter biochemistry, and neurospecificity. The final chapter, by C. R. Slater, deals with the formation and experimental modification of chemical synapses. This chapter contains fascinating results obtained in recent years, especially concerning the regulation of acetylcholine receptors of vertebrate skeletal muscle and the regeneration of and competition between nerves at nerve-muscle synapses. In addition, evidence concerning the primary events in the formation of chemical synapses, the transformation of the neuronal growth cone into a secreting nerve terminal, and the development of local transmitter sensitivity in the postsynaptic cell is discussed in some detail.

The book should be useful to cell biologists, developmental biologists, and neurobiologists who are already familiar with the subject and wish to read a summary of some of the more recent findings.

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Methods in Ethology

Quantitative Ethology. PATRICK W. COLGAN, Ed. Wiley-Interscience, New York, 1978. xvi, 364 pp., illus. $25.

Ethology has traditionally been a nonquantitative science. This is basically for two reasons. First, the Lorenz-Tinbergen school primarily responsible for the development of the field emphasized observation and inference rather than experiment, and, second, as Peter Slater aptly points out in his chapter in this book, it is by no means obvious just how behavior should be quantified. If one is to study unrestrained animals in their natural habitats, the key principle of classical ethology, then one must take what the animals choose to give rather than relying on the power of factorial experimental design. The resulting data are complex, messy, and often cryptic. What, then, is the ethologist to do?

That is the question this book attempts to answer in a series of chapters by ethologists expert in a variety of quantitative techniques. The range of subject matter is impressive, there being discussions of information theory, temporal patterns, cluster analysis, scaling, modeling, and a number of multivariate methods. All of the 11 chapters are written in the same format, with an introduction to the quantitative analysis in question, some examples of it, and a discussion of its limitations and pitfalls. Colgan has edited carefully, and the resultant relative uniformity of style belies the fact that this is a many-author work. The result is that the book is a useful survey of quantitative methods in ethology for professional ethologists and graduate students looking for ways to handle their data for maximum gain. Mathematical sophistication is not necessary for comprehension, although understanding of matrix algebra, standard statistics, and elementary calculus certainly helps.

Depending on their experience and interest, individual ethologists will have their own biases as to which chapters are most rewarding. Slater's chapter on data collection is valuable and thought-provoking and should probably be required reading for experienced ethologist and novice alike. I found Fagen's chapters (one coauthored by Young) on repertoires and temporal patterns a delight for clarity and style. Losey provides an excellent discussion of information theory, although my own regretful conclusion was that because of its drawbacks and excessive number crunching the approach is probably not worth the effort (except possibly for comparison by the same investigator between similar species). Sustare's chapter is an elegant summary of everything you ever wanted to know about systems diagrams even if you didn't know it was systems diagrams you were constructing. Colgan's chapter on modeling seemed to me less satisfying, perhaps because the subject is really too broad for the brief treatment afforded it.

In spite of its many virtues, however, I think the book gives insufficient attention to what may be the most important and difficult problem in quantitative ethology, one arising from the way behavioral data are usually taken. This is the question of what to regard as the sample and the attendant problem of inflated sample size. Difficulties of this nature are apparent throughout the book. An example is Colgan and Smith's discussion on p. 168 of a contingency table that consists of 939 dyads, but from only four fish. The sample is taken to be the dyads, but one can argue that $N = 4$, namely the individual fish. The authors skirt this problem. Losey in his chapter on information theory deals with possible bias introduced by exceptional individuals and uneven contributions from different individuals but does not deal explicitly with the sample size problem. The assumptions involved in statistically treating acts rather than animals need to be emphasized and dealt with explicitly; in this book they are not.

My other caveats are best summarized by Fagen and Young at the close of their chapter on temporal patterning:

> We are frankly skeptical about the value of many quantitative methods currently in use in ethology, and especially of the more complex formalisms. Quantification of perfectly adequate verbal descriptions of behavior is not what we mean by "quantitative ethology." Is any insight really gained by reducing a data set of 10,000 behavioral acts of 10 types to a first-order transition matrix of 100 numbers of unknown accuracy? . . . By contrast we strongly support the modeling approach, and we feel that judicious quantification is an essential aspect of the ethological approach to behavior.

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