although this deficiency is partly allayed by the outlines that precede each chapter.

Many of these topics have been reviewed elsewhere, and in some cases more successfully; the virtue of *The Vertebrate Neuromuscular Junction* is that it assembles within a single volume such a broad range of material related to the endplate. It should prove particularly useful for newcomers to this area of research who might otherwise find the literature overwhelming, but students of the neuromuscular junction should also find it a very good reference work.

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Olfaction and Gustation

Neurobiology of Taste and Smell. THOMAS E. FINGER and WAYNE L. SILVER, Eds. Wiley-Interscience, New York, 1987. xii, 449 pp., illus. $69.95. Wiley Series in Neurobiology.

As has been true for many areas of neuroscience over the past decade, research on the chemical senses—principally olfaction and taste—has benefited enormously from the influx of methods, ideas, and talents from other fields of science and other disciplines of neuroscience. The remarkable advances in visual, auditory, and somatosensory research have served as examples and stimuli for investigations of the organization, mechanisms of function, development, behavioral roles, and diseases of the olfactory and gustatory systems. The invigoration of this important area of sensory neuroscience is evident in the relatively recent spawning of a journal (*Chemical Senses*), professional societies (the Association of Chemoreception Sciences, the European Chemoreception Organization, and the Japanese Association for the Study of Taste and Smell), a regularly scheduled Gordon Research Conference on olfaction and taste, and several organized research groups concerned with the chemical senses.

Olfaction and gustation play key roles in controlling vital behaviors, such as those of feeding and reproduction, and olfaction appears to be profoundly important in the establishment and maintenance of cognitive and emotional states. Moreover, research on the cells, pathways, molecular mechanisms, and psychophysics of chemical-sensory function is contributing to the general progress of neuroscience. There are now marvelous opportunities for advances on problems such as the mechanisms of chemosensory transduction, the genetic and molecular aspects of receptor-cell turnover and target plasticity in the olfactory and gustatory pathways, the cellular basis of information coding and the computational organization of the olfactory system, and the involvement of the chemical-sensory pathways in nutritional and neurological disorders.

As interest and activity in chemical-sensory neuroscience grow, so does the need for an up-to-date introduction to the field. There has been no such single source in recent years, and even otherwise comprehensive textbooks of neuroscience have tended to deal minimally with smell and taste. This compact and particularly welcome new book fills the void at last.

Intending to serve the needs of both students and established neuroscientists requiring an introduction to the area, the editors sought to provide an overview of important issues, ideas, and research findings rather than a collection of comprehensive literature reviews or a treatise on the technical details of research in the chemical senses. The resulting volume is a coherent set of 18 chapters written by leading investigators and clustered under three major topics. The first part, Chemical Sensitivity and Sensibility, deals with chemoreception in unicellular organisms and invertebrates as well as the "common chemical sense" of vertebrates and sets the stage for a second section on olfaction and vomeronasal chemoreception and a third on gustation. Each topic is addressed in an interdisciplinary spirit, with balanced attention to anatomical, physiological, developmental, and psychophysical aspects. Knowledge of basic neurobiology is assumed, but this is not an advanced book.

This book is timely and up-to-date, adequately illustrated, nicely produced, and clearly written. It offers an excellent starting point for both newcomers to the field and cognoscenti who want to broaden their knowledge of the chemical senses.

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Ontogenetic Changes

Development as an Evolutionary Process. RUDOLPH A. RAFF and ELIZABETH C. RAFF, Eds. Liss, New York, 1987. xiv, 329 pp., illus. $58. MBL Lectures in Biology, vol. 8. From a meeting, Woods Hole, MA, Aug. 1985.

The relationship between development and evolution was one of the great themes of late 19th-century biology. The recent renewal of interest in this subject was sparked in part by R. A. Raff and T. C. Kaufman's *Embryos, Genes, and Evolution*, which appeared in 1983. That book argued that a small number of changes involving regulator genes could easily lead to major ontogenetic changes that could be the basis for macroevolution.

Development as an Evolutionary Process contains further papers on this theme. The volume as a whole has a somewhat diffuse and eclectic flavor, partly because it lacks an introduction that spells out the issues involved (the nearest thing to an introduction is a paper in the middle of the book, "Molecular and developmental correlates of macroevolution," by ten researchers from Raff's laboratory).

About half of the 12 papers in the book are case studies and minireviews of the genetic apparatus of eukaryotes. These include two papers on transposable elements and three papers on gene families. Given this emphasis, the title of the book is surprising. The main point the authors of these papers make is that the element of the genetic apparatus they are discussing could bring about a major regulatory change in gene expression during development. One gets the impression that many of these authors normally do molecular biology using a set of proteins or DNA sequences as markers and that they have incorporated a bit of comparative work into their studies. Their papers appear to be attempts to dress up some of this work after the fact by putting it in an evolutionary context.

The papers I found most interesting start with an evolutionary problem and try to marshal comparative data that bear on it. Valentine and Erwin review the paleontological evidence for the appearance of animal phyla during the early Cambrian and develop a convincing argument that macroevolution was very rapid during this period. Elinson compares the development of aquatic and terrestrial amphibians. There has been an enormous increase in the size of eggs of terrestrial amphibians; Elinson examines some of the consequences of this increase for the pattern of development and compares the extra-embryonic membranes of these anamniotes with those of amniotes. Lord and Hill examine the role of heterochrony in the evolution of higher plants. They make a number of interesting comparisons between plant and animal systems and point out the advantages that plants have for this kind of analysis because of their indeterminate growth pattern. Alberch examines the evolution of developmental pathways responsible for remodeling the hypobranchial apparatus of urodele amphibians during metamorphosis. He discusses the effect these pathways have in constraining the