



Tasting and Smelling

Edited by
Gary K. Beauchamp
Linda Bartoshuk



**Handbook of
Perception
and Cognition**
Second Edition

Tasting and Smelling

Handbook of Perception and Cognition
2nd Edition

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and **Morton P. Friedman**

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Preface

This book consists of six chapters covering a variety of topics on taste and smell research. It is not intended to be a complete overview of research in the chemical senses. The authors of these essays were encouraged to emphasize their own perspectives on important issues in the field. They were particularly asked to address unanswered questions and neglected research topics. Consequently, each of the chapters provides a point of view on an important and often controversial research area in the chemical senses. The editors also chose not to include chapters in several areas that have been thoroughly and frequently reviewed. For example, olfactory transduction and CNS processing have received considerable attention elsewhere and thus are not treated here.

Each of the first three chapters is concerned with the sense of taste. As befits this research area, the question of whether there are “primary” or “basic” tastes (e.g., whether taste experience can be classified into a small number of categories, namely, sweet, sour, salty, bitter, and perhaps a few others) is implicitly or explicitly a central issue in all three chapters. In his overview of the biophysics of taste, Brand argues in Chapter 1 that the sense of taste can be conveniently divided into discrete categories, most likely four or five, and he discusses the transduction mechanisms underlying these categories. Within each of these categories, he shows that multiple receptor and transduction mechanisms exist. The remarkable progress in unraveling these molecular and cellular processes forms the bulk of this chapter.

Smith and Vogt, in Chapter 2, on neural codes and integrative processing of taste, argue that the goal of the neurophysiologist is to trace the pathways and elucidate the mechanisms of information processing throughout the central nervous system. They point out, however, that because individual taste fibers are often responsive to stimuli that elicit more than one of these categorical experiences (e.g.,

sucrose and NaCl; sweet and salty), these categories cannot arise through a strict straight-line mechanism where each fiber carries information on only a single taste quality. Moreover, taste nerve fibers also are influenced by tactile and other nontaste stimuli, further confusing the issue. Nevertheless, Smith and Vogt marshal an impressive array of evidence indicating that while no individual taste fiber is exclusively responsive to a single taste quality, the fibers do have a rough specificity. From this complexity, Smith and Vogt delineate the reasons that there is still sentiment for the idea that taste coding is similar to coding in color vision. They argue that, in taste, activity of one fiber type is insufficient to discriminate between stimuli of different taste qualities; that is, salt-best fibers do not, by themselves, signal saltiness.

Halpern, in his treatment of the psychophysics of taste, in Chapter 3, focuses on a perceptual phenomenon, the nature of taste mixtures. He provides a sophisticated account of the complexity inherent in the old debate over whether taste mixtures are analytic (i.e., the components are individually perceived) or synthetic (i.e., the components lose their identities and a new quality emerges). This old debate remains important because of the argument that it is linked to the coding debate (e.g., there is a presumption that labeled-lines would result in analytic mixing while quality coding dependent on multiple fibers would result in synthetic mixing). Halpern goes on to argue that the general acceptance by researchers of a small number of taste qualities is premature and dangerously influences the kinds of experiments investigators undertake. Instead, he draws the reader's attention to the taste complexities of real foods and to studies by investigators who argue against what he calls the basic taste theory.

In considering the utility of basic taste theory, Brand and Smith and Vogt note an interesting taste phenomenon: certain chemical compounds appear to be able to specifically eliminate one or more of the basic tastes without substantially altering other taste sensations. For humans, one dramatic instance of this is the effect of lactisole (the sodium salt of 2-[4-methoxyphenoxy]-propanoic acid) on sweet taste. It appears that this compound blocks sweetness of all substances (with perhaps a very few exceptions). This observation may have profound implications for understanding the molecular mechanisms for taste transduction and for theoretical considerations concerning the existence of a small set of taste experiences (not compounds) out of which all others are constructed. If we were able to identify similar specific blockers of bitter, salty, sour, and perhaps umami taste qualities, would every sapid substance be thereby rendered tasteless? If for no other reason than testing this hypothesis, a search for such blockers is of great theoretical as well as obviously practical interest.

Beyond the issue of basic tastes or taste primaries, Brand's chapter provides a fine overview of the fascinating details of taste transduction and provides hints as to how knowledge here—sometimes ignored by those interested in behavior—should have a profound impact on our understanding of taste perception. Smith and Vogt emphasize the role of taste as a hedonic system and one that impacts ingestive behavior and physiology. That taste is a sensory system with but a single major func-