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感官评定实践

(第三版) (影印版)

Herbert Stone

Joel L. Sidel

Sensory Evaluation Practices

Third Edition



中国轻工业出版社

感官评定实践（第三版）（影印版）

赫伯特·斯通 乔尔 L. 赛德

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感官评定是一个发展中的领域，它主要研究利用人来测量感官的感知及这种感知对食物和口味接受性的影响。自从《感官评定实践》（第二版）出版以来，感官评定有了很大的发展。新版提供了对这个领域全部现有的发展的关键评价，辨析了在商业中的学术领域的原理的影响及其在研究开发和应用之间关系。

《感官评定实践》一书主要供在食品、饮料、家庭用品、纸产品和香料生产中的感官专业人员、技术经理、产品专员和研究指导人员使用。在技术专员开发消费产品和增加产品市场份额的因素之间的相互关系方面，市场企划活动、市场调研和广告专员也能从本书中获益。

对以感官评定为职业的个人来讲，他也能通过选择性地阅读本书而获益。书中的引论章节提供了在感官评定在商业应用中总体观点和特殊例子。而对于入门水平的专业人员或刚开始了解感官评定的人来说，书中关于各种测试方法中包含的那些信息是无价的。对于那些有经验的个人来讲，他们要求是扩展他们的视野，书中关于测量、试验策略和特殊问题的内容里包含了他们所要的信息。

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SENSORY EVALUATION PRACTICES

Third Edition

Herbert Stone Joel L. Sidel



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Foreword

Sensory evaluation over the last 60 years has grown from an emerging area of inquiry, confined to relatively simple quality control applications in a few food organizations, to one which is considered an essential component of the research and development process in food and non-food entities throughout the world.

This growth has been reflected in the formation and increasing membership of sensory professional organizations and in sensory related presentations at national and international meetings; as well as in the emergence of sensory related journals.

Naturally this growth has been accompanied by an increase in the number of individuals who are employed in sensory positions, and who have the necessary skills and knowledge. As a result, many working in this field depend on core texts such as this one to enhance their working knowledge base.

The first and second editions of **Sensory Evaluation Practices** contributed admirably to help fill this knowledge gap both as a reference and as a textbook in educational institutions. This text was specifically designed to give practical guidance on sensory procedures that could be directly applied to the sensory issues encountered in a working environment.

The third edition updates the methods of sensory evaluation and in addition gives test design and organizational guidelines. This information can further enhance the sensory professional in performing their responsibilities at a higher level of competence.

The authors bring to this endeavor over 35 years of experience in dealing with the “real” problems of product development and quality control in both the food and non-food area.

I appreciate the invitation to write a foreword to this book and am confident that the reader will find that **Sensory Evaluation Practices, Third Edition** will contribute in a meaningful way to their development as a sensory professional.

Howard G. Schutz
Professor Emeritus of Consumer Sciences
Food Science & Technology Department
University of California at Davis

Preface, First Edition

There has long been a need for guidance in the development and application of sensory evaluation within the corporate environment. The purpose of this book is to provide this guidance and to identify principles and practices that will result in increased utilization of sensory evaluation. In recent years, there has been a considerable increase in the number of individuals working in the field who lack the necessary academic training or practical skills for sensory evaluation. Published guides have described test methods and suggested procedures for the analysis of results from sensory tests, but have not provided the rationale behind the selection of a particular procedure or test method. This book addresses this and other equally important gaps in the field, including the organization and operation of a testing program, the design of a test facility, recommended procedures for the selection, screening, and qualifying of subjects, and the communication of actionable results. We have drawn heavily from our more than two decades of research and consulting in this field. To our knowledge, no other book provides such an extended coverage of the topic.

With regard to sensory evaluation, this book expounds a particular philosophy that can best be described as one that places greatest emphasis on the concepts of planning and decision analysis in the broadest sense. For the sensory professional, the ability to provide test services should not be considered the primary goal but rather a resource that can be used if a problem warrants it. With each request, the sensory evaluation professional must decide how best to meet the needs of the requestor and what methods to apply to the problem. Considerable emphasis is placed on the quality of the information derived from a test. It is also important to have sufficient behavioral and statistical knowledge to understand the nature of a problem, to ensure that the experimental design is appropriate to the test objective, to understand results, and to communicate them in an actionable way.

The book is organized into three main parts. Chapters 1 and 2 trace the development of the field and define sensory evaluation: what it does, how, where, and for whom. Chapters 3 and 4 address the more fundamental issues of measurement, psychological errors in testing, and statistics and experimental design. Chapters 5–7 provide the reader with a detailed description of the three classes of test methods (discrimination, descriptive, affective), criteria used to select a specific method, and suggested procedures for data analysis and the interpretation of results. A final chapter

and epilogue focus on a series of problems that require substantive sensory evaluation involvement: for example, storage testing, measurement of perceived efficacy, correlation of instrumental and sensory data, and systems for product optimization.

To the extent possible, pertinent literature has been referenced and discussed. However, this book is not intended as a review of the literature. In those sections with few references, the authors have drawn on their extensive experience to describe a recommended procedure or practice. For example, there is little or no published information on the design of a test facility, and the authors' experience was used to develop the enclosed diagrams and to assist the sensory professional in this endeavor.

The book is intended for sensory professionals, technical managers, product development and production specialists, and research directors considering the establishment of a program or anticipating expansion of existing resources. Marketing, marketing research, and advertising professionals will also benefit from the information in this book. The increased interaction between the technologist formulating the product and those responsible for marketing the product requires a greater awareness of sensory evaluation by everyone concerned. Individuals considering sensory evaluation as a career will also benefit from reading selected chapters of this book. In particular, Chapters 1, 3, 4, and 8 will provide both an overall perspective and specific examples of sensory evaluation applications in business. For the entry-level professional or the undergraduate taking a first course in sensory evaluation, Chapters 1 and 2 provide an introduction to the topic, while Chapters 5–7 describe the various test methods. For experienced individuals seeking to expand their perspective, Chapters 3, 4, and 8 will be especially helpful.

Numerous individuals and companies directly and indirectly provided assistance in the development of the ideas expressed in this book as well as the opportunity to put these ideas into practice. In particular, we wish to acknowledge the contributions of Jean Eggert of Kraft, Inc.; Robert Boone, Carole Vohsen, and Geralyn Basinski of Ralston Purina; Emer Schaefer of S.C. Johnson & Son, Inc.; Daryl Schaller, Jan Michaels, and Jean Yamashita of the Kellogg Company; Robert Brieschke and Lenore Ryan of Kimberly-Clark Corporation; Kaye Zook of the Quaker Oats Company; Margaret Savoca of R.J. Reynolds Tobacco Co.; Jan Detwiler of Olympia Brewing Co.; and Erik von Sydow of Nordreco AB.

Our associates also provided thoughts and assistance at various times. In particular, we wish to acknowledge the contributions of Jean Bloomquist of our staff; Professors Rose Marie Pangborn, Edward B. Roessler, and Howard Schutz of the University of California at Davis; Birgit Lundgren of the Swedish Food Institute; and Dr Richard Singleton of SRI International. We wish to express our appreciation to Marjorie Sterling-Stone who typed many of the drafts of this book and provided the comments needed to make it a more understandable text. Special thanks are due to Raymond Andersen who prepared the graphics. Herbert Stone also wishes to acknowledge the intellectual support and guidance provided by the late Professor George F. Stewart, who through the years encouraged him in this effort.

Herbert Stone

Joel L. Sidel

Preface, Second Edition

Herbert Stone
Joel I. Stibel

In the seven years since the publication of the first edition of this book, there have been many changes in the field of sensory evaluation. New books and journals devoted to sensory evaluation have appeared, professional associations have experienced increased membership, and there is a much greater awareness of sensory evaluation academically and in business. More universities are offering courses in sensory evaluation and more companies are recognizing the value of sensory information. This latter change created opportunities for sensory professionals that we have addressed in more detail in this revised edition. Careful consideration also has been given to the reviews of the first edition and the comments provided by numerous individuals who have written to or talked with us about the book.

In this edition we have added more background information about various recommended procedures and practices, particularly with regard to organizing and structuring resources to better operate in today's competitive business environment. Attention also has been given to methodology emphasizing developments in descriptive analysis. Several new methods have been proposed and are now in use leading to more literature on these and related topics.

As was stated in the first edition this book is not intended as a review of the literature. However, some of the literature is discussed in detail as it relates to specific methods and procedures. Attention is also given to the more practical issues of the strategy that sensory professionals use as they communicate information and demonstrate the cost benefits derived from a full-scale sensory program.

Numerous individuals contributed to the ideas expressed here, and to the opportunity to put these ideas into practice. In particular we wish to acknowledge the contributions of Patricia Beaver, Melanie Pons, and Jean Eggert (retired), of Kraft General Foods—USA; and Birgit Lundgren of Kraft General Foods—Europe; Margaret Savoca and Harvey Gordin of R. J. Reynolds Tobacco Company; Katy Word of Coors Brewing Company; and Erik von Sydow of Nestlé.

Our associates also provided helpful comments and, through their questions, enabled us to enhance our perspectives of certain problems. In particular we wish to acknowledge Brian McDennott, Rebecca Newby, Heather Thomas, Dr. Richard Singleton of SRI International, and Professor Howard Schutz of the University of California at Davis. Finally, we wish to recognize the important contributions of our

longtime friend and associate, the late Professor Rose Marie Pangborn of the University of California at Davis who worked tirelessly to educate students encouraging them to pursue a career in sensory evaluation, and worked with a total commitment for the betterment of the science of sensory evaluation. This edition is dedicated to her memory.

Herbert Stone
Joel L. Sidel

Preface, Third Edition

In the decade since the publication of the second edition of this book, there have been many developments and changes in the field of sensory evaluation. However, some aspects of sensory evaluation have not changed; a continuing lack of scientific rigor, and an increased reliance on default analyses driven by the power of PCs without an appreciation for the manner in which the information was obtained or whether the output has any face validity. Despite these impediments, the field continues to grow and attract interest as a result of market forces. In addition, many books have been published and/or revised, some focused on the design and analysis of sensory tests while others provide a review of the literature. New journals devoted to sensory evaluation have appeared, and some professional associations have experienced increased memberships reflecting growth in the field especially outside of the food industry. Perhaps most gratifying has been the increase in academic programs offering course work and degrees in sensory evaluation. This has occurred in both the United States and in Europe. The latter is especially promising, in as much as 15 years ago such programs were quite rare. More course offerings will eventually lead to a more scientific approach to the testing process. In this edition, we have reviewed the organizational issues and where necessary we have made changes that we believe will help maintain programs in spite of the many changes taking place in the consumer products industries. Consideration has also been given to the reviews of the second edition and comments provided by numerous individuals who have written and/or talked with us about what is missing in the book.

In this edition, we give more consideration to methods, in part because various misconceptions have developed and recommended practices no longer appear to be practised as rigorously as in the past. The search continues for the universal scale, the perfect subject, and other sacred goals that we will discuss. Also, there have been many developments in the use of multivariate analyses, the linking of consumer and sensory information, and greater involvement of sensory with marketing research. We have expanded the discussions on the use of sensory evaluation in quality control and optimization techniques.

As we stated in the first edition, and restate here, this book is not a review of the literature. We do, however, discuss literature relevant to specific issues and cite what we consider to be pertinent to the applications of sensory resources to provide

actionable information. In this edition, we continue to emphasize the importance of strategic planning and acting as a means for sensory professionals to make meaningful contributions. This is especially important as they communicate information and demonstrate the value of a full-scale sensory program.

As was mentioned in previous editions, numerous individuals contributed to the ideas expressed here, and to put these ideas into practice. In particular, we wish to acknowledge the contributions of Bruce Yandell, Heather Thomas, and Rebecca Bleibaum. We also acknowledge the comments and the suggestions from Marcia Young of the Campbell Soup Company, Josef Zach of Kraft-Europe, Birgit Lundgren of Kraft-Europe, ret.; Professor Brian Yandell of the University of Wisconsin and Professor Howard Schutz of the University of California at Davis and Senior Consultant to Tragon Corporation. We wish to express our appreciation to Ms Sylvia Heastings who typed the revised draft of this current edition.

Finally, we wish to recognize the important contributions of our longtime friend and associate, the late Professor Rose Marie Pangborn of the University of California at Davis, who worked tirelessly to educate students, encouraged them to pursue a career in sensory evaluation, and worked with a total commitment for the betterment of the science of sensory evaluation. This third edition is dedicated to her memory.

Herbert Stone

Joel L. Sidel

About the Authors

In this Third Edition of *Sensory Evaluation Practices*, the authors, Herbert Stone and Joel L. Sidel, draw from their extensive experience to provide readers with the background and understanding necessary to make informed decisions about developing and managing a sensory program. In this edition, the authors provide more current information about the applications for sensory information and operating in a more expanded business environment.

In 1974, Stone and Sidel founded Tragon Corporation, an important sensory and consulting company offering full-service consumer goods research. As a pioneering company in the field of sensory evaluation, Tragon has been able to offer unparalleled capabilities to its customers through the Quantitative Descriptive Analysis (QDA) sensory method, and Product Optimization (PROP) marketing and sensory modeling method, much greater insight into driving consumer purchase behavior.

Cumulatively, the authors have more than half a century of experience in the field of sensory evaluation and its business applications. In addition to founding Tragon Corporation, the authors have conducted domestic and international workshops; designed and analyzed, and reported on thousands of sensory tests; and have been consultants to the senior management of many major food and consumer products companies. In 2003, Herbert Stone was elected President (for the period 2003–2005) of the Institute of Food Technologists.

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Introduction to Sensory Evaluation

1

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I. Introduction and Objective

Since publication of the second edition of this book a decade ago, there have been many developments in the science and the application of sensory evaluation that directly or indirectly have had an impact. Today, just about all consumer products companies in the food and beverage industry as well as other industries, for example, home care and personal care industries, are aware of sensory evaluation and most agree that it has a role within their company. Marketing research and brand management professionals also are giving increased recognition to sensory information. Such recognition has yielded benefits for the profession in the form of improved status (and increased compensation), and for some, a bigger/louder voice in the product decision-making process. It is the latter which has the greater effect in the longer term. These developments have also resulted in more support for research and more course offerings at the University level. However, some fundamental, as well as some practical, issues remain to be considered or re-considered. New professionals tend to rely on pre-packed software that provides not only data capture capabilities, but also design and analyses options. While such capabilities are a significant enhancement, many also provide designs that are neither balanced properly nor relevant for anything other than a standard test. Reliance on such packages make for an easy entry for the inexperienced professional but have the potential for misapplication when the action taken is to modify the problem to fit the program. There has been a decline in understanding and appreciation for the consequences of not using qualified subjects, a tendency to limit replication (in sensory analytical tests) for cost savings purposes,