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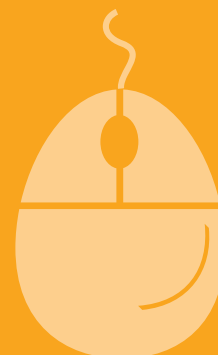
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Chapter 5 Structure and Properties of Cast Dental Alloys

Chapter 7 Biocompatibility

Chapter 10 Dental Waxes, Casting Investments, and Casting Procedures

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Chapter 17 Wrought Metals

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Eugene W. Skinner



Ralph W. Phillips

*We would like to dedicate this edition to the first two editors of this book,
Dr. Eugene W. Skinner (1896–1966) and Dr. Ralph W. Phillips (1918–1991).*

Dr. Eugene Skinner, a professor of physics at Northwestern University School of Dentistry in Chicago published the first edition of *The Science of Dental Materials* in 1936. Dr. Skinner introduced Ralph Phillips as a co-author of the 5th edition of the book in 1960. Dr. Skinner died during the proof page proof review stage of the 6th edition in 1966. Dr. Phillips renamed the book, Skinner's Science of Dental Materials in the 7th through 9th editions. After the death of Dr Phillips in 1991, the book has been subsequently renamed as *Phillips' Science of Dental Materials* for the 10th through 12th editions.

Throughout an eminent career that spanned five decades, Dr. Phillips was recognized as one of the world's foremost leaders in the field of dental materials science. He was one of the first dental scientists to investigate the relationship between laboratory tests and clinical performance. He initiated clinical investigations designed to analyze the effect of the oral environment on restorative materials and to determine the biocompatibility of restorative materials and the efficacy of newer material formulations and techniques of use. Over his many years of service he remained firmly committed to his original focus on the clinical relevance of laboratory findings, an approach that dominated both his style of teaching and his research activities. Among his main contributions to dentistry, Dr. Phillips pioneered studies of fluoride's influence on the solubility and hardness of tooth enamel and its anticariogenic potential when included in restorative materials. In the 1960s he coordinated the first workshop on adhesive dental materials, which brought together research experts in the fields of adhesion, polymer science, and tooth structure. During his career he published more than 300 scientific papers and books and organized more than 40 symposia and conferences related to biomaterials and dental research.

PREFACE

This book represents a comprehensive overview of the composition, biocompatibility, physical properties, mechanical properties, manipulative variables, and performance of direct and indirect restorative materials and auxiliary materials used in dentistry. The book is intended as a textbook for dental students, dental hygiene students, laboratory technicians, and dental materials scientists. It is also designed as an authoritative reference book for dentists, dental assistants, dental hygienists, and corporate marketing staff. Although the scientific concepts presented in some chapters are somewhat advanced, the text information in most chapters can be readily understood by individuals with a general college education.

The twelfth edition of *Phillips' Science of Dental Materials* is divided into four sections to reflect the focus of the chapters contained in each part. Part I, General Classes and Properties of Dental Materials, consists of seven chapters on the structure, physical properties, mechanical properties, casting methodology, dental polymers, and biocompatibility

of restorative and auxiliary materials used in dentistry. Part II: Auxiliary Dental Materials, contains four chapters on impression materials, gypsum products, dental waxes, casting investments and casting procedures, and finishing and polishing materials. Part III: Direct Restorative Materials, is focused on four areas, bonding and bonding agents, restorative resins and cements, dental cements, and dental amalgams. Part IV: Indirect Restorative Materials, consists of six chapters including dental casting and soldering alloys, wrought metals, dental ceramics, denture base resins, dental implants, and a new chapter on emerging technologies. Direct and indirect materials are used to restore function and/or aesthetics in mouths containing damaged, decayed, or missing teeth by producing the restoration directly within the prepared tooth or by producing a prosthesis indirectly in a dental laboratory before placement in the oral cavity.

As shown in the table below, the previous 23 chapters of the 11th edition have been condensed into the 21 chapters of the 12th edition by combining [Chapters 5 and 6](#) into the new

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