



Understanding Textiles (7th Edition)

By Billie J. Collier, Martin Bide, Phyllis G. Tortora

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This book helps readers *understand* how the components of textiles—fiber, yarn, fabric, dye, and finish—contribute to the performance of products for specific end uses. With a focus on the *why* behind the material, it encourages students to understand and predict textile properties and performance. This edition emphasizes the global environment and offers separate chapters in fiber properties; fabrics and structures; and nonwoven fabrics. Finishes are now separated into two chapters (physical/mechanical finishes and chemical finishes) and *Take a Closer* look sections bring an in-depth perspective to select chapter topics.

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Editorial Review

From the Publisher

The purpose of this book is to provide a common background for students who are making a study of textiles. Presented in this text is an overview of the textile industry. Certain basic concepts are presented in a clear, logically developed format.

From the Inside Flap

PREFACE

The purpose of this book is to provide a common background for students who are making a study of textiles. Some students may be planning to enter one of the many career areas that require some knowledge about textiles. Others may be interested in becoming better-informed consumers. Whatever may motivate students to enter an introductory course in textiles, certain basic concepts are essential to their understanding of the subject. It is our hope that these concepts are presented in a clear, logically developed format.

The text begins with an overview of the textile industry. The majority of students are likely to begin their study of textiles without any prior knowledge of the origin, manufacture, and distribution of the wide variety of textile products they use daily. The first chapter presents an overview of the journey of textile products that begins with fiber production and goes on to manufacture of yarns or other components, to fabric production, to design, and to manufacture of the final product. It is our intention to set a context for the chapters that follow in which basic processes, rooted in science and technology, are explored in depth, beginning with the basic building blocks of fabrics: fibers. In subsequent chapters emphasis is placed on the interrelationships of fibers, yarns, fabric constructions, dyes, and finishes. What is known about each of these components is applied to the understanding of textile behavior and performance. The chapters build on each other, much as the textile structure itself is built, and summaries at various stages in the text review the properties that affect performance. We reinforce this view of analyzing component parts of a textile by case studies of particular end use products.

Diagrams and photographs have been selected with care to illustrate the concepts and processes described in the text. Many students study in parts of the country where they have no access to field trips to textile manufacturing sites; therefore, we have included photographs of various types of machinery.

Each chapter includes review questions that invite students to summarize and apply the concepts presented in the text.

The recommended readings at the end of each chapter have been selected to complement the subject matter of the chapters. We have made a conscious effort to include both relatively elementary and highly technical material so as to introduce students to the variety of resources in the field. We have also tried to include readings from the most widely used periodicals in the field. An extensive bibliography, broken down under special subject headings, appears at the end of the book.

After chapter 1 introduces the reader to the various elements from which textiles are made, their historical development, and the present-day organization of the textile industry, chapter 2, a combination of the second and third chapters of the last edition, establishes the relationship of fiber properties to fiber behavior. It includes the chemical and physical concepts basic to understanding the behavior of textile fibers, and is written for the reader who has had little previous chemistry training. Students should be able to gain some

understanding of these elementary concepts and to appreciate not only the integral role that chemistry plays in the manufacture and finishing of textile products but also the role of chemistry in the use and care of textiles by consumers. Often this kind of material is integrated into varying parts of a text. We have not done so here because a separate chapter on the subjects offers a better opportunity to explain elementary chemical and physical terminology and concepts and to relate these concepts to the science of textiles in later discussions. Some instructors may prefer to emphasize this chapter a great deal, whereas others may wish to discuss it only briefly. Either approach may be taken, and the chapter is divided into three parts to enable further flexibility in assigning the material.

The chapters on textile fibers (chapters 3 to 12) begin with the natural fibers (chapters 3 and 4). Cellulosic fibers are discussed first because they are simpler in structure than the protein fibers and because cotton is so widely used. Protein fibers, with emphasis on wool and silk, follow. In chapter 5 we introduce important concepts about manufactured fibers, after which we review manufactured cellulosic fibers in chapter 6. Chapters 7 to 12 cover related groups of manufactured fibers.

Chapters about fibers are all organized in the same way, with many of the topic headings being repeated in each chapter. These topic headings are also used in chapter 2, "Textile Fibers and Their Properties," in order to facilitate comparisons between fibers. Some common brand names of manufactured fibers that are produced under a number of trademarks are mentioned. As companies merge and change products, trademarks become outdated. Readers can keep current through obtaining information on the Internet. Each chapter ends with a table summarizing some of the more important characteristics of the major fiber groups discussed.

From fibers the text moves to yarns and their production (chapter 13), and then discusses fabric structures. Those who have used previous editions of this text will note that chapters dealing with fabric manufacture have been reorganized, with weaving and woven fabrics separated into two chapters (14 and 15), followed by chapter 16 on knitted fabrics. The chapter on nonwovens from previous editions (now chapter 17) has been renamed "Other Fabric Construction Methods" because not all the fabrics discussed are classified as nonwovens. Chapter 19, on multicomponent fabrics, concludes the presentation of fabric construction methods.

For both yarns and fabrics, summaries in the chapters show how fiber, yarn, and fabric construction contribute to the total structure of the fabric and how the structure of the fabric is in turn related to its performance. Performance factors affecting durability, appearance, and comfort are discussed. The intent is to enable readers to begin to put together the parts of a textile product and think in terms of end use properties. Examples of specific end uses are presented as case studies under the heading "Putting It All Together"

The various methods of finishing fabrics and adding color and design are discussed in chapters 19 to 23. New to this edition is a chapter 19, devoted to the preparation steps that fabrics undergo before being dyed and finished. Chapter 24, "The Care of Textile Products," is entirely devoted to the care of textiles, even though some material on this subject appears in preceding chapters. This chapter is important because of the importance of care in relation to consumer satisfaction with textiles. Chapter 25 explores the important topic of "Textiles and the Environment, Health, and Safety."

Consumer Briefs appear throughout and explore in depth topics of particular interest to consumers. These features include such diverse topics as how to select carpet, developments in manufacture of recycled polyester, washable silk apparel, and ink jet printing.

The final chapter summarizes standard test methods used in the textile industry to evaluate the performance

of textile products. Performance is related to specific end uses by additional case studies on sail cloth, outdoor clothing, and automotive textiles.

Special reference tools within the text are provided in appendices. These include the aforementioned bibliography, a glossary of terms (many from the Annual Book of ASTM Standards), and a summary of textile legislation.

A Basic Textiles Swatch Kit is available for use in conjunction with this edition of *Understanding Textiles*. The swatch kit consists of 120 fabric swatches, mounting sheets, a master list with fabric name/description/fiber content, and a three-ring binder. It is available through Textile Fabric Consultants, Inc., PO. Box 111431, Nashville, TN 37222/615-4597510. **ACKNOWLEDGMENTS**

We have received assistance in the preparation of this revision from many individuals and organizations and would like to acknowledge those that provided assistance with previous editions as well as those more directly involved in the current edition. We are grateful for the encouragement and support provided by our families, especially our respective husbands, Dr. John R. Collier and Vincent Tortora, as well as for the assistance of colleagues and students. A special thanks is due to Madalina Romanoschi at Louisiana State University who helped with many aspects of the revision.

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It is impossible to acknowledge all the help we received in obtaining illustrative material. We have specified the sources in the figures caption, and thank the many individuals who worked on our behalf to find these illustrations and grant permission for their use. Among those we wish to offer special thanks are Judy Gloston, a handweaver of Huntington, N.Y., for giving us the opportunity to photograph her spinning and weaving supplies; Dr. Dong Zhang, the University of Tennessee; Dr. Jenna Kuttruff, Louisiana State University; and Pati Bel-Berger, Southern Regional Research Center.

Finally, we want to thank the many individuals and trade and professional associations that provided both information and illustrations. Information provided by Seth Walters, Continental General Tire, and Dr. Danny Akin, United States Department of Agriculture, Agricultural Research Service (USDA ARS), is gratefully acknowledged. Among the trade associations that provided useful information were the American Association of Textile Chemists and Colorists (AATCC); the American Fiber Manufacturers Association (AFMA); the American Textile Manufacturers Institute (ATMI); the American Society for Testing and Materials (ASTM); Crafted with Pride in the U.S.A. Council, Inc.; INDA, the Association of the Nonwovens Industry; and the International Fabricate Institute (IFI).

From the Back Cover

The text seeks to provide basic information on the structure, processing, and properties of textiles. The approach of the book, as signaled in the title, *Understanding Textiles, Sixth Edition*, is to understand how the components of textiles—fiber, yarn, fabric, dye, and finish—contribute to the performance of products

for specific end uses. Rather than being predominantly descriptive in our approach, we emphasize the "why" behind fiber, yarn, and fabric characteristics to help students understand and predict textile properties and performance. The text is most suitable for an interactive, analytical approach to learning the basics of textiles structures and textile performance.

In this revision of our book, we further emphasize how the properties of the different components of a textile fabric affect the performance of the final product. As a textile is built from fiber, then yarn, then fabric, so the text strives to build an understanding of how each contributes to product performance. The concept of "putting it all together" encourages students to think of a textile fabric in terms of the sum of its parts, rather than of the separate components. Two features in the book help to accomplish this. First, properties of fibers, yarns, and fabrics are summarized under the headings of "Durability," "Appearance," and "Comfort." The summaries discuss the effects of fabric components on these areas of performance that are important in the selection of textile fabrics. A second feature is the presentation of case studies of specific end use textile products. The case studies describe what properties are important for a specific textile end use and detail the considerations in selecting the appropriate fiber, yarn structure, fabric construction, and/or finish for that end use. Students are encouraged to analyze other end use products in a similar fashion.

The revised text also features updated material on production, processing, and use of textiles. New fibers, such as lyocell and a number of high performance fibers, are presented. Advances in processing, dyeing, and finishing are also described. To provide emphasis for these or to pique student interest in a particular area, Consumer Briefs (boxed material that highlights a particular consumer product or products) are included in selected chapters.

Users Review

From reader reviews:

Lewis Lin:

Have you spare time for just a day? What do you do when you have much more or little spare time? That's why, you can choose the suitable activity intended for spend your time. Any person spent their spare time to take a walk, shopping, or went to often the Mall. How about open or read a book titled Understanding Textiles (7th Edition)? Maybe it is to get best activity for you. You understand beside you can spend your time with the favorite's book, you can cleverer than before. Do you agree with their opinion or you have additional opinion?

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