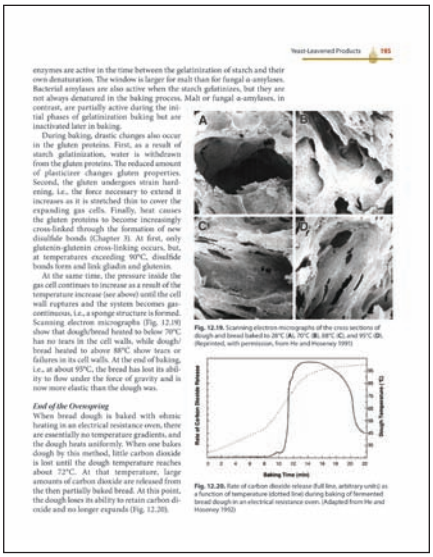
Principles of Cereal Science and Technology Authors Provide Insight into the Current State of Cereal Processing

Much has changed in cereal science and technology since the second edition of *Principles of Cereal Science and Technology* was published in 1994. The newest edition, available since January 2010, is completely updated, providing food science professionals and students the most thorough cereal science information available. This edition will benefit anyone involved in the whole chain of cereal processing from farm to fork. In addition, all of those preparing for a career in industries processing cereals mainly for food or food ingredient purposes will undoubtedly benefit from reading the book and will be able to use it as a reliable resource for easily approachable background information. Moreover, employees with a general food science background outside of the cereal field who have become involved in food systems containing cereals or cereal components will fully be able to take advantage of having the latest edition on their bookshelves. The book is written in a style and at a level that a person with limited background in science can still greatly benefit from. With the recent publication of the third edition, *Cereal Foods World* asked the book's authors, Jan Delcour and Carl Hoseney, to discuss the advances they see in cereal science and technology today.

Q. What are the most significant developments in cereal science since the last edition was published in 1994?

A. There have been many developments in cereal science and technology that have come into reality as a result of both progress in basic science, as well as a result of changes in consumer needs. The main developments have been in our understanding of cereals themselves and their starch, protein, and nonstarch constituents. Also, the way cereal functionality in grain-based biotechnological processes can be impacted by the use of enzymes has profited enormously from developments in enzyme technology. For example, we now understand much better



arabinoxylans' role in many areas of cereal science and how it can be impacted by the use of enzymes. There have also been significant advances in our knowledge of proteins and starches. Our understanding of lipids and how they function has also increased. In addition, we have a better understanding of staling phenomena.

Q. Does this book provide a global perspective on cereal science and technology?

A. One reader already made the remark that it is a great asset that the book has been written by both a European and a North American author. It thus has, almost automatically, united both European and North American perspectives on cereal processing. This is especially true when discussing differences in wheat terminology as well as in sections dealing with the use of enzymes in cereal processing. Also, the fact that, in some parts of the world, maize is the main source of cereal starch, while in other parts of the world it is wheat, has necessitated the more elaborate description of the processes for the isolation of both starches. Even more important than providing a global perspective, is that the book, in terms of authorship, has united two generations of science and that it, without breaking up with the past, has brought the best of the most recent insights.

Q. How has the third edition been updated?

A. Much has changed in grain science since the second edition was published. The book details significant progress in our understanding of starch, protein, and nonstarch constituents, along with the changes in consumer expectations that have motivated cereal scientists to apply this new information. New uses of enzymes and new knowledge of lipid functionality are important additions. More elaborate descriptions of processes for the isolation of starches for wheat and maize give broad coverage of these two important commodities. The book also updates the view on the rheological behavior of starch, introduces the concept of enzyme-resistant starch, presents current views on bread firming, and relates raw material characteristics, as well as processing conditions, to pasta product quality. Furthermore, the book includes a profound revision of the sections on gluten proteins and how their functionality in breadmaking is impacted by ascorbic acid. This edition also presents new information on industrial gluten starch separation and the effects of gluten proteins on cookie and cake quality. The storage and processing of the various cereals into intermediate products (flour, semolina, starch, and gluten) or finished products (bread, cookies, pasta, beer, breakfast cereals, and feeds) are described in detail.

Apart from that, the new format has allowed us to introduce updated figures and to bring the figures closer to the place where they are first introduced. For those interested, it also allows for writing some notes in the margins, while the use of color gives the text a more appealing look as a whole.

Q. What do you predict are the emerging issues and opportunities in grain science?

A. We expect that processing using clean label ingredients will gain importance. Developments in enzyme technologies to the benefit of processing and final product quality (in terms of organoleptic quality and/or shelf life) will also occur. Also, the full unlocking and exploitation of the health potential of cereals and

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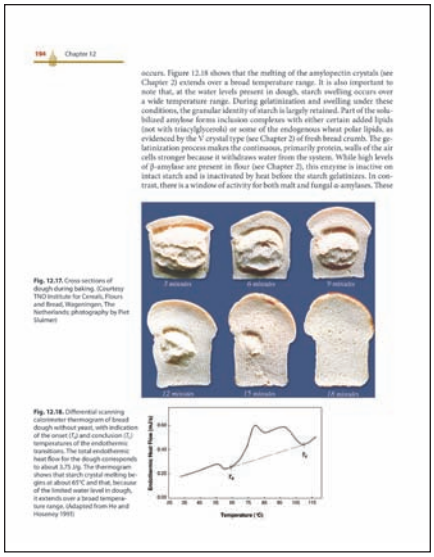

their constituents will be high on the agenda. Clearly, the health issue is a hot topic today, because as outlined above, the consumer is increasingly aware of the possibilities of health-promoting foods in general and the health-promoting properties of cereals and their constituents in particular.

Q. What developments in enzyme technologies are you referring to above?

A. In the past decades, a lot of progress has been made in enzyme technologies as they apply to cereal constituents. To begin, in the area of starch hydrolysis, marvelous developments have allowed great enhancement of the shelf life of bread by reducing the crumb firming rate, and at the same time, largely maintaining its resilience. In the area of protein functionality, developments aiming at optimizing their functionality have largely relied on the application of oxidative enzymes. In the area of nonstarch polysaccharide functionality, the discovery of wheat endogenous xylanase inhibitors (only 12 years ago) has clearly allowed for the development of much more effective enzyme systems.

Q. How can this book help product developers move toward cleaner labeling?

A. It seems evident that the book is very helpful in this respect. A better understanding of cereal constituents on the one hand, and cereal processing on the other, would almost automatically lead to the design of strategies based on clever raw material choices and processes that would be able to move toward clean labeling.

Q. As you stated, health issues are "hot" right now. How do you see this unfolding in 2010?

A. We absolutely expect that health issues will further, to a large degree, the research agenda and developments in our industry. The increased understanding of the benefits of particular cereal constituents will increasingly allow for improved health care solutions for consumers.

Q. Jan, can you tell *CFW* readers what your students at the Katholieke Universiteit Leuven are working on right now?

A. Generally speaking, the students working in our group at the university all, in one way or another, contribute to the group's two-fold research mission. First, we aim to fulfill a role in society by generating and communicating basic insights into the starch, nonstarch polysaccharide, lipid, and protein constituents of cereals, as well as into plant and microbial enzyme systems converting such constituents. Secondly, we want to apply such insights in cereal-based biotechnological processes with the aim of developing and optimizing processes, developing the production of health-promoting constituents, and/or to contributing to a final product's organoleptic properties.

Q. Carl, as editor-in-chief of the *Cereal Chemistry* journal, what's "hot" in grain science right now? Are there any articles in this area of research that you would recommend?

A. In general, *Cereal Chemistry* depends on the authors submitting manuscripts to define the current hot topics. However, we are currently working on three special issues; these include papers from a Durum Wheat Pasta Symposium held in Italy, an AACC Intl. symposium on molecular diversity and the health benefits of carbohydrates from cereal and pulses, and manuscripts from the C&E Section's Whole Grain Global Summit held in Newcastle.

Jan A. Delcour, as a NATO research fellow at Kansas State University in 1988, was introduced to cereal science and technology by coauthor R. Carl Hoseney. He is currently a full professor at the Katholieke Universiteit Leuven in Leuven (Belgium), where he teaches food chemistry and cereal science and technology courses. His research, and that of the team he leads, focuses on generating basic insights into the starch, nonstarch polysaccharide, and protein constituents of cereals, as well as on plant and microbial enzyme systems converting such constituents. Delcour, senior editor of *Cereal Chemistry*, is the author of more than 325 peer-reviewed publications and (co)inventor of more than 20 patent families. He is module leader of project HEALTHGRAIN, an AACC Intl. fellow, an ISI highly cited author, and the recipient of several AACC Intl. awards. He is also a fellow of ICC and has served on the AACC Intl. Board of Directors. He can be reached at jan.delcour@biw.kuleuven.be.

R. Carl Hoseney received his Ph.D. degree from Kansas State University (KSU) in Manhattan, KS. He was a research chemist for the Agricultural Research Service of the USDA for 15 years before joining the Department of Grain Science and Industry at KSU as a professor. He currently is president of R&R Research Services, Inc. He has published about 350 papers and is an ISI highly cited author. He also holds more than 15 U.S. patents. He has served as president of AACC Intl., serves as editor-in-chief of *Cereal Chemistry*, has been the recipient of awards of the association, including the T. B. Osborne Medal, and has been granted the status of fellow. He is also the recipient of the Harold Perten Award from the International Association of Cereal Chemists and the Irwin E. Youngberg Research Award from the Kansas University Endowment Association. He is the author of the first and second editions of *Principles of Cereal Science and Technology.* He can be reached at r_and_r@kansas.net.