

COMPREHENSIVE GLYCOSCIENCE

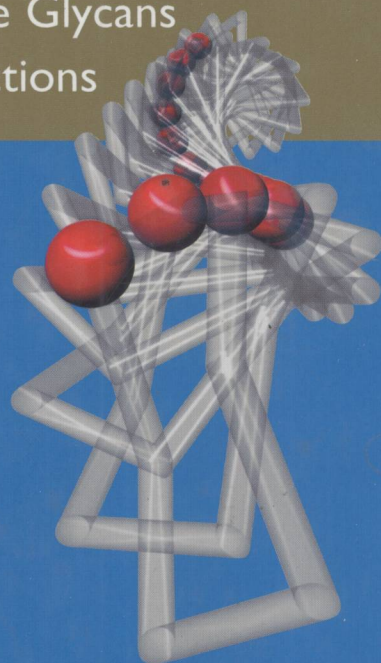
From Chemistry to Systems Biology

Editor-in-Chief
J.P. Kamerling

Volume
3

Biochemistry of Glycoconjugate Glycans
Carbohydrate-mediated Interactions

Editors
G.-J. Boons
Y. C. Lee
A. Suzuki
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A. G. J. Voragen



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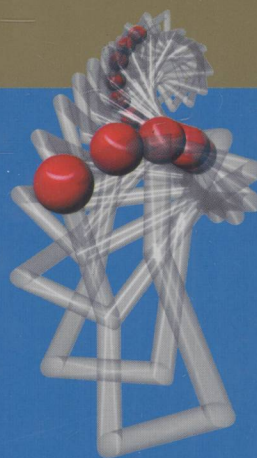
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Volume

3

Biochemistry of Glycoconjugate Glycans
Carbohydrate-mediated Interactions

- Volume 1 Introduction to Glycoscience
Synthesis of Carbohydrates
- Volume 2 Analysis of Glycans
Polysaccharide Functional Properties
- Volume 3 Biochemistry of Glycoconjugate Glycans
Carbohydrate-mediated Interactions
- Volume 4 Cell Glycobiology and Development
Health and Disease in Glycomedicine



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Volume 3
BIOCHEMISTRY OF GLYCOCONJUGATE GLYCANS
CARBOHYDRATE-MEDIATED INTERACTIONS

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Preface

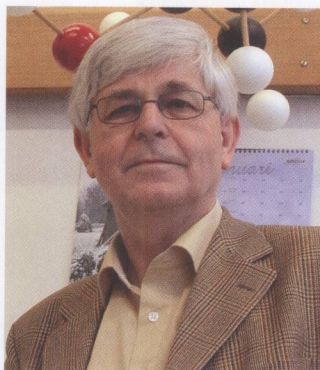
In terms of sub-topics, the world of carbohydrates is an extremely heterogeneous world. Quite often, only the word 'carbohydrate' forms a connection between the different continents. Although (poly) saccharides have already been in use for decades in various industrial applications, and polysaccharide-based vaccines are on the market, new developments make them challenging for deep investigations and novel (biomolecular) applications. But nowadays carbohydrate biochemistry and molecular biology focused on glycoconjugates may also rejoice in a high level of interest from the biomedical and pharmaceutical side. Carbohydrate-mediated communication between biomolecules on the molecular level, glycoprotein engineering, and oligo- and polysaccharide immunology are all aspects of this fast growing area. Structural analysis including conformational analysis and organic/enzymatic synthesis of carbohydrates are cornerstones of nearly all of the developments mentioned. It is evident that carbohydrate research/glycoscience on a high level can only be successful in a multidisciplinary approach. After genomics and proteomics, glycomics is also ready for a key position in life sciences.

Comprehensive Glycoscience brings together glycochemistry, glycoanalysis, glycobiology, glycomedicine, glyco(bio)technology, food and industrial glycoscience, and glycobioinformatics – glycoproteins, glycolipids, proteoglycans, glycosylphosphatidylinositol anchors, and polysaccharides – the microbial, animal, plant, and human world – health and disease. In a collection of 118 chapters in four volumes, and in the electronic version via Science Direct, highly-recognized glycoscientists (academic and industrial scientists, polysaccharide experts and glycoconjugate experts, chemists of all disciplines, biochemists, biologists, and medical doctors) give insight into their glycoworld. Volume 1 contains 23 chapters that give an Introduction to Glycoscience and then focuses on the Organic and Enzymatic Synthesis of Carbohydrates. Volume 2, also of 23 chapters, deals with Analysis and Structural Aspects of Glycans as well as with Polysaccharide Functional Properties. Then, in Volume 3, with 36 chapters, attention is paid to the Biochemistry of Glycoconjugate Glycans and to Carbohydrate-mediated Interactions. Finally, in Volume 4, also of 36 chapters, Cell Glycobiology and Development as well as Health and Disease in Glycomedicine are the topics of interest.

The glycknowledge is discussed by the authors on a basic (tutorial) level as well as on a more advanced level, depending on the topic. Referring to older reviews and key papers discloses the glycoliterature broadly. This makes Comprehensive Glycoscience a real encyclopedia for master students, Ph.D. students, professors, and industrial scientists, interested in the state of the glyco-art.

Johannis P. Kamerling
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Editor-in-Chief



Hans Kamerling (1944) studied chemistry at Utrecht University (1962–1969), and obtained his Ph.D. degree in 1972 with Prof. J. F. Arens and Prof. J. F. G. Vliegthart. His glycoscience research is focused on: (1) structural studies on polysaccharides and glycoprotein glycans (since 1969); (2) organic/enzymatic synthesis of (conjugated) carbohydrates (since 1984); and (3) interaction studies between carbohydrates and complementary biomolecules (since 1990). Since 1969, he is connected to the UU Department of Bio-Organic Chemistry. In 1974 he was a visiting scientist with Prof. B. Lindberg at the University of Stockholm (Sweden), and in 1981 with Prof. A. Kobata at the University of Kobe (Japan). In the period 2000–2003 he was Dean of Studies of the Faculty of Chemistry. Since 2002 he is Chairman of the Department of Bio-Organic Chemistry.

In 1990 in Yokohama (Japan), he was honoured with the prestigious Roy L. Whistler Award of the International Carbohydrate Organization. He is Doctor Honoris Causa of the Lajos Kossuth University of Debrecen, Hungary (1999), and Profesor Invitado of the University of Havana, Cuba (2002).

Since 2003, he is the Dutch representative in the European Carbohydrate Organization and in the International Carbohydrate Organization. He has been / is Editor and Board Member of several scientific journals, and acted as secretary of the XIIth International Carbohydrate Symposium (1984), the 9th European Carbohydrate Symposium (1997), and the XVIth International Symposium on Glycoconjugates (2001).

He is (co)author of over 370 scientific papers/books/reviews, and has supervised 42 doctoral theses at Utrecht University.

Editors



Geert-Jan Boons received his B.S. in chemistry in 1983 and his Ph.D. in synthetic carbohydrate chemistry in 1991 from the State University of Leiden (Netherlands). Prior to joining the faculty at the CCRC in 1998, he spent seven years in the U.K., first as a postdoctoral fellow at Imperial College, London, and the University of Cambridge, and then as a lecturer and professor at the University of Birmingham. In 2003, Dr. Boons was the recipient of the Carbohydrate Research Award for Creativity in Carbohydrate Science from the European Carbohydrate Association. Also in 2003, he was elected chairman for 2005 of the Gordon Research Conference on Carbohydrates. In 2004, he received the Horace Isbell Award from the Division of Carbohydrate Chemistry of the American Chemical Society and was appointed Franklin Professor of Chemistry in the Franklin College of Arts and Sciences at the University of Georgia. Dr. Boons serves on the editorial boards of *Carbohydrate Research*, the *Journal of Carbohydrate Chemistry*, and *Advances in Carbohydrate Chemistry and Biochemistry*.

Research in the Boons laboratory deals with the synthesis and biological functions of carbohydrates and glycoconjugates. The diversity of topics to which Dr. Boons has significantly contributed include the development of new and better methods for synthesizing exceptionally complex molecules, the use of new methods in the synthesis and study of properties of complex carbohydrates of increasing size and complexity, the development of synthetic cancer and bacterial vaccines, the design and synthesis of glycosidase inhibitors and the use of synthetic compounds for the study of innate immunity.



Yuan Chan Lee received his Ph.D. degree in Biochemistry from the University of Iowa in 1962. After his postdoctoral training at the University of California in Berkeley, he was appointed Assistant Professor of Biology at Johns Hopkins University, where he became Professor of Biology in 1974. Dr. Lee's research interests encompass glycochemistry and glycobiology, especially in the area of carbohydrate recognition. He developed neoglycoproteins and other neoglycoconjugates, with which he probed the modes of carbohydrate-protein interactions. He is also well known in the areas of carbohydrate analysis. Dr. Lee has received many awards, including the Claude Hudson Award from the American Chemical Society.



Akemi Suzuki graduated from Shinshu University School of Medicine in 1971. He joined Prof. T. Yamakawa's laboratory, Department of Biochemistry, Faculty of Medicine, University of Tokyo, and received his D.Med.Sci. in 1977. He started his career working on glycolipid biochemistry. Then, he studied immunology in the laboratory of Prof. Donald Marcus at the Albert Einstein College of Medicine from 1978 to 1980. He returned to work in the Department of Biochemistry, University of Tokyo, and started research on glycolipid genetics using mice as an experimental model. He moved to the Tokyo Metropolitan Institute of Medical Science in 1982 and then to RIKEN Frontier System in 1999 as a group director, Supra-Biomolecular System Research Group. His research interests include regulation of glycolipid expression and microdomain formation and functions supported by glycolipids.



Naoyuki Taniguchi graduated from the Hokkaido University School of Medicine, Sapporo, Japan in 1967, and obtained his M.D. degree and then his Ph.D. at the same university in 1972. He was a visiting Associate Professor, Department of Biochemistry, Cornell University Medical College, New York and then became Associate Professor, Biochemistry Laboratory Cancer Institute, Hokkaido University in 1980. He became Professor and Chairman of the Department of Biochemistry, Osaka University Medical School from 1986 to 2006. He is now Endowed Chair, Department of Glycomics, Research Institute for Microbial Diseases, Osaka University and Professor Emeritus of Osaka University. His research interest is mainly focused on the disease-related functional glycomics using glycosyltransferase genes and non-enzymatic glycosylation.



Alphons G. J. (Fons) Voragen, born in Heerlen, The Netherlands, studied Food Science at Wageningen University, where he obtained his M.Sc. in 1968 and his Ph.D. in 1972. He then took up a lecturer position in Food Chemistry, Department of Agrotechnology and Food Sciences, Wageningen University and Research Center, interrupted by stays in the laboratories of Professor Peter Albersheim, Plant Biochemistry, at UC Boulder as research associate (1974–1976) and as visiting consultant with the H. J. Heinz Company, Pittsburgh, PA (1983–1984). Since 1989 he is full Professor in Food Chemistry at Wageningen University. His scientific interests are plant cell wall polysaccharides, processing of plant raw materials to high quality foods, food enzymology and food ingredients. He is author, coauthor, editor, or coeditor of more than 400 journal articles, book chapters and books, and editorial board member of a number of scientific journals.

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