

Lipids: Structure, Physical Properties and Functionality

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Lipids: Structure, Physical Properties and Functionality

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Foreword

Over ten years have passed since the publication of Kåre Larsson's *Lipids – Molecular Organization, Physical Functions and Technical Applications (LMO)* by The Oily Press, then based in Dundee, Scotland, and run by Dr William W. Christie. The book was soon recognized as a major contribution to the literature (“This is a book without comparison in the lipid literature...”, Stig E. Friberg in the *Journal of Dispersion Science and Technology*, 1995, Vol.16, p.295 and “...the content is excellent”, Philip W. Wertz in *Chemistry and Physics of Lipids*, 1994, Vol.74, p.99). Dr Christie's excellent choice of Kåre Larsson as the author was also confirmed (“His expertise in describing the various states of lipids is second to none”, Edward G. Perkins in *INFORM*, 1994, Vol.5, p.1394 and “...written by an acknowledged world expert in his field”, Fred B. Padley, *Lipid Technology*, 1994, Vol.6, p.102). Until the publication of *LMO* there had been no single, concentrated source of so much information on the subject: “The strength of this book – and it is enormous – is the fact that the author has been able to compile in one volume information otherwise found only in the most widely different kinds of scientific journals” (Friberg).

When *LMO* was published, Kåre Larsson was a Professor of Food Technology in the Chemical Centre at Lund University, Sweden. He is now cofounder of Camurus AB and Probi AB, and earlier of Biogram AB (which later became Bioglan AB), and serves as Chairman of the Board of the Camurus Lipid Research Foundation in Lund. Camurus is a provider of drug delivery systems and works closely with pharmaceutical manufacturers. Kåre Larsson is a Fellow of the Royal Swedish Academy of Science and the Academy of Engineering Science and has authored more than 200 original papers and five books covering areas of lipid biophysical chemistry, food science and nutrition, and biomedicine. He is also the named inventor on several patents, of which four have led to industrial products. In 2001 he won the Rhodia prize of the European Colloid and Interface Society for his discovery of cubosomes and hexosomes and explorative work on their applications.

When I asked Kåre Larsson to write a second edition, the comprehensive coverage of *LMO* became an obstacle – the subject area had expanded to such an extent that one author could not cover it alone. But we did not want to resort to the usual edited book with each chapter written by a different author. The solution was to invite three other well-known scientists in this field to act as coauthors – and it is a tribute to Kåre's reputation that all three agreed.

Peter Quinn, Professor of Biochemistry in the Department of Life Sciences at King's College London, UK, is renowned for his work on biological

membranes and their constituents, as evidenced by the publication of ten books, more than 400 research papers, and several patents.

Kiyotaka Sato, Professor in the Graduate School of Biosphere Sciences, Hiroshima University, Japan, is widely recognized as a leading expert in the physical chemistry and biophysics of fats and lipids and in the crystallization of biological soft materials. Among other awards, he was presented with the 2005 AOCS Stephen S. Chang Award for distinguished accomplishments in basic research that have been used by industry for the improvement or development of products related to lipids in the area of lipid crystallization and crystallography.

Fredrik Tiberg is President, Chief Executive Officer and Head of Research & Development at Camurus AB, and also Adjunct Professor of Surface and Colloid Chemistry at Lund University. He has published more than 80 original scientific papers, coauthored several books, and been named as inventor on a number of patents.

With some major changes in the areas covered, and with four authors instead of one, we were obliged to define the resulting publication as a new book with a new ISBN number, rather than as a second edition retaining the old number. Therefore we took the opportunity of also giving it a new and more appropriate title: *Lipids: Structure, Physical Properties and Functionality*. With the knowledge and experience of the above-named four authors behind it, I am confident that this new book will build on the reputation of *LMO* and be a valued source of information for many years to come.

Peter J. Barnes
Publisher, The Oily Press
Bridgwater, UK

January 2006

Preface

The ambition behind the new edition of this book is to provide an up-to-date description of the diversity of lipid molecular arrangements in different physical states, as a basis for the understanding of lipid functionality in biological and technical systems. The first edition was published in 1994 with Kåre Larsson as author, and when he was asked by the publisher to revisit the text he realized that he could not cover this broad field alone. Three colleagues joined forces with him, and the present edition has therefore in many aspects been extended. In some cases the description is deeper with a more narrow focus. For example, the chapter on the solid state in the earlier edition covered all lipids, whereas in this new edition there is a very complete demonstration of the crystal structures and crystallization properties of fatty acids and fats. These general principles, however, can be applied to all lipids.

In biology, as well as in technical applications such as foods, we are dealing with soft matter. Lipids form aqueous phases alone or in conjunction with proteins and polysaccharides. The combination of short-range disorder and long-range order into liquid-crystalline structures plays a crucial role. A driving force is the dualistic properties of the molecules in relation to water. Molecular regions avoiding water contact, in combination with regions striving towards such contact and interaction, lead to self-assembly, and even in the liquid state to the formation of organized structures on the colloidal level. This new edition presents many new results, particularly on the structure and functions of dispersions of liquid-crystalline phases forming nanostructures and mesoporous systems.

With regard to the role of lipids in cellular and molecular biology, this book focuses on biophysical aspects, and discussion of lipid biochemistry is limited to a chapter on cell membranes.

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Peter Quinn, London, UK
Kiyotaka Sato, Hiroshima, Japan
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January 2006

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