

**CHEESE:
CHEMISTRY, PHYSICS AND MICROBIOLOGY**

**Volume 2
Major Cheese Groups**

Second Edition

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Edited by

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Preface to the Second Edition

The first edition of this book was very well received by the various groups (lecturers, students, researchers and industrialists) interested in the scientific and technological aspects of cheese. The initial printing was sold out faster than anticipated and created an opportunity to revise and extend the book.

The second edition retains all 21 subjects from the first edition, generally revised by the same authors and in some cases expanded considerably. In addition, 10 new chapters have been added: Cheese: Methods of chemical analysis; Biochemistry of cheese ripening; Water activity and the composition of cheese; Growth and survival of pathogenic and other undesirable microorganisms in cheese; Membrane processes in cheese technology, in Volume 1 and North-European varieties; Cheeses of the former USSR; Mozzarella and Pizza cheese; Acid-coagulated cheeses and Cheeses from sheep's and goats' milk in Volume 2. These new chapters were included mainly to fill perceived deficiencies in the first edition.

The book provides an in-depth coverage of the principal scientific and technological aspects of cheese. While it is intended primarily for lecturers, senior students and researchers, production management and quality control personnel should find it to be a very valuable reference book. Although cheese production has become increasingly scientific in recent years, the quality of the final product is still not totally predictable. It is not claimed that this book will provide all the answers for the cheese scientist/technologist but it does provide the most comprehensive compendium of scientific knowledge on cheese available.

Each of the 31 chapters is extensively referenced to facilitate further exploration of the extensive literature on cheese. It will be apparent that while cheese manufacture is now firmly based on sound scientific principles, many questions remain unanswered. It is hoped that this book will serve to stimulate further scientific study on the chemical, physical and biological aspects of cheese.

I wish to thank sincerely all the authors who contributed to the two volumes of this book and whose co-operation made my task as editor a pleasure.

P.F. Fox

Preface to the First Edition

Cheese manufacture is one of the classical examples of food preservation, dating from 6000–7000 BC. Preservation of the most important constituents of milk (i.e. fat and protein) as cheese exploits two of the classical principles of food preservation, i.e.: lactic acid fermentation, and reduction of water activity through removal of water and addition of NaCl. Establishment of a low redox potential and secretion of antibiotics by starter microorganisms contribute to the storage stability of cheese.

About 500 varieties of cheese are now produced throughout the world; present production is $\sim 10^7$ tonnes per annum and is increasing at a rate of $\sim 4\%$ per annum. Cheese manufacture essentially involves gelation of the casein via iso-electric (acid) or enzymatic (rennet) coagulation; a few cheeses are produced by a combination of heat and acid and still fewer by thermal evaporation. Developments in ultrafiltration facilitate the production of a new family of cheeses. Cheeses produced by acid or heat/acid coagulation are usually consumed fresh, and hence their production is relatively simple and they are not particularly interesting from the biochemical viewpoint although they may have interesting physico-chemical features. Rennet cheeses are almost always ripened (matured) before consumption through the action of a complex battery of enzymes. Consequently, they are in a dynamic state and provide fascinating subjects for enzymologists and microbiologists, as well as physical chemists.

Researchers on cheese have created a very substantial literature, including several texts dealing mainly with the technological aspects of cheese production. Although certain chemical, physical and microbiological aspects of cheese have been reviewed extensively, this is probably the first attempt to review comprehensively the scientific aspects of cheese manufacture and ripening. The topics applicable to most cheese varieties, i.e. rennets, starters, primary and secondary phases of rennet coagulation, gel formation, gel syneresis, salting, proteolysis, rheology and nutrition, are reviewed in Volume 1. Volume 2 is devoted to the more specific aspects of the nine major cheese families: Cheddar, Dutch, Swiss, Iberian, Italian, Balkan, Middle Eastern, Mould-ripened and Smear-ripened. A chapter is devoted to non-European cheeses, many of which are ill-defined; it is hoped that the review will stimulate scientific interest in these minor, but locally important, varieties. The final chapter is devoted to processed cheeses.

It is hoped that the book will provide an up-to-date reference on the scientific aspects of this fascinating group of ancient, yet ultramodern, foods; each chapter is extensively referenced. It will be clear that a considerably body of scientific knowledge on the manufacture and ripening of cheese is currently available but

it will be apparent also that many major gaps exist in our knowledge; it is hoped that this book will serve to stimulate scientists to fill these gaps.

I wish to thank sincerely the other 26 authors who contributed to the text and whose co-operation made my task as editor a pleasure.

P.F. Fox

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