



Gastronomy and Food Science

Edited by
Charis M. Galanakis



Gastronomy and Food Science

Gastronomy and Food Science

Edited by

Charis M. Galanakis

Research and Innovation Department, Galanakis Laboratories, Chania, Greece

College of Science, King Saud University, Riyadh, Saudi Arabia

Food Waste Recovery Group, ISEKI Food Association, Vienna, Austria



ACADEMIC PRESS

An imprint of Elsevier

Academic Press is an imprint of Elsevier
125 London Wall, London EC2Y 5AS, United Kingdom
525 B Street, Suite 1650, San Diego, CA 92101, United States
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom

Copyright © 2021 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-820057-5

For Information on all Academic Press publications
visit our website at <https://www.elsevier.com/books-and-journals>

Publisher: Charlotte Cockle
Acquisitions Editor: Megan Ball
Editorial Project Manager: Sara Valentino
Production Project Manager: Paul Prasad Chandramohan
Cover Designer: Victoria Pearson

Typeset by MPS Limited, Chennai, India



Contents

List of contributors

	ix	2. Role of gastronomy and new technologies in shaping healthy diets	19
		<i>Carmen Pérez-Rodrigo and Javier Aranceta-Bartrina</i>	
1. The impact of molecular gastronomy within the food science community	1		
<i>Nicola Caporaso</i>			
1.1 Molecular gastronomy: definition, aims, and development	1	2.1 Gastronomy: a matter of taste, health, and sustainability	19
1.2 Collaboration among scientists and haute-cuisine chefs	2	2.2 Eating for health	20
1.3 The outcome of scientific research applied at the kitchen restaurant level	3	2.3 Eating, pleasure, and well-being	20
1.4 Molecular gastronomy and food science	4	2.4 “Foodies” and “gourmets”	21
1.4.1 Differences among molecular gastronomy and “traditional” food science and technology	4	2.5 Gastronomy in the context of food-based dietary guidelines	21
1.4.2 Example on olive oil and (molecular?) gastronomy studies	5	2.6 Traceability and product quality: a priority	22
1.5 Outcomes of molecular gastronomy	6	2.7 Gastronomic marketing: a challenge to highlight the value of innovation, quality of products, and services—potential support to healthy eating	23
1.5.1 Practical applications of molecular gastronomy	6	2.8 Gastronomy, social marketing, and food pleasure	24
1.5.2 Example of sous-vide cooking of pork meat	7	2.9 Inform consumers about the characteristics of menus, products, and processes (health and commitment to sustainability and food ethics)	25
1.5.3 Using liquid nitrogen in cooking	7	2.10 Accommodate special dietary requirements of consumers, beyond food allergies or vegetarian options	25
1.5.4 Using ultrasound to prepare “molecular gastronomy” food	7	2.11 An aging population and gastroseniors	25
1.5.5 The technique called “spherification”	9	2.12 Research and innovation to adequate the food offered to consumer needs and condition	26
1.5.6 Other applications	9	2.13 Implement healthy culinary techniques and minds about the quality of packaging, cookware, culinary equipment, cutlery, and supplies	27
1.6 Study of food pairing, theoretical basis, and empirical tests	10	2.14 Training foodservice workforce and personnel related to gastronomy: technology, health, and customer service	27
1.7 The consumer’s perception of gastronomy and the pleasure of eating	12	2.15 Mealtime should be a happy time: let’s work for it!	28
1.8 Molecular cooking and behavior of the diner	13		
1.9 The future of molecular gastronomy, molecular cooking, and new culinary trends	14		
1.10 Some conclusive remarks	15		
References	16		

2.16	New challenges for a healthy and sustainable gastronomy in the 21st century	29			
2.17	Conclusion	30			
	References	30			
3.	Cooking with computers: the vision of digital gastronomy	35			
	<i>Amit Zoran, Emiliano Arencibia Gonzalez, Ariel Bezaleli Mizrahi and Alexander “Zoonder” Lachnish</i>				
3.1	Introduction	35			
3.2	Sustainable development and digital gastronomy	36			
3.2.1	Digital gastronomy and the environment	36			
3.2.2	Digital gastronomy and the economy	37			
3.2.3	Digital gastronomy and society	38			
3.3	Digital gastronomy: from vision to practice	38			
3.3.1	Computational concepts and the digital gastronomy principles	39			
3.4	Related work on computational cooking	41			
3.4.1	Applications of digital fabrication methods for digital gastronomy	41			
3.5	Cooking with computers: technical challenges	43			
3.5.1	Theoretical framework and implementation examples	43			
3.5.2	Hardware: digital cooking machines	46			
3.5.3	Chef–diner–computer interaction	48			
3.6	A closing note	49			
	Acknowledgments	51			
	References	51			
	Further reading	53			
4.	Gastronomic systems research	55			
	<i>Rosa Paula Cuevas, Marie Claire Custodio, Jhoanne Ynion, Arindam Samaddar and Matty Demont</i>				
4.1	Introduction	55			
4.2	Methodology	58			
4.2.1	Define purpose of study and target population	58			
4.2.2	Module 1: capturing food choice	58			
4.2.3	Module 2: assessing behavioral response to interventions	65			
4.3	Case studies	69			
4.3.1	Novel food products: promoting heirloom rice among middle-to-high-income urban consumers in the Philippines	69			
4.3.2	Nutrition interventions: promoting healthier diets among low-to-middle income households in eastern India	70			
4.4	Conclusion	72			
	Acknowledgments	73			
	References	73			
5.	The Mediterranean diet between traditional foods and human health through culinary examples	75			
	<i>Massimiliano Renna, Francesco F. Montesano, Francesco Serio and Maria Gonnella</i>				
5.1	Introduction	75			
5.2	History and background of the Mediterranean diet	75			
5.3	Nutritional traits and healthy effects of the Mediterranean diet	77			
5.4	Sustainability and agrobiodiversity	78			
5.5	From traditional products to innovations in the agri-food sector: new production systems and products	86			
5.6	Traditional cuisines and gastronomy in the Mediterranean Basin	92			
5.7	Mediterranean dishes	94			
5.7.1	Anchovies fillets au gratin	94			
5.7.2	Fave bianche e cicorie	94			
5.7.3	Gazpacho	95			
5.7.4	Orecchiette e cime di rapa	95			
5.7.5	Tzatziki	96			
5.8	Conclusion	97			
	Acknowledgment	97			
	References	97			
6.	Olive oil in gastronomy and food science	101			
	<i>Maria Lisa Clodoveo</i>				
6.1	The prince of the Mediterranean diet	101			
6.2	Much more than a condiment	101			
6.3	To season is a noble action	102			
6.4	Not all that glitters is gold	102			
6.5	European Food Safety Authority claims for the olive oil supply chain	103			
6.6	Form and substance, words, ideas, and new categories of thought	104			
6.7	The consumer often is not informed	105			
6.8	A synesthetic experience	105			
6.9	Extra-virgin olive oil: raw or cooked?	106			
6.9.1	Raw extra-virgin olive oil	106			

6.9.2	Extra-virgin olive oil and gastronomic culture: a travel and discovery tool	106	8.1.2	Biopolymers	139
6.9.3	The sensory experience at the restaurant	107	8.2	Note-by-note cooking	141
6.9.4	The perceptible benefits of raw extra-virgin olive oil	109	8.2.1	Constructing a note-by-note dish	142
6.10	From the restaurant room to the kitchen	110	8.3	Pure compounds isolated from food processing by-products	144
6.10.1	Raw sauces with extra-virgin olive oil	110	8.3.1	Nutrients used in traditional and modernist gastronomy	145
6.10.2	Cooked sauces	112	8.4	Molecular gastronomy recipes	148
6.10.3	Sofrito technique	112	8.4.1	Molecular cocktails	148
6.10.4	Frying	113	8.5	Future perspectives and outlooks	159
6.10.5	Confit cooking	115	Acknowledgments	159	
6.10.6	Extra-virgin olive oil in canned foods	115	References	159	
6.10.7	Microwave cooking	116	9.	Recipes for the valorization of culinary by-products and leftovers	165
6.10.8	Pizza	116		<i>Özge Seçmeler and Yaşar Sevimli</i>	
References	117		9.1	Introduction	165
7.	From folklore to the nutraceutical world: the <i>Corema album</i> potential	119	9.2	Causes of food waste based on sectors	165
	<i>Maria João Barroca and Aida Moreira da Silva</i>		9.3	Current prevention, recovery, and recycling solutions against food waste generation	166
7.1	Introduction	119	9.4	Value-added usage of potential culinary by-products and leftovers in the kitchen itself	167
7.2	A singular Iberian endogenous plant as a food resource: <i>Corema album</i>	120	9.5	Recipes	174
7.3	One contribution to the valorization of <i>Corema album</i>	125	9.6	Conclusion	189
7.3.1	Nutrient profile of the little white berries	125	References	189	
7.3.2	Phytochemical profile and biological effects on human health	125	10.	Gastronomic tourism and the senior foodies market	193
7.3.3	First complete vibrational study by micro-Raman and Fourier transform infrared spectroscopy	129		<i>Adela Balderas-Cejudo, Ian Patterson and George W. Leeson</i>	
7.4	<i>Corema album</i> as a source of ancient recipes and novel food ingredients	130	10.1	Introduction	193
7.4.1	Pearlberry jelly	131	10.2	Our aging society	194
7.4.2	Pearlberry tisane	131	10.3	Tourism and an aging population	195
7.5	Final remarks	132	10.4	Gastronomy and its significance for the tourism market	196
Acknowledgments	133		10.5	Profiling senior foodies	198
References	133		10.6	Conclusion	200
8.	Food processing by-products and molecular gastronomy	137	References	201	
	<i>Gabriela Precup, Laura Mitrea, Lavinia Florina Călinoiu, Adrian Gheorghe Martău, Amalia Nemeş, Bernadette Eموke Teleky, Vasile Coman and Dan Cristian Vodnar</i>		11.	Holistic cuisine and gastronomic tourism	205
8.1	Molecular gastronomy	137		<i>G. Mehul Krishna Kumar</i>	
8.1.1	Techniques used in molecular gastronomy	138	11.1	Introduction	205
			11.2	Review of the literature	206
			11.2.1	Producers	206
			11.2.2	Consumers	208
			11.2.3	Gastronomic tourism	209
			11.3	The framework	210
			11.4	Methodology	211

11.5	Result and discussion	212			
11.5.1	Producer	212			
11.5.2	Consumers	216			
11.5.3	Gastronomic tourism	218			
11.6	Conclusion	224			
	References	224			
12.	Seven dimensions of taste—taste in a sociological and educational perspective	227			
	<i>Karen Wistoft and Lars Qvortrup</i>				
12.1	Introduction	227			
12.2	A sociologically informed theory of taste	228			
12.2.1	Method	228			
12.2.2	The phenomenology of taste	228			
12.2.3	Taste: a system of systems	229			
12.2.4	A brief history of taste theories	230			
12.2.5	System of taste: basic concepts	231			
12.2.6	System of taste	232			
12.3	The seven dimensions of taste	233			
12.3.1	Sensed taste	233			
12.3.2	Pleasant taste	235			
12.3.3	Healthy taste	236			
12.3.4	Moral taste	238			
12.3.5	Loving taste	240			
12.3.6	Religious taste	241			
12.3.7	Trendy taste	243			
12.3.8	A system of taste judgments	245			
12.4	Teaching taste: why and how?	245			
12.4.1	<i>Sentire aude</i> : participate in society's taste communities	245			
12.4.2	General didactic reflections	246			
12.4.3	Example of use in teaching practice	247			
12.4.4	From taste dimensions to taste education	248			
12.5	Conclusion: the sociology and didactics of taste in the context of food science	248			
	References	249			
	Index				253

List of Contributors

- Javier Aranceta-Bartrina** Department of Physiology, Faculty of Medicine, University of the Basque Country (UPV/EHU), Leioa, Spain; Department of Food Sciences and Physiology, University of Navarra, Pamplona, Spain; Research Institute of Biomedical and Health Sciences (IUIBS), University of Las Palmas de Gran Canaria, Las Palmas, Spain; CIBEROBN, Biomedical Research Networking Center for Physiopathology of Obesity and Nutrition, Carlos III Health Institute, Madrid, Spain
- Adela Balderas-Cejudo** Esic Business and Marketing School, Madrid, Spain; Oxford Institute of Population Ageing, University of Oxford, Oxford, United Kingdom
- Maria João Barroca** University of Coimbra, Molecular Physical-Chemistry R&D Unit, Department Chemistry, Coimbra, Portugal; Coimbra College of Agriculture, Institute Polytechnic of Coimbra, Bencanta, Coimbra, Portugal
- Lavinia Florina Călinoiu** Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania; Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania
- Nicola Caporaso** Department of Agriculture and Food Science, University of Naples Federico II, Naples, Italy; Department of Food Sciences, School of Biosciences, University of Nottingham, Sutton Bonington, United Kingdom
- Maria Lisa Clodoveo** Interdisciplinary Department of Medicine, University of Bari, Bari, Italy
- Vasile Coman** Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania
- Rosa Paula Cuevas** International Rice Research Institute (IRRI), Los Baños, Philippines
- Marie Claire Custodio** International Rice Research Institute (IRRI), Los Baños, Philippines
- Matty Demont** International Rice Research Institute (IRRI), Los Baños, Philippines
- Bernadette Eموke Teleky** Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania
- Maria Gonnella** Institute of Sciences of Food Production, CNR – National Research Council, Bari, Italy
- Emiliano Arencibia Gonzalez** The Hybrid Lab, School of Computer Science & Engineering, The Hebrew University of Jerusalem, Jerusalem, Israel
- G. Mehul Krishna Kumar** School of Management, Shri Venkateshwara University, Gajraula, India
- Alexander “Zoonder” Lachnish** The Hybrid Lab, School of Computer Science & Engineering, The Hebrew University of Jerusalem, Jerusalem, Israel
- George W. Leeson** Oxford Institute of Population Ageing, University of Oxford, Oxford, United Kingdom
- Adrian Gheorghe Martău** Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania; Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania
- Laura Mítrea** Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania; Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania
- Ariel Bezaleli Mizrahi** The Hybrid Lab, School of Computer Science & Engineering, The Hebrew University of Jerusalem, Jerusalem, Israel
- Francesco F. Montesano** Institute of Sciences of Food Production, CNR – National Research Council, Bari, Italy
- Aida Moreira da Silva** University of Coimbra, Molecular Physical-Chemistry R&D Unit, Department Chemistry, Coimbra, Portugal; Coimbra College of Agriculture, Institute Polytechnic of Coimbra, Bencanta, Coimbra, Portugal

Amalia Nemeş Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania; Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania

Ian Patterson Silk Road International University of Tourism, Samarkand, Uzbekistan

Carmen Pérez-Rodrigo Department of Physiology, Faculty of Medicine, University of the Basque Country (UPV/EHU), Leioa, Spain

Gabriela Precup Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania; Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania

Lars Qvortrup Danish School of Education, Aarhus University, Copenhagen, Denmark

Massimiliano Renna Institute of Sciences of Food Production, CNR – National Research Council, Bari, Italy

Arindam Samaddar International Rice Research Institute (IRRI), Los Baños, Philippines

Özge Seçmeler Gastronomy and Culinary Arts Department, Altınbaş University, Istanbul, Turkey

Francesco Serio Institute of Sciences of Food Production, CNR – National Research Council, Bari, Italy

Yaşar Sevimli Gastronomy and Culinary Arts Department, Altınbaş University, Istanbul, Turkey

Dan Cristian Vodnar Faculty of Food Science and Technology, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania; Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca, Cluj-Napoca, Romania

Karen Wistoft Danish School of Education, Aarhus University, Copenhagen, Denmark

Jhoanne Ynion International Rice Research Institute (IRRI), Los Baños, Philippines

Amit Zoran The Hybrid Lab, School of Computer Science & Engineering, The Hebrew University of Jerusalem, Jerusalem, Israel

Chapter 6

Olive oil in gastronomy and food science

Maria Lisa Clodoveo

Interdisciplinary Department of Medicine, University of Bari, Bari, Italy

6.1 The prince of the Mediterranean diet

The Mediterranean diet is UNESCO's "Intangible Cultural Heritage of Humanity." More than being a diet, it is a real lifestyle. But what are its basic foods? Cereals, vegetables, fruit, milk and dairy products, nuts and seeds, legumes, fish, white meats, and eggs; and unfailingly extra-virgin olive oil (EVOO).

The Mediterranean diet was "discovered" by the American Ancel Keys, who studied its effects on health. Born in 1904 in Colorado Spring, he was a biologist, physiologist, and nutritionist. He took part in the first world conference on food that was held in Rome in the 1950s. Here Keys, fascinated by the low incidence of cardiovascular diseases and gastrointestinal disorders, concluded that the diet based on cereals, fruits, vegetables, EVOO, legumes, fish, and reduced consumption of meat was responsible for these positive effects. Ancel called this type of diet the "Mediterranean diet," as a nutritional system typical of the Mediterranean basin populations.

The Mediterranean diet is a balanced, healthy, and sustainable food model based primarily on the consumption of foods of plant origin. Numerous scientific studies have shown that this type of diet helps one to prevent the main chronic diseases (cardiovascular diseases, diabetes, and obesity), above all thanks to the daily consumption of EVOO and vegetables.

The Mediterranean food pyramid indicates the frequency of consumption of the foods of the Mediterranean diet. According to this pyramid,

- vegetable fats (mainly EVOO) and cereals must be taken at every meal;
- fruits and vegetables should be consumed in quantities of two or three portions daily;
- healthy diets always include the daily integration of some small portion of legumes and even dried fruit;
- eggs, white meats, and fish, as well as cheeses with a high calcium content, must be taken three times a week; and
- refined grains, butter, potatoes, and red meat must be consumed occasionally and moderately.

Today, there is an increase in the consumption of fats, above all saturated and polyunsaturated at the expense of monounsaturated fats (present in large quantities in olive oil). EVOO is the main fatty food of the Mediterranean diet: elected as the only condiment, if taken in the right dose (two tablespoons a day), it is protective on the stomach, liver, arteries, promotes the growth of the child, and improves the aging, guaranteeing the pleasure of eating, not only for its high monounsaturated fatty acid content but also for the presence of health-promoting microconstituents, namely, polyphenols, terpenoids, squalene, and tocopherols (Boskou and Visioli, 2003).

6.2 Much more than a condiment

The production of olive oil has centuries of history behind it and has been part of the cultural heritage of the Mediterranean populations since they began to devote themselves to olive growing. In the past, however, olive oil, as well as a condiment, was also widely used for lighting and, to a lesser extent, as a compound for the preparation of cosmetic products or emollient ointments.

In the Mediterranean diet, however, food, in addition to being an identifying element, also represents a means by which to communicate with other cultures, not only through the sale of food products but also through a reciprocal and constant exchange of recipes culinary, food preparation and preservation methods, nutrition and nutritional knowledge

Gastronomy and Food Science

Covers the interrelation of gastronomy and food science in one integral reference

Gastronomy and Food Science fills the transfer knowledge gap between academia and industry by covering the interrelation of gastronomy, food and culinary science in one integral reference. Coverage of the holistic cuisine, culinary textures with food ingredients, the application of new technologies and gastronomy in shaping a healthy diet, and the recycling of culinary by-products and leftovers giving examples of recipes is also offered in this important reference.

Written for food scientists and technologists, food chemists, and nutritionists, researchers, academics, and professionals working in culinary science, culinary professionals and other food industry personnel, **Gastronomy and Food Science** is sure to be a welcomed reference.

This book:

- Discusses the role of gastronomy and new technologies in shaping healthy diets
- Describes a toolkit to capture diversity and drivers of food choice of a target population and identify entry points for nutrition interventions
- Presents the experiential value of the Mediterranean diet, elaiio-gastronomy, and bioactive food ingredients in culinary science
- Explores gastronomic tourism and senior foodies market

Edited by

Dr. Charis M. Galanakis is a multi-/inter-disciplinary scientist and a Highly Cited Researcher in Agricultural Sciences (Web of Science Group, 2019) with experience in the food and environmental science and technology, innovation and sustainability, industry and academia. He has defined the new term and discipline of "Food Waste Recovery", and established the biggest open innovation network worldwide in the particular field with an ultimate goal to inspire related professionals to extract high added-value compounds from wasted by-products in all stages of food production (from agriculture to the consumer) and re-utilize them in the food chain. He is the research & innovation director of Galanakis Laboratories (Chania, Greece), a Professor of King Saud University (Riyadh, Saudi Arabia), and the coordinator of Food Waste Recovery Group (SIG5) of ISEKI Food Association (Vienna, Austria). He serves as a senior consultant for the food industry and expert evaluator/monitor for international and regional funded programs and proposals. He is an editorial board member of Food and Bioproducts Processing, Food Research International, and Foods, also he has published hundreds of research articles, reviews, monographs, chapters and conference proceedings.



ACADEMIC PRESS

An imprint of Elsevier

elsevier.com/books-and-journals

ISBN 978-0-12-820057-5



9 780128 200575