

1	Biological Foundations of Our Nutrition	1
1.1	Why We Eat	1
1.2	Oil and Water: More Than Just Essential.	4
1.3	Fatty Acids—A Look into Fat Molecules	5
1.3.1	Physics and Chemistry Determine Physiology	8
1.3.2	Plants Show the Way	10
1.3.3	It's All About the Biological Function.	11
1.3.4	Animal or Plant-Based?	12
1.4	Macronutrients—Function and Structure	13
1.4.1	Carbohydrates	13
1.4.2	Proteins.	15
1.5	Micronutrients—Small Atoms and Molecules, Big Impact.	19
1.5.1	Minerals and Trace Elements.	19
1.5.2	Micronutrients: Vitamins	19
1.6	Fat and Water—Solvents for Flavors and Taste.	23
1.7	Taste as a Driving Force of Evolution	24
1.8	Alcohol Dehydrogenases—The Step Towards More Food in the Evolution of Early Humans	25
1.9	The Control of Fire—The Beginning of Better Nutrition for Modern Humans.	27
1.10	Glutamate Taste—Fire and Protein Hydrolysis	30
1.11	What Is Really in Plants—The Fundamental Problem of Raw Food	32
1.12	Decay, Fermentation, and Digestion: Intestines and Microbiome	35
1.13	How Do We Digest Food? What Are Valuable Ingredients?	36
1.14	The Evolutionary Advantage of Animal Foods	37
1.15	The Advantage of Cooking for Nutrition and Bioavailability	38
1.16	Digestion is Life, is Physical Chemistry	39
1.16.1	The Advantages of Cooking are Measurable.	39
1.16.2	Physicochemical <i>in-vitro</i> Intestinal Models.	42
1.17	Apes Would Choose Cooked Food	44
1.18	What the Body Wants—and How It Tells Us.	45
	References.	46

2	Recognizing Food, Learning to Eat: A Look into Evolution	51
2.1	Hunters, Gatherers, Energy Gainers	51
2.1.1	Scavenging and Hunting—Nutrition before the Utilization of Fire	52
2.1.2	Effort and Yield of Hunting and Gathering—The Energy Balance	52
2.2	Animal Foods—High Energy Gain	56
2.3	Fat, Brain, Bone Marrow—Sources of Essential Omega-3 Fatty Acids	58
2.4	Fatty Acids: Function, Structure, and Physical Properties	60
2.5	The Omega-6/Omega-3 Ratio of Foods	63
2.6	Offal—Forgotten and Valuable Foods	67
2.6.1	From Early Hominids to <i>Homo Sapiens</i>	68
2.7	Sedentism—Fundamental Change in Food and Nutrition	68
2.7.1	Grains and Starch: Additional Food Sources	69
2.7.2	The Fundamental Dietary Change	70
2.7.3	Consequences of Sedentism—The Third Revolution in Evolution	71
2.8	Lactose Tolerance—Point Mutation in DNA: Lactose Tolerance as a Result of Selection Pressure	74
2.9	Fermenting and Fermentation—in the History of Food Culture	79
2.9.1	Fermentation of Vegetables	82
2.9.2	Asia—Advanced Culture of Fermentation	83
2.9.3	Fermented Beverages, Hot Drinks	86
2.9.4	Miso, Fish Sauce, Soy Sauce & Co—Brilliant Examples of (Complete) Fermentation and Flavor	87
2.9.5	Safety and Advantage of Fermented Products	91
2.9.6	Kokumi— Perpetual Umami Companion for Millennia	92
2.10	Germination as a Universal Cultural Technique for Food Enrichment	93
2.11	The Origin of Human Chemical Sensing	94
2.12	The Cultural Imprint of Universal Molecule Classes—Beloved Flavors	94
2.13	Culinary Triangle and Structuralism: The Universal Basis of Human Nutrition	95
2.13.1	The Molecular-Evolutionary Variant of the Culinary Triangle	96
2.13.2	Cooking Cultures in the Light of the Culinary Triangle	97
2.14	Conclusion	100
	References	101

3	Consequences of Early Industrialization on the Molecular Composition of Food	107
3.1	Neolithic—The Modernization of Food	107
3.1.1	Natural Fats, Industrial Fats, <i>trans</i> Fats	109
3.1.2	Cholesterol and Cell Membranes	111
3.1.3	Phytosterols	114
3.1.4	Cholesterol, LDL, and HDL—What Is Good, What Is Bad?	115
3.1.5	Margarine, Fat Mixtures & Co.	123
3.2	The Early Economic Models Using the Example of Agriculture	124
3.3	Industrial Animal Production and BSE (Bovine spongiform encephalopathy)	127
3.3.1	Contemporary Industrialized Agriculture	127
3.3.2	The Early Beginnings of Industrialization	127
3.3.3	Animal Food for Ruminants?	128
3.3.4	Prion Hypothesis—Physical Infections	128
3.3.5	The Well-Intentioned Attempt to Impose Omega-3 Fat on Sheep	132
3.3.6	Intensive Fattening, US-Beef—Other <i>trans</i> Fats	134
3.4	Staple Food Bread: Physics, Chemistry, Nutrition	137
3.4.1	Grains	137
3.4.2	What can be learned from the germination of grain	139
3.4.3	Wheat Bread and Aids—Industrial and Natural Methods?	140
3.4.4	Dough Properties, Dough Processing, and Gluten	142
3.4.5	Yeast and Sourdough—Dough Leavening, Fermentation	144
3.4.6	Heating of Gluten: Vulcanization of the Network	146
3.4.7	Starch and Water Management in Baked Bread	148
3.4.8	The Taste of Bread	149
3.4.9	The Early Regional Bread Culture	150
3.4.10	Nixtamalization—Ancient Grain Technology of Gluten-Free Cereals	151
3.4.11	A Look Into the Modern World of Additives Using Bread as an Example	153
3.5	Food Spoilage and Preservation Methods	162
3.5.1	The Desire for Preservation	162
3.5.2	Drying, Canning, and Sterilizing	163
3.5.3	Hurdle Concept and Barrier Theory	165
3.6	Misunderstood Preservation Methods	166
3.6.1	Example of Misunderstood Industrialization—Liquid Smoke	167
3.6.2	Example of a Misunderstood Water Binding with Polyols—Sorbitol	167

3.6.3	Example of a Misunderstood Preservation— Rosemary Extract.	168
3.7	Consumer Precariousness	169
	References.	171
4	Molecules Determine Our Food.	177
4.1	Where We Come From.	177
4.1.1	Genesis 1.0—In the Beginning was the Singularity	178
4.1.2	Genesis 2.0—Elementary Life is Based on Self- organized Interfaces and Molecular Copy & Paste	179
4.2	The Beginning of Ancestor Worship	181
4.2.1	From Ancestor Worship to Religion.	181
4.2.2	Non-structuralist (Food) Cultures	182
4.3	Basic Food Meat: Physics, Chemistry, Taste	183
4.3.1	Proteins Everywhere	183
4.3.2	The Modern Western Individual and the Inclination Towards White Meat	185
4.3.3	Many Studies, Little Clear Insight.	186
4.3.4	Of Heme Iron and Cancer	187
4.3.5	Once Guilty, Always Guilty.	189
4.4	The Chinese Restaurant Syndrome and the Chemistry of Umami Taste	189
4.4.1	Mother's Milk Sets the Example: Umami and Sweet.	190
4.4.2	Comparison of Mother's Milk, Dashi, and Chicken Broth	193
4.4.3	The Umami Taste as a Result of Purine Metabolism.	195
4.4.4	The Synergy Effect between Glutamic Acid and Nucleotides.	196
4.4.5	Consequences for the Philosophy of Taste.	198
4.5	Glutamate and Nucleotides as Flavor Enhancers are the Cause of Global Cooking Cultures	199
4.5.1	How Taste Chemistry Determines Cooking Culture	199
4.5.2	From Hidden Glutamate in Yeast Extract.	201
4.5.3	Artificial and Natural Glutamate?	202
4.6	Umami Never Comes Alone	204
4.6.1	The Chinese Restaurant Syndrome—Biogenic Amines and Secondary Products	205
4.7	Glutamic Acid and Its Function Beyond Taste	209
4.8	Physics of Sugar: Taste, Water Binding, Preservation	210
4.8.1	Sugar and Natural Sugar Alternatives	210
4.8.2	The Sweet Receptor	212

4.8.3	Metabolism and Sugar	214
4.8.4	Glycemic Index	216
4.8.5	Glucose versus Fructose.	217
4.8.6	Honey, Rice, Maple, and Agave Syrup	220
4.8.7	Fruit Remains Valuable	222
4.8.8	Sugar is much more than just Sweet: OH loves H ₂ O.	224
4.8.9	The Appeal of Sucrose, and Why Stevia is not Always an Alternative	225
4.8.10	What is the Purpose of Additives in Jam?	227
4.8.11	Conclusion: Is Sugar Poison or Not?	228
4.9	Lipid Digestion: Colloid Physics During the Gastrointestinal Passage.	228
4.9.1	Stomach and Small Intestine—Mainly Colloid Physics	229
4.9.2	The Path of Fat from the Mouth to the Intestine	230
4.9.3	Bile Acids, the Other Side of Cholesterol	233
4.9.4	Long-chain Fats ($n > 12$)	235
4.9.5	Medium-chain Fats ($12 > n > 6$)	235
4.9.6	Plant Fats, Nuts, and Oilseeds in the Digestive Tract	235
4.9.7	Oleosins—Very Special Proteins	237
4.10	Basic Food Milk: Physics, Chemistry, Nutrition	238
4.10.1	Raw Milk Proteins—Macro, Micro, Nano.	239
4.10.2	Structure and Composition of Milk Fats	243
4.10.3	Milk—Raw and Pasteurized	245
4.10.4	Whey Protein—A Glutathione Supplier	249
4.10.5	Milk—Raw vs. Homogenized	250
4.10.6	Raw Versus Homogenized Milk in Digestion	253
4.10.7	Homogenized Milk and Atherosclerosis	255
4.10.8	$\alpha 1$ - and $\alpha 2$ - β -Casein	256
4.10.9	Micro-RNA in Milk	260
4.10.10	Cow's Milk Exosomes as Information and Drug Transporters	262
4.10.11	Milk Makes the Difference	265
	References.	266
5	Physical Chemistry of Nutrition and Dietary Forms.	273
5.1	Healthy? Harmful? Where are the Dividing Lines	273
5.2	From Observational Studies and Popular Interpretations	276
5.3	The Inevitability of Acrylamide.	277
5.3.1	Acrylamide—Brand New and Yet Ancient	277
5.3.2	Acrylamide and Non-Enzymatic Browning Reaction	280
5.3.3	Acrylamide—Amino Acids and Sugar	281
5.3.4	Acrylamide—Amino Acids and Fats.	283

5.3.5	Glycidamide—Fatty Partner of Acrylamide	284
5.3.6	How relevant is glycidamide?	285
5.3.7	The Influence of pH Value, Water Activity, and Fermentation on Acrylamide Formation	286
5.3.8	Asparaginase—A New Enzymatic Tool for Acrylamide Reduction?	287
5.3.9	The Other, Good Side of the Maillard Reaction	289
5.4	Biological Value and Food Proteins.	290
5.4.1	Biological Value	290
5.4.2	Liebig's Minimum Theory	292
5.4.3	Classic Definitions of Biological Valency	293
5.4.4	Collagen Drinks—Collagen Against ellulite?	294
5.4.5	Biological Valency and Bioavailability are Different.	296
5.5	Intolerances and Gluten-free Baked Goods.	299
5.5.1	Gluten-Free	299
5.5.2	Wheat Germ Lectins	301
5.5.3	Amylase-Trypsin Inhibitors	302
5.5.4	Why is Wheat Intolerance Increasing?	304
5.5.5	Is Gluten-Free Healthy?	305
5.5.6	Gluten-Free—Often Nutrient-Poor	306
5.5.7	Super Grain Teff?	309
5.6	Carbohydrates: Structure and Digestion	311
5.6.1	Complex Carbohydrates.	311
5.6.2	Whole Grain Flour during Intestinal Passage	312
5.6.3	Dietary Fiber	313
5.7	Nitrate and Nitrite	314
5.7.1	Nitrate, Nitrite, and Stoked Fear	314
5.7.2	Nitrate, Nitrite—A Search for Traces	316
5.7.3	Nitrosamines	317
5.8	Raw Food Diet: Physical-Chemical Consequences.	319
5.8.1	Only Raw Food is Healthy? Stories of the <i>Homo Non Sapiens</i>	319
5.8.2	Structure and Mouthfeel—Macronutrients and Dietary Fiber	320
5.8.3	Micro-nutrients.	322
5.8.4	Temperature and Nutrients.	322
5.8.5	Interfaces Between Enzymes and Vitamins	324
5.8.6	Blanching, Enzyme Inactivation, and Vitamin C.	325
5.8.7	Pseudo-Raw Enjoyment—A Matter of Food, Time, and Temperature	327
5.9	Paleo-Diet	330
5.9.1	Back to the Stone Age	330

5.9.2	The Paleo Hypothesis—Adaptation, Maladaptation . . .	332
5.9.3	For or Against Paleo? What Does Science Say?	333
5.10	Vegan—Exclusive Exclusion and Missing Links	334
5.10.1	The Radical Food Elite	334
5.10.2	Health Benefits?	336
5.10.3	Vitamin D.	338
5.10.4	Essential Fatty Acids: EPA and DHA	340
5.10.5	Supplementation Necessary	340
5.10.6	Fermentation and Germination as Systematic Methods in Plant-Based Nutrition	341
5.10.7	Example Nattō	342
5.10.8	Free From Animal—Vegan Substitute Products	344
5.10.9	Industrial Processes for Surrogate Products.	346
5.10.10	Structuring of Proteins	348
5.10.11	Leghemoglobin as a Hemoglobin Substitute	350
5.10.12	The Modified Culinary Triangle of Modern Industrial Culture	351
5.11	Clean Meat—Cultured Meat from the Petri Dish	352
5.11.1	Meat without Animals	352
5.11.2	Technical Problems and Solutions	354
5.12	Insects	354
5.13	Mushroom Proteins—New Research Findings	357
5.14	Fast Food, Highly Processed Foods—Curse or Blessing?	358
5.15	Superfoods	364
5.16	Secondary Plant Compounds	366
5.16.1	Polyphenols	366
5.16.2	Carotenoids: Delocalized π -Electron Systems	369
5.16.3	Why Plants and Seeds Cannot Be Superfoods	371
5.17	The Value of Natural Science in Nutrition.	373
5.18	What Does “Healthy” Actually Mean?	374
	References.	375
6	Pleasure and Nutrition	385
6.1	Hygiene and Pleasure.	385
6.2	A Dilemma of Food Production.	387
6.3	Detoxifying Food and a Few Contradictions	388
6.4	Understanding of Research is Dwindling	390
6.4.1	Recognizing Connections	390
6.4.2	Why Mechanically Separated (or Deboned) Meat is Good in Essence.	391
6.5	Tradition and Enjoyment: Meat and Sausage from Home Slaughtering.	392
6.5.1	What We Know About Meat and Sausage	392

6.5.2	Warm Meat Processing: Fundamental Advantages on a Molecular Scale	395
6.5.3	Cold Meat Processing: Systematic Physical Deficits in Microstructure	397
6.6	Home Cooking is Worth Its Weight in Gold	400
6.6.1	Control It, Do It Yourself	400
6.6.2	Forgotten Vegetables, Secondary Vegetable Cuts, Root-to-Leaf.	401
6.6.3	Pure Pleasure	402
6.6.4	Intramuscular Fat: Fancy Flavour Enhancer	403
6.7	Nose-to-Tail, Taken Seriously	406
6.8	Game (Venison), Organic Meat from the Forest	408
6.8.1	Meat Doesn't Get More Natural Than This	408
6.8.2	Red and White Muscle Fibers	408
6.9	The Salt Issue.	411
6.9.1	Salt in the Kitchen	411
6.9.2	Salt and Osmosis	414
6.9.3	Salt and Humans	415
6.9.4	Salt and Interactions at the Atomic and Molecular Level.	416
6.9.5	Salt is Not Equal to Salt.	418
6.9.6	Salt is Not a Poison	419
6.10	Lot Makes You Full, Complex Makes You Satisfied!	419
6.10.1	More is Not Always Better.	419
6.10.2	Variety and Combinatorics – Complexity on the Plates	420
6.10.3	Excitement and Variety	422
6.11	Hunger—A Western Luxury	425
6.11.1	The Forgotten Hunger	425
6.11.2	Autophagy	426
6.12	What We Will Eat in the Future.	429
6.12.1	We Eat What We Used to Eat.	429
6.12.2	Insects, But Not Only.	430
6.12.3	New Foods to Discover: Duckweeds.	431
6.12.4	Spirulina: Hype or Opportunity?	432
6.13	<i>Ikejime</i> —Gentle, Sustainable, and Umami-Promoting Cultural Technique.	433
6.13.1	Taste-Driven Cultural Technique	433
6.13.2	The Molecular Aspects of <i>Ikejime</i> Slaughtering	436
	References.	439
7	Conclusion—Or: What Remains?	445
7.1	Reading and Better Understanding Critical Studies	445
7.2	It's Not Just About the Amino Acid Balance	447

7.3	Bioactive Peptides: Small but Essential Features of Protein Origin.	450
7.4	Should We Eat Everything?	452
	References.	453