

Index

Note: Page references in *italics* refer to Figures; those in **bold** refer to Tables

- A-isomorph 96
- Acceptance (sensory test) 7
- activated diffusion 190
- active fillers 316
- adaptive experimentation (AE) 344
- adaptive management 344
- air in ice cream 84–5
- algin 209
- alginate 65, 102
 - films 209–210
 - in ice cream 89
- 'all in' cake process 60, 61
- allergen free foods 17
- American breadcrumbs (ABC) 134–5, 136, 137, 138, **154**
- α amylase 102, 140
- amylomaltase 97–8
- amylomaltase treated starch gels 98–9, 99
 - in yogurt 101–2
- amylomaltase treated starches 97–8, 97, 100–2, 100, 103
 - in low fat spreads 103
- amylopectin 95, 98, 208, 239
 - gelling 97
 - potato starch 95–6, 97
 - in soft confections 105
- amylose 98, 141, 154, 208, 239, 293
 - corn starches 97, 100, 102, 209
 - crystallized 95
 - gelling 96
- angel food cake 55–6, 57, 58, 59, 60, 63
- ANOVA 424
- anterior temporal muscles 283
- apoproteins 64
- arabic gum 61, 62
- Arrhenius equations 173, 174, 191, 209
- arrowtooth flounder proteins 64
- Ascophyllum nodosum* 209
- ASTM E96/E96M-10 192–4, *192*
- Atomic Force Microscope (AFM), colloid probe 408–410
- atomic force microscopy (AFM) for foams and emulsions 402–3, 408–419
- for bubbles and droplets 412–15
- Derjaguin approximation 411
- normal force measurements between solids 411–12
- normal spring constant measurements 410–11
- outlook 415–19
- bubble/droplet coalescence driven by van der Waals forces 416–18
- droplet deformation and interfacial properties 416
- droplet detachment from surfaces 418
- stabilization mechanism 418–19
- AVEBE 98
- Avogadro number 405
- B-isomorph 96, 97
- baking powder 60
- barbeque sauce 2
- batters 129
 - adhesion 129–130, **130**
 - clear coatings/French fry batters 131, 132, *134*
 - corn dog batter 131, *132*
 - definition 128
 - specialty 131–2
 - Tempura 130–1, **130**, *131*
 - thinning 140
- BDDT classification 171
- bending stress tester 228
- BET multilayer adsorption isotherm 171
- Bingham Plastic 119
- bloom value of gelatin 94
- blowout 140
- Boltzmann constant 186, 405
- Boltzmann equation 186
- bovine blood plasma 62–3
 - protein isolates 59
- bovine serum albumin (BSA) 60, 108
- bowl life testing 428
- bread staling 183

- bread texture 3
 breaded and battered foods, texture
 design 145–56
 adhesion 147–51
 coating systems 151–5
 reduced fat uptake 152–5
 crispy vs crunchy vs ‘crinchy’ 146–7, 148
 methods for reducing fat uptake 156
 textural quality **149–150**
 breadings 133–9
 definition 128
 flour-based 133, *133, 134*
 sheeted 133–9
 white 134
 whole grain 156
 Brunauer-Emmett-Teller (BET) equation 173
 butter cake 60
 buttermilk powder 79
 butters, low fat 102–3
 butyric acid 76

 capillary diffusion 190
 capillary effect 204
 capric acid 76
 caproic acid 76
 caprylic acid 76
 carbohydrate based films 206–9
 carbohydrate ingredients 13
 carboxylmethylcellulose (CMC) 395
 film 206, 207–8
 carrageenan 61
 in ice cream 78, 89
 β -casein 61, 389
 casein micelle 76
 caseinate 64
 category appraisal 34
 cellulose film 206–8
 central location testing (CLT) 7, 35
 cheese
 cold melt of 183
 cream cheeses and spreads 115–16, **115**, 121–3, **122, 123**
 hard and semi-hard 113–15, **113**
 cheese sauces, cheese reduction/replacement in 117–19, **118**
 chemical leavening 142–3, **142**
 chemical potential 165
 chiffon cake 60
 chitin 209, 210
 chitosan films 210
 chocolate, mouth behavior 432
 cholesterol, removal from egg yolk 61
 Chung-Pfost equation 174
 Clausius-Clapeyron 169
 clean labeling 156
 clear coatings 131, *132, 134*
 club sandwich 160

 cluster analysis 339, 293, 362, 370, 424
 coating pick up 139–140
 coatings
 coating pick up 139–140
 fundamentals 128
 gluten-free 155–6, **155**
 ingredients in 140–3
 predust 129
 technique 213
 traditional 128–140
 see also batters; breaded and battered foods,
 texture design; breadings
 cocoa-based films 213
 Cohesiveness 224, 288, 333, *315, 334*
 Cohesiveness of Mass 326, 327
 cold melt of cheese 183
 colloidal vibration current (CVI) 386
 composite edible films 213
 composite food isotherm 166, *167*
 conalbumin 55
 concentration 23, 24
 confections, soft
 gelatin in 103–5
 gelatin replacement in 103–5
 starch in 103–4
 stickiness and elasticity of *104, 104*
 confocal laser scanning microscopy 183
 conjoint analysis 344, 349, 354, 362
 consumer acceptance or preference tests 7
 consumer language terms 9–10
 continuous process 79
 conversion corn syrups 77
 cookies 63
 corn dog batter 131, *132*
 corn flour in coatings 140
 corn sweeteners 77
 corn syrup solids (glucose syrup solids) in ice cream 77, 88–9
 cracker meals 134, *135, 136*
 Crave IT!TM 346–50, **347, 349, 350, 352–3, 334**
 ‘craving’ 346
 cream cheeses and spreads 115–16, **115**
 reduced fat 121–3, **122, 123**
 creaminess 308–18
 engineering texture for perception of 317–18
 in mouth mechanisms 309–11, 310
 Crisp Film[®] (Ingredion) 153
 crispiness
 application of Fermi Model to *182*
 definition 181
 crispy and crunchy
 consumer perspective 331–2, **332**
 vs ‘crinchy’ 146–7, *148*
 descriptive analysis 330–1
 crude fiber (CF) 258
 crumb staling 183
 crust staling 183

- cryogenic freezing 156
cuttlefish paste 67
- dasher assembly in freezing barrel 84
Debye force 403
Debye length 405
deep fat/immersion frying 128, 143–4
heat transfer process 143
mass transfer 144
principles 143–4
- definition of food texture 5–6, 159–160, 224
Derjaguin approximation 411
Descriptive (sensory test) 7
descriptive analysis 33–4, 35
Devil's food cake 63
dextrin 65, 131, 141
resistant 154, **154**
DIAL-IN® Texture Technology (Ingredion)
14–15, *15*
- dietary fiber (DF) 245–61
analysis by AOAC methods **246**
applications 259–61
beneficial effects 245
definition 245–6
in gluten-free mixes **259**
healthy foods 258–9
insoluble 255–6, **256**
in pastas, meats, beverages and pet food 256–8
products containing **248**, 249
reasons for adding to foods and beverages **249**
role in foods 247–50
texture and functional benefits 252–6, 252,
253, **255**
toolbox **255**, **255**
total dietary fiber (TDF) content 250–2, 251
types 247, **247**
- Difference (sensory test) 7
differential scanning calorimetry (DSC) 178, 208
diffusing wave spectroscopy (DWS) 379–83, 381
backscattering method 380–1, 394
forward scattering (transmission) 380
following structure formation with 386–97
in dairy emulsions 394–7
milk gelation 387–9, 369
polysaccharides 389–92
recombined milk 392–4
whey protein aggregation 389
- diffusion mechanisms 188–9
Anomalous 188
Case I (Fickian) 188–9
Case II 188, 189
digastric muscle 283
discriminant function analysis (DFA) 373, 374–5
DLVO theory 403–6
durum wheat semolina 67, 222–3, 227, 230, **231**,
231, 234–5, 237, 238–9, **239**
dynamic light scattering (DLS) 379
- Dynamic Vapor Sorption (DVS) 187, 199
dysphagia
food texture design for 288–9
thickeners for 298–9
- Eclonia maxima* 209
edible film barriers 204–15, 205
edible films 211, 213
egg
in batters 142
composition and functionality 45–53, **46**
emulsion products 64–5
functionality in food products **54**
- egg, whole 53
aerated products using 60–3
aeration of 53
foaming capacity 53
gel formation 53
- Egg Beater® 68
egg gelation, products based on 65–7
egg noodles 67
egg products, commercial 67–8
egg substitutes 45, 53–67
commercial 67–8
- egg white 45, 46–50
composition and functional properties **47**
foaming properties 46–8
gelling property 46, 48–9
- egg white foam
aerated products 55–60
properties 46–8
- egg white protein (EWP) 56–9, 57, 58
- egg yolk 45, 50–3
adsorption at oil/water interface 51, 53
composition and functional properties 49–50, **49**
dried, in ice cream 79
emulsifying properties 50–2
emulsion product 64
frozen, in ice cream 79
gel formation 52–3
substitutes for 68
- electroacoustics 394–5
electromyography (EMG) of masticatory
muscles 283–6
bite force and 300–1, *301*
carrageenan gels 287, 288
cheese and 292–3
cooled rice of different cultivars 293–4
effect of cutting of food 294–5
experimental conditions 290–1, 291
flavor and taste release 296–7
gelatin gels 287, 288, 289
gels/sols from hydrocolloids as model food
287–8
hard jelly 284, 286
heterogeneous structure 289–290
influence of age and dental status 291–2

- electromyography (EMG) of masticatory muscles
 (cont'd)
 liquid food 284, 285
 mechanical properties and 297–8
 other *in vivo* measurements and 300–1
 physical properties of food bolus 295
 sample size and 286
 soft jelly 284, 285
 texture design of healthy diets 299–300
 thickeners for dysphagia patients 298–9
 tongue-palate pressure 300, 301
- electrostatic double electric layer force 405
 elements in experimental design 354
 emulsifiers in ice cream 78–9, 89
 emulsion-filled gels 314, 316
 emulsion products, egg in 64–5
 emulsion technique 213
 Ener-G® Egg Replacer 68
 Equilibrium Relative Humidity (ERH) 166
 equipment, process 14
 Ernie Curve 36–7, 37–8, 38–9, 40, 40, 41–2
 ETENIA™ 457 98
 evaluators, food, selection of 9
- facilitated diffusion 190
 factor analysis 39, 335, 339
 fat based ingredients 13
 fat mimetics 65
 fermentation 63
 Fermi's model 180, 180, 181, 182
 application to brittle cereal foods 182
 application to crispy foods 182
 Ferro-Fontan equation 174
 fibrinogen 63
 Fick's first law 190, 191
 Fick's second law 183, 184, 185, 199
 film barriers, edible 204–15, 205
 finite difference schemes 185
 finite element scheme 185
 Finney, Essex 27
 flavor 4
 flaxseed gum 391, 392, 395
 Flory equation 196
 Flory-Higgins isotherm 171
 flour in coatings 140–1
 flow behavior 10
 fluorescein 189
 fluorescence recovery after photobleaching (FRAP)
 method 189
 foaming agents 403
 foaming emulsifiers 403
 food aversion 423
 food brands 3
 food costs 3
 food formulation 12–13
 food inflation 4
 food quality 3
- food safety 9, 18
 Fourier transform infrared (FT-IR)
 spectroscopy 183
 fracturability 330, 331
 french fries, cryogenic freezing of 156
 French fry batters 131, 132, 134
 frozen desserts 74–5, 75
 frying oils 144–5
 fugacity 165
 functional ingredients 13
- galactomanans 102
 gamma-globulin 63
 gel
 characteristics 13
 definition of 93
 formation 93–4
 gelatin 78, 94–5
 applications 105
 replacing by starch 98–100
 strength in water 98
 in yogurt 100–2
 gelatinization 208
 gellan (deacylated) gum films 211–13
 gelled food 93–8
 gelling agents, definition 93, 94
 Gelometer 29
 geniohyoid muscles 283
 ghosts 95
 glass transition
 definition 176
 effect of mechanical properties of food
 systems 179–81, 179
 effect of water on 176–8
 globules, fat 76
 4- α -glucanotransferase 98
 gluten free baked goods 17
 gluten-free coatings 155–6, 155
 Glutograph 227, 228
 glycerol as water activity reducing agent 203
 glycerol monostearate 61
 Grain Research Laboratory (GRL) spaghetti
 tenderness tester 229
 granular ghost/ remnants 98
 grape leaves 205
 Greek-style yogurts 335
 guar gum 61, 62
 in coating systems 141
 in ice cream 78, 85, 89
 Guggenheim, Anderson and de Boer (GAB)
 equation 173–4
 fitted moisture sorption isotherms 196
 gumminess in ice cream 89
 gums in coatings 141, 152–3, 154
- Hamaker constant 404
 hardness 333, 315, 334

- Harkins Jura model 174
 Healthy You!™ 346
 heat shock *see* temperature abuse
 Henry's law of solubility 190, 191
 high density lipoprotein (HDL) in yolk 61
 high fructose corn syrup. in ice cream 88
 high pressure processing (HPP) 3, 17
 high temperature-short time (HTST) process 79
 homogenization of ice cream 79, 81–2, **82**
 homogenization valve 81, 81
 Hooke's Law 409
 hydrocolloids 61, 62
 in coatings 141
 definition 93
 role of 94
 hydroxypropyl cellulose (HPC) film 206
 hydroxypropylmethylcellulose (HPMC) 61
 film 206, 207, 208
 hygroscopic products 170
 hygroscopicity 175
 hysteresis 166
 ice cream 65, 74–91
 components 75–9
 composition 75
 material science approach to 86, 87
 microstructure, physical and sensory aspects 86, **86**, 87
 mix formulation 87–90, 91
 total solids 87–9
 processing factors 89–90
 pasteurization 79, **81**
 popularity 74
 process flow diagram 80
 processing 79–82
 regulations 75, 91
 standards of identity 76–7
 storage and distribution 90–1
 structural elements 82–7, **83**, **86**
 ice in ice cream 85, 90
 immunoglobulins, enzymes 108
 inactive fillers 316
 ingredients, healthy 16–17
 in-home placement 7
 Instron Universal Testing Machine® 25, 29, 30, 227, 232
 instrumental measurements 10–11
 integrated language terms 9
 integrated light scattering (ILS) 379
 inulin, in skimmed milk 317
 Japanese-style breadcrumbs (JBC)/Panko 135–7, **138**, **139**
 JBMB™ (Jeltema/Beckley Mouth Behavior) Classification Tool 429–430, **430**, **434**
 just-about-right scales (JAR) 39, 41, **41**, 42
 kappa-carrageenan 391, 392
 Kashar cheese 114
 Keesom force 403
 ketchup 1, 2
 kinaesthesia 24
 Knudsen diffusion 186–7
 konjac flour 152–3
 Kramer cell 230, **231**, 257
 α-lactalbumin (α -Lb) 108
 β-lactoglobulin 56, 59, 60, 108, 389
 lactose
 in ice cream 76
 as water activity reducing agent 203
Laminaria digitata 209
Laminaria hyperborea 209
Laminaria japonica 209
 Langmuir equation 173
 Langmuir isotherm 171, 174
 language for texture 9–10
 lard 78
 leavening acids 142–3, **142**
 lecithin 61, 79
Lessonia nigrescens 209
 Lewicki model 174
 Lifshitz theory 404
 lipid based films 212–14, **212**
 hydrophobic lipid type coatings **214**
 lipid composite films 213
 lipoproteins 60, 64
 liquid emulsions 314–17
Listeria innocua 211
Listeria monocytogenes 211
 location for sensory analysis 8
 locust bean gum 65
 in ice cream 78, 85, 89
 low cholesterol yolk 65
 low density lipoprotein (LDL) in yolk 61
 low temperature-long time (LTLT) process 79
 low-linolenic soybean oil 145
 lubrication 308–18
 role in perception of liquid emulsions 314–17, **315**
 lubricity 13
 lysozyme 46, 48, 55, 56, 60
Macrocystis pyrifera 209
 Maillard reaction 175, 237
 mall/store intercept 7
 maltodextrins in ice cream 77, 96, 98
 margarine, low fat, gelatin replacement in 102–3
 composition **103**
 masseter muscles 283, 284, 287, 290, 301, 302
 mastication 6, 283
 matrix in ice cream 85
 mayonnaises 65, 64, 119
 whey proteins in 112

- mean square displacement (MSD) 382–3, 383
 measurement of texture 4–5, 6–12, 160
 mechanical deformation 10
 medical capsules 105
 meringues 55
 methoxyl pectin 390–1
 methylcellulose (MC) derivatives, film 206, 207
 methylcellulose in coating systems 141, 152
 microbiological stability 4
 microcrystalline cellulose in ice cream 78, 89
 microwavable products, quality 18
 milk fat in ice cream 75–6, 83–4, 84, 87
 milk proteins in ice cream 77
 milk solids not fat in ice cream 75, 76–7, 79, 83, 88
Mind Genomics™ 343–4, 349, 353–4
 clustering in 363–4
 data analysis 351
Dollar Model 360
 experimental design 356–7
 experimental results 360–3
 individual respondent level 359–360
Interest Model 360
 mind-set segmentation 362–3
 orientation page 357–8, 358
Persuasion Model 359–360
 test concept 357–8, 358
 texture and emotions 364–75
 tools of 344–5
model bar systems 183–4
Modified Halsey equation 174
Modified Henderson equation 174
Modified Oswin equation 174
 modified starch 64–5
 in coatings 140
 modified whey proteins (MWP) 112, 114
 in cream cheeses and spreads 116, 121–3, 122, 123
 in light cream soup 123–5, 124, 125
 replacement of cheese in sauces 117–19
 in salad dressing 116, 119–21, 120, 121
 in yogurt 116
 moistness of mass 327
 moisture absorption 327
 moisture effective diffusivity 197
 moisture migration, kinetics of 184–202
 effective diffusivity and solubility
 coefficients 185–9
 in low, intermediate and high moisture foods 198–9, 198
 preservation issues with intermediate and high moisture foods 199–202, 200, 201
 through barrier films with constant water vapor permeability 190–5
 corrections for resistance to still air/
 specimen surface 193–5
 through barriers including interactions of
 barriers with moisture 195–7
monoglycerides 60
monounsaturated fatty acids 145
monounsaturated oleic acid 145
 mouth behavior 425–41
 categorization of 430–3
 group prevalence in the US 430–1
 reported behavior by group 431–3
Chewers 426, 427, 428, 431, 432, 433
 classification 427–8, 429
 refinement of 429–430
Crunchers 426–9, 428, 431, 432, 433, 434
 developing insight 426
Fiddlers 434
 body 434
 mouth 434
 hypothesizing groups 426–7
 desired sensation levels 432–3
 implications 433–4
 product choice 432
 in product design 435–440
 potato chips case study 435–7
 yogurt case study 438–440
 qualitative validation of groups 427
Smooshers 426, 427, 428, 431, 432, 433
Suckers 426, 427, 431, 432, 433
MPI 32
MR1 187
 multi-domain foods 161
 multi-textured (multi-domain) foods 181–4
 definition 160
 examples 163
 impact of water in 163–4, 164
 water activity 164–170
 mylohyoid muscle 283
 nama panko 137
 Natick Soldier RD&E Center, Natick
 Laboratories 25–6, 28, 31
 library 29
 Neufchatel cheese 115, 121–2, 123
 NMR 187, 189, 386
 noise, data 8
 non-DLVO forces 406–8
 bringing force 407
 hydration forces 406–7
 solvation forces 406
 steric forces 407
 non-starch, non-cellulosic carbohydrate films 209–14
 Nori films 205
 Norrish Equation 204
 Novelose® (Ingredion) 153
 Nutritional Labeling and Education Act (NLEA)
 (US 1992) 75
 nutritive sweeteners in ice cream 77

- obesity 102, 159, 250, 300, 434
 octenyl succinic anhydride (OSA)-modified starch 64–5, 317
 oil-in-water (O/W) emulsions 314
 olive oil 145
 optimization of food texture 12–14
 formulation 12–13
 process 13–14
 oral processing 309–11, 310, 424–5
 ordinary least squares (OLS) regression 351, **361**, 362, 365, 368, 374, 376
 Oregami films 205
 osmotic dehydration 201
 Ostwald ripening 394
 in ice cream 85, 90
 ovalbumin 46, 48, 55, 56
 overrun in ice cream 77
 ovoglobulin 46, 55
 ovomucin 46, 55, 56
 ovomucoid 55
- packaging
 plastic 211
 techniques 3
 texture claims on 16, *17*
 palm kernel 78
 pan frying 128
 Panko 135–7, 138, 139
 Partial Least Square (PLS) Regression 339, 424
 pass 139–40
 pasta 67, 222–40
 al dente eating properties 224, 226
 compression tests 227–30, **231**
 drying 236–7
 elasticity 231
 extrusion 235–6, 236
 factors influencing textural properties 234–7
 gluten-free 237–9, 238
 good texture in 222–4, 223
 instrumental methods 227–33
 instrumental vs sensory texture 233–4
 measurement of texture in 224–7
 optimal cooking time 225–6, 225
 sensory method 233
 tensile strength tests 231
 textural properties 224
 pasteurization 3
 ice cream 79–81
 pea fiber 156
 pea protein in coatings 155
 pea starch in coatings 155, **155**
 pectins 102
 Peleg Model 174
 peptides 108
 perception of texture 6
 permeability 191
 permeance 191
 permeate diffusivity 190
 permeate flux 190
 phospholipids 60
 photon transport mean free path (λ^*) 383
 physical aging 178
 physical attributes, testing of 11
 physical characteristics, measurement of 10
 plastic packaging 211
 plasticized films 206–7
 Poisson-Boltzmann equation 405
 polysaccharide coatings 152
 polysorbates 79
 polyunsaturated fatty acids 145
 potato flour in coatings 140
 potato starch 95–6
 powdered egg substitutes 68
 Poynthing pressure 204
 Preference (sensory test) 7
 Preference Mapping 424
 principal component analysis (PCA) 293–4, 339, 424
 principal component regression 339
 process optimization 13–14
 protein based ingredients 13
 proteins in coatings 141–2
 psychographic segmentation 343
 psychometric effect 176
 psychophysics 33–4
- quality assurance 7
 Quantitative Descriptive Analysis™ 7, **8**
- Raoult's law 165, 174, 203–4
 rapeseed oil 145
 retrogradation 208
 rheological testing 10–11
 rheology, limitation 379
 rice flour in coatings 140
 rice papers 205
 rice starch in coatings 140
 Ridgeliometer 29
 roughness of mass 327
 rule developing experimentation (RDE) 344, 345
- Sader method 411
 salad dressing, low fat creamy (case study) 119–21, **120, 121**
 sample presentation 8–9, **8**
 sandiness in ice cream 76
 saponins 62
 saturated fatty acids (SAFAs) 308
 scrambled eggs 65, 67
 Second Nature® 68
 selection function 289
 selection of evaluators 9
 sensory input, initial 6
 sensory intensity 23

- sensory preference segmentation 42–3, 43
 sensory specific satiety 160
 sensory testing and analysis 7–10, 7, 8
 Shear Press 30
 shelf life 4
 optimization 17, 18
 shortometer 228
 sigmoid isotherm 171
 silos in experimental design 345, 350, 351–2, 354
 single scattering regime 380
 soapwort (*Gypsophila arrostii*) 62
 sodium carboxy methyl cellulose (CMC) 25
 in ice cream 89
 sodium carboxymethylcellulose 78
 sodium stearyl-2-lactylate 61
 sorbitol as water activity reducing agent 203
 sorption curves 188–9, 188
 sorption isotherm 170–4, 172, 174
 cluster formation 172, 172
 monolayer formation 172, 172
 shape classification 171, 172
 soup, light cream 123–5, 124, 125
 soy lecithin 64
 soy protein 60, 61, 64
 soybean oil 78
 space cubes 29–30
 Spectrum Community Narrative Panel (SCAN) 331
 Spectrum Descriptive Analysis 7, 8, 321
 sponge cake 60, 61
 water sorption properties 183
 spreadability of cream cheeses and spreads 116
 spreads, low fat, gelatin replacement in 102–3
 amylomaltase treated starch in 103
 composition 103
 stabilizers in ice cream 78, 89
Staphylococcus aureus, spoilage, moisture and 201, 201, 202
 starch 95–8
 characteristic data 95
 in coatings 140–1
 gel strength in water 98
 replacing by gelatin 98–100
 starch based films 208–9
 starch gelatinization in pasta 222, 224
 starch gelling 95–8, 99
 Stern layer 404
 Stokes-Einstein equation 382
 Stokes-Reynolds drainage 415
 strained yogurt 335
 Stribeck curve 312–13, 294, 315
 ‘subjective-instrumental’ correlations 40
 ‘subjective-objective’ correlations 30
 sucrose 24
 in ice cream 77, 88
 sweetness 76, 77
 sugar-sucrose function 24
 suprathyoid muscles 283, 284, 290, 298, 301
 surface force apparatus (SFA) 408, 412
 surface forces in liquid environment 403–6
 swallowing 6
 sweeteners in ice cream 88
 taste intensity 24
 TA-XT2i Texture Analyzer 147, 147, 151, 227
 temperature abuse in ice cream 90–1
 Tempura batter 130–1, 130, 131
 terminology 9–10
 TEXICON™ (Ingredion Incorporated) 11–12, 12
 textile profile analysis 288
 textural awareness 423
 textural knowledge 423–4
 texture analysis 183
 texture analyzer 146
 texture choice, factors impacting on 5
 texture claims 16, 17
 texture descriptive analysis
 annoying textures 332–3
 applications 334–9
 correlation of sensory and instrumental texture measurements 338
 linking consumer and product understanding 338–9
 understanding product similarities and differences 334–7
 common texture attributes 322
 components 321–6
 consensus vs. individual ratings 329–330
 creation of new attribute 322–4
 attribute definition 323
 attribute name 323
 practical example 324–6
 references 323–4
 scale 323, 324–6
 technique 323
 crispy and crunchy 330–2
 management of variable and complex products 328–9
 new views on 326–8
 bite/chew/spoonful size 327
 chewdown 327–8
 reporting variability 328
 stages in 322
 texture as signal of wholesomeness and freshness 333–4
 texture terminology 330–2
 texture map 161
 texture profile analysis (TPA) 114, 321
 texturogen 342
 Texturometer® 10, 30
 time course analysis 296–7

- Timmermann GAB model 174
 tofu as egg substitution 68
 tomato seed proteins 64
 touch, sense of 5–6
 trans fatty acids 308
 tribology 308, 311–14
 ‘acoustic’ 314
 ball-on-disk set-up 313, 314
 pin-on-disk set-up 313, 314
- ultrasonic spectroscopy (US) 379, 384–6
 with electroacoustics 386
 following structure formation with 386–7
 in dairy emulsions 394–7
 milk gelation 387–9, 369
 polysaccharides 389–92
 recombined milk 392–4
 whey protein aggregation 389
 scattering losses 385
 thermal losses 385
 viscoinelastic losses 385
- ultrasound pulse Doppler method 300
- United States Army Soldier Systems Center 22
- United States Food and Drug Administration (US FDA) 75
 ice cream pasteurization 79, **81**
- United States Public Health Service, ice cream pasteurization 79, **81**
- Urick equation for homogeneous materials 384
- validity 32–3
- value added 35, 36
- van der Waals forces 403, 404, 386, 406, 409
- videoendoscopy 300
- videofluorography 300
- Viollaz GAB Model 174
- viscoelastograph 232
- viscosity 13
- visual appearance 5
- Vlasic 37 Pickles® 38, 42
- water
 activity in multi-textured food 164–84
 chemical potential of 165
 control of activity 169–70
 effect of temperature on complex food system 168, **168**
 effect on glass transition of food materials 176–8
 effect on microorganisms 169–170, **169**
 free 175
 impact in isotherm regions **162**
 impact on multi-texture property 163–4, **164**
 impact on stability **162**, 164
 reactions driven by 175–6
- water activity equalization 202–4
 water activity isotherm 166, **167**
 water activity measurements 183
 water activity reduction 202–4
 water activity-stability map 160–1, **161**
 water vapor permeability (WVP) 184, 185, 191, 192, 196, 197
 Correction Method 194
 of high amylose corn starch (HACS) films 209
- water vapor transmission rate (WVTR) 192–4
 chitosan films 210–11
- wheat flour 2–3
 in coatings 140
- wheat gluten 3
- wheat starch 59
- whey 108–9
 sweet 108
 acid 108
 whey derived products in ice cream 76–7
 whey powder in ice cream 77
 whey protein concentrates (WPC) 116
 whey protein isolates (WPI) 56–9, 57, 58
 in coatings 154–5
 in ice cream 116
 whey proteins 61, 64, 108–9, **109**
 in cream cheese and spreads 115–16, **115**
 food functional properties 109–12
 gelation 109–11, **110**
 in hard and semi-hard cheeses 113–15, **113**
 hydrolysis of 112
 in ice cream 77, 116
 improvement in functionality 112–13
 ions, effect on gelation 110
 microparticulation 112
 pH, effect on gelation 110, **110**
 pH, effect on solubility 111
 in salad dressings 116
 solubility 111
 surface properties-emulsification and foaming 111–12
 as texture modifiers 113–16
 in yogurt 116
 white bread 134
 white layer cakes 62, 63
 white lupine protein (WLP) 62, 64
 whole grain bread 156
 Williams-Landel-Ferry (WLF) models 180
- xanthan gum 57–8, 59, 61, 62, 65, 85
 in coating systems 141
 in ice cream 89
- yeast growth, egg proteins and 63
- yellow cake system 61–2, 62

- yogurts 9, 100–2, **101**
 amylomaltase treated starch in 101–2
 Greek-style 335
 mouth behavior case study 438–440
 texture 334–7
viscosity 101, **101**
whey proteins in 116
- yolk granules 65
yolk livetin protein 65
yolk protein concentrates 65
Young modulus 410
Young-Laplace equation 415
zeta potential 405