

Index

a

absorption coefficient 103
 A β peptide, *see* peptide
 activation agents 9
 adhesion
 – adhesion force(s) 72, 73, 80
 – adhesion phenomenon 81
 – cell adhesion 80
 adjuvant, effect on immune response 144
 alcohol dehydrogenase (ADH)
 – inhibition 206–209
 Aldrich 111
 Alzheimer, Alois 193
 Alzheimer's disease 101
 – role of β sheets 193
 – symptoms 193, 194
 – treatment 194, 195
 amino acids, role in membrane rupture
 – process 252
 aminopyrazoles 193, 195–201
 amine 5, 126
 angiotensin-converting enzyme (ACE)
 – inhibitors 202
 antibody
 – as biorecognition elements 223
 – bifunctional 115, 116–118
 – bispecific 116, 117
 – catalytic, *see also* cancer therapy
 – chemically programmed (cpAb) 128, 131
 – in cancer therapy 114–128
 – in chiral molecular imprinting 97
 – in prodrug therapy 116
 – monoclonal 113
 antibody-directed enzyme prodrug therapy (ADEPT) 116
 antigen
 – effect of adjuvant 144
 – glycosphingolipids (GSLs) 159–161

– in cancer therapy 116
 – in vaccine development 53, 54, 144
 antimicrobial peptides (AMPs) 247, 251, 253, 254, 256, 258
 assays
 – chloramphenicol transacetylase (CAT) 310, 311
 – cyclic luciferase 315
 – for analysis of biological interactions 230, 232
 – growth inhibition 114, 125, 127
 – protein-fragment complementation (PCA) 323–326
 – protein-splicing assay (PSA) 315, 326–331
 – two-hybrid 314, 317
 atomic force microscopy (AFM)
 – cantilever 73, 74, 76, 89
 – in study of composite fibers 14, 15
 – in study of silica– cell interaction 70
 – probe 73–76, 78–80, 82
 – scanners 73
 – sensitivity 80
 – software 72
 – system 70
 – technique 71, 72
 ATP binding cassette (ABC)
 – transporters 281, 287
 Avanti Polar Lipids 144

b

bacterial display 11
 β -sheet capping 193–201
 B₆ ester derivatives 113
 binding
 – coordinative 44
 – covalent 44
 – ephedrine 103
 – ionic 44

- nonspecific 103, 105, 225
 - of D-histidine to L-histidine-imprinted films 107
 - of nicotine 102
 - of template to film 104
 - template/analyte rebinding 105
 - bioconjugation, *see* conjugation
 - biocompatibility in drug delivery systems 40
 - biodegradability in drug delivery systems 40
 - biofunctionalization 42, *see also* nanoparticles
 - bioluminescence, in luciferases
 - functions 310
 - origins and characteristics 310
 - bioluminescence resonance energy transfer (BRET) 315, 321, 322, 333
 - biomaterials for drug delivery 33, 52
 - biomolecule(s)
 - conjugation techniques 42
 - immobilization 97, 226, 227
 - purified, examples 49
 - biomolecular sensing, *see* biosensors
 - biopanning technique 8
 - biosensors, *see also* CPs; PDAs; SLO
 - development 177–190
 - surface plasmon resonance (SPR)-based 219–238
 - using the protein-binding family 281–294
 - birecognition elements
 - immobilization 224
 - surface chemistry 224
 - blue fluorescent protein (BFP) 300, 303, 318
 - Bristol-Myers Squibb 130
 - bucky balls, *see* fullerenes
- c**
- camptothecin (CPT) 125
 - cancer, detection
 - of acute myeloid leukemia 125
 - of breast 127, 129, 132, 272
 - of colon 127
 - of erythroleukemia 125
 - of Kaposi's sarcoma 127
 - of MOLT-3 T cell leukemia 122
 - of murine NXS2 neuroblastoma 118, 119, 122
 - of prostate 131
 - cancer research 272
 - cancer therapy 114–128
 - CD1d 158, 163–167
 - cell membrane, composition 247, 248
 - cell separation 69
 - cell–silica particle interaction 70
 - silica–cell contact 81
 - silica–cell interaction 85
 - cells
 - cancer cells 78, 80–83, 87, 89
 - cervical cancer cells 72
 - epithelial cells 72
 - human epithelial cells 73
 - human epithelial cervical cells 70, 72, 78
 - normal cells 78, 80–83, 85, 87, 88
 - normal cervical cells 72, 77
 - red blood cells 69
 - cell surface 70, 73–75, 78, 80–83, 89
 - chemical adaptor 123, 124
 - chemical ligation 5
 - chemical modification
 - of silicon oxide 35
 - of viruses, in combination with genetic modification 8
 - chemical nanotechnology 31
 - chemical sensors for molecular imaging 313, 316
 - chemotherapeutic agents,
 - concentration 111
 - chemotherapy 116–118, *see also* cancer therapy
 - chiral discrimination 97, 104
 - chiral drugs, chemical structure 100
 - chiral molecular imprinting, *see* MI
 - chiral polymer 98
 - chiral specificity 100, 103
 - chiral templates 97
 - chromatographic separations 97, 98, *see also* MI
 - circular dichroism (CD) 283, 286, 291, 292
 - circular permutation 331, 332
 - critical micelle concentration (CMC) 39
 - coat protein(s)
 - gene encoding 7
 - M13 bacteriophage 3, 12
 - tobacco mosaic virus (TMV) 21
 - colloidal dispersion 87
 - colorimetric signals 178,
 - signaling 179–189
 - conductance switching 21
 - conductivity, anisotropic 19
 - conjugated polymers (CPs)
 - applications 177
 - as sensing materials 177
 - examples 177
 - properties 177

- conjugation
 - capture molecule 56
 - conventional bioconjugation strategies 5
 - controlled 1D assembly of nanostructures 14
 - controlled 3D assembly of M13 bacteriophage 19
 - controlled 3D assembly of TMV 19
 - convective alignment 18
 - convective assembly process 19
 - core/shell particle 31, 50, 51, 54
 - coupling
 - between recognition layers and sensor surfaces 98, 99
 - carbodiimide 5
 - diazonium 5
 - of proteins 43
 - polymer–sensor 101
 - critical particle size D_c 37
 - crystallographic defects 34
 - cyan fluorescent protein (CFP) 318, 319, 321
 - cyclic voltammetry 103
 - cyclization 118, 127
 - cysteine 7–9, 20
 - cytokine(s)
 - proinflammatory 139
 - stimulation activity of monophosphoryl lipid A 144
 - cytoplasmic membrane 80
- d**
- D-dopa, 1 101
 - Debye length 78
 - deflection signal 70
 - Dennis, Edward A. 143
 - deposition, metals 9
 - Derjaguin approximation 79
 - 1,3-diketone 10 114
 - differential scanning calorimetry (DSC) 283
 - diffusional path 99
 - dimerization 84
 - dip-pen nanolithography (DPN) 17, 18
 - direct dissolution method 40
 - direct-write lithographic method 17
 - discoids 85
 - drug release 112–115, 123, 125
 - drug sensors
 - development 97, 99
 - electrochemical 101, 102
 - enantioselectivity 101, 103, 107
 - label-free 99
 - mass sensor 106, 107
 - – quartz crystal microbalance sensor 106
 - optical 103–105
 - redox characteristics 101
 - drugs, anticancer
 - camptothecin (CPT) 125
 - doxorubicin 115, 126, 133
 - dynemicin 126–128
 - 5-fluorodeoxyuridine 2 112
 - nitrogen mustard anticancer drug 5 112
- e**
- electrical double-layer interaction 78
 - electrochemical impedance technique 107
 - electromagnetic radiation 31
 - electrophilic substitution reaction 5
 - electrospinning method 16, 18
 - electrospray ionization (ESI) 199
 - electrospraying 39
 - electrostatic 82
 - emission spectrographs 87
 - enantiomer 97–99, 107
 - enantioselectivity, *see* drug sensors
 - endocytosis 53, 54
 - endohedral materials 42
 - endotoxin, bacterial
 - discovery 137, 138
 - inflammatory potential 138
 - energy transfer 21
 - enhanced permeability and retention (EPR) 120
 - enzyme inhibition 202–210
 - epitope approach 33, 46, 47, 49
 - Escherichia coli*
 - D-galactose/D-glucose-binding protein (GGBP) 282–285
 - glutamine-binding protein (GlnBP) 285–287
 - inhibition 112
 - lipid A, synthesis 138, 140
 - ester(s)
 - activated 43
 - derivatives, B_6 113, 114
 - 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDC) 43
 - etoposide, prodrug activation, 38C2-mediated 118–120
 - exponential force dependencies 78, 79
 - fatty acid 138
 - functions 42
 - in prodrug activation 112–114

f

- fd phage 20
- fibers
 - composite 14–17
 - conductive 16
 - continuous 16
 - 1D 12
 - fiber-like structures 14, 15
 - long 15, 16
 - M13, applications 16
 - microfibers 16
 - nanofibers 15, 16
 - nonconjugated 18
 - polyvinylpyrrolidone (PVP), virus-blended 16
- films
 - acrylic 103
 - A7–ZnS 21
 - casting 40
 - in drug sensors 106, 107
 - Langmuir-Blodgett (LB) 224
 - molecularly imprinted polymers (MIPs), electropolymerized 103
 - monolayer 19
 - mutant M13–ZnS 21
 - sol-gel
 - – imprinted with L-histidine 106
 - – imprinted with nafcillin 104
 - – imprinted with propranolol 103
 - thin
 - – applications 99
 - – fabrication by 2D assembly 17
- “flip-flop” type probe 314, 315, 321
- Fllip, *see* “flip-flop” type probe
- fluorescence, *see also* fluorescent proteins
 - resonance energy transfer 105, 178
 - sensors, “turn-on” 178, 181–185, “mix-and-detect” 186–189
 - use in biomolecular sensing 177
- fluorescence anisotropy 314
- fluorescence correlation spectroscopy (FCS) 199
- fluorescence emissions 86, 87
- fluorescence polarization 316
- fluorescence resonance energy transfer (FRET)
 - in determining protein phosphorylation 319–321
 - in determining protein–protein interactions 319
 - in DNA detection 178
 - in glucose binding 284, 285
 - in molecular imaging 317–321

- in nanoparticle detection 105
 - in probe preparation 265, 269–274
- fluorescence signal 86, 87, 89
- fluorescence spectroscopy 283, 284, 286, 287, 289, 291
- fluorescent dyes 32
- fluorescent microscopy 87
- fluorescent particles 83, 86, 87
- fluorescent silica particles 84, 85
 - ultra-bright fluorescent silica particles 70, 85, 87
- fluorescent proteins, *see also* BFP; CFP; GFP; RFP; YFP
- applications 307, 308
 - factors influencing activities of 317
 - general requirements 307
 - with changing with changing intensity or color 306, 307
- fluorescent tagging 84
- 5-fluorodeoxyuridine 2 112
- Förster distance 268
- Förster resonance energy transfer, *see* FRET
- Force curves 72, 73, 78, 80, 89
- normal cell force curves 80
 - retraction force curves 80
 - retracting curves 72
- Fourier transform infrared (FTIR) spectroscopy 283, 286–289, 291
- fullerenes 37, 42
- functional peptides
 - in development of fusion protein probes 312
 - properties required 312, 313
- functional shells 42–49
- functional silanes 35
- functional surfmers 43
- fusion proteins
 - A7 13
 - immunogenic peptides 13
 - in production of nanostructures 7
 - J140– VIII 13
 - probes for molecular imaging 307, 313, 316
 - variable lymphocyte receptor (VLR) 152

g

- D-galactose/D-glucose-binding protein (GGBP) 282–285
- genetic engineering 7
- genetic modification 1
- genetic mutation 8
- glucose-6-phosphate dehydrogenase (G6PD) inhibition 207–209

glutamine-binding protein (GlnBP)
285–287
green fluorescent protein (GFP)
– as fusion protein probes 307, 316
– as markers for gene expression 299, 300
– compared with RFP 301, 302
– in determining molecular dynamics 316, 317
– in determining protein–protein interactions 317–319
– use in FRET 317, 318
– variants, attributes 299–307
– wild-type, limitations 302, 306
grinding 32
glycocalyx molecules 82
glycosphingolipids (GSLs), *see* sphingolipids

h

Hank's balanced salt solution (HBSS)
73, 74, 83, 87
hemolysis 69
Hertz–Sneddon model 75
hexa-acylation 144
hybrid materials 12
hybrid viruses 7
hybrid virus–inorganic nanostructures 20
hybrid virus–silicon nanotube 20
hydrogen 82
hydrogen bonding 72
hysteresis 72

i

impedance spectroscopy 103
immune response 137
– effect of adjuvant 144
– role of MD-2/lipid IVA complex 149, 150
immune response
– innate natural immunity 137
– T cell immunity 53, 54
immunization, reactive 114
immunosensors, surface plasmon-based 219, 223, *see also* biosensors
inorganic core materials
– crystalline nanoparticles 34
– metal and metal oxides 36, 37
– silica nanoparticles 35, 36
inorganic nanowires 8, 10, 11, 14
inorganic nanoparticles 32
inorganic oxides, preparation of 20
interface, assembly 14

interfacial energy 12, 19
interfering compounds 103
intramolecular folding sensor 315
isothermal titration calorimetry 208

k

Kdo₂-lipid A, *see* LIPID MAPS
keratinocyte serum-free medium 72
Kirin Pharmaceuticals 159

l

Langmuir–Blodgett (LB)
– deposition 224
– films 224
– self-assembly 224
leucine-rich repeats (LRRs) 139
L-dopa 104
ligands, interaction with receptors 159
light-emitting devices 34
light-harvesting systems 9, 20
limit of detection (LOD) 101
– of surface plasmon resonance 233–235, 237, 238
lipids
– bilayer 247, 248
– composition 248
– Eritoran 151
– function 249
– identification, *see* LIPID MAPS
– in drug delivery 41
– lipid A, *see* LPS
– – chemical structure 138
– – derivatives, monosaccharide 146
– – hexa-acyl 144
– – in development of antibiotics 140
– – intermediates 153
– – minimal, modified 140–143
– – monophosphoryl lipid A 144
– – synthesis 140
– mycobacterial 160, 161
– physiological 41
– structure 249
– synthetic 41
lipid-binding proteins (LPBs) 138, 148
– structure 148–152
Lipid Metabolites And Pathways Strategy (LIPID MAPS) 143, 144
lipocalins and odorant-binding protein 289–293
lipopolysaccharide (LPS) 137, 138, *see also* endotoxin
– biosynthesis 140, 144
– discovery 137, 138

- effect of lipid IVa 149
 - in detection of endotoxin in water 147
 - neutralization 147
 - recognition 138, 139
 - relationship with Toll-like receptor 139, 151
 - liposomes
 - mannosylated 53
 - neutral 54
 - poloxamer F127 41
 - stealth 41
 - lithium-ion batteries, storage capacity 22
 - localized surface plasmon resonance (LSPR)
 - compared with SPR 235
 - Mie theory 236
 - long-chain base (LCB) 153, 156
 - LpXF 142
 - luciferases
 - as functional proteins 299, 308
 - as reporters for bioanalysis and molecular imaging 310, 311
 - attributes 299
 - drawbacks 312
 - from insects, marine organisms and prokaryotes 308–311
 - luminescent proteins, factors influencing activities 317
 - luminex 55, 56
 - lysomotropic carrier systems 40
- m**
- macropinocytosis 53
 - magnetic beads/tweezers 70
 - magnetic moment 31
 - magnetic nanoparticles, *see also* nanoparticles
 - applications 32, 37, 49, 50
 - attributes
 - diameter, *see* critical particle size D_c
 - superparamagnetic property 37, 38
 - biopurification 49, 50
 - examples 37
 - production 37
 - mass spectroscopy 199
 - M13 bacteriophage
 - as template for inorganic materials synthesis 11
 - in nanowire synthesis 12
 - mutants, streptavidin-binding 20
 - mutated 18
 - native M13 11, 16
 - membrane (cell) disruption 251
 - metal oxide(s) 9, 32, 34
 - microemulsation 41
 - microscopy 71
 - microvilli 82, 89
 - microridges 82, 89
 - mirror image binding profile 103
 - moiety
 - aminopyrazole 196
 - β -diketone 131, 132
 - carboxylic acid 114
 - cysteine 43
 - Kdo 146
 - *N*-isopropyl acrylamide 40
 - molecular recognition 32
 - simple phosphate 142
 - targeting 120
 - molecular clips 202, 205, 210
 - molecular dynamics (MD) 283, 284, 287, 291
 - molecular fluorophores
 - as donors and acceptors in FRET-based assays and sensors 265
 - in development of luminescent quantum dots 265
 - limitations 265, 269
 - molecular imaging
 - classical methods 313, 316, 317
 - new methods 317–332
 - molecular imprinting (MI)
 - chiral 97–107
 - challenges 45, 46
 - development 97
 - of peptides 32, 45, 46
 - of polymers 31, 56, *see also* MIPs
 - of proteins 32, 45
 - noncovalent 45
 - reaction 33
 - understanding the mechanisms
 - by isothermal titration chemistry (ITC) 45, 48
 - in chromatographic separations 97
 - using protein surface recognition 210, 214
 - molecular recognition
 - biomimetic feature 32
 - in molecularly imprinted polymer (MIP) generation 47
 - of target enantiomer 97
 - recognition sites 97
 - role in nature 44
 - molecular tweezers 202, 205, 206, 210
 - molecularly imprinted polymers (MIPs)
 - applications

- creation of recognition elements for chiral drugs 99
- high-performance liquid chromatography 55, 98
- immunoassays 55, 56
- protein purification 55, 56
- sensor technology 55, 56
- solid-phase extraction 55
- waste-water treatment 55
- coupling to sensor surface 99
- ephedrine imprinted 103
- nanoparticulate 32
- nanospheric 47
- recognition layers 101
- preparation 33
- quartz crystal microbalance (MIP-QCM) chiral sensor 106
- tools for developing 44–49
 - design of experiments (DoE) 44, 45
 - experimental high-throughput screening 44
- nuclear magnetic resonance (NMR) spectroscopy 45
- molecule(s)
 - analyte 103
 - L-dopa 104
 - amino-functionalized 43
 - immunostimulatory 137
 - polymer 120
 - membrane-active, *see* peptide, membrane-active
- monomers
 - achiral 98
 - functional 45
 - in protein surface recognition 210–214
- motifs
 - functional binding 8
 - materials-specific 12
 - substrate-specific 12
- multivalency 210
- murine NXS2 neuroblastoma 118, 119
- mutagenesis
 - polymerase chain-reaction based site directed 7
 - single amino acid substitution 7
- M13 viral systems 20
- M13 virus, genetically engineered
 - as template in fabrication of composite nanowires 22
 - conjugated with quantum dots 18

n

- molecularly imprinted polymers (nanoMIPs)
 - applications 44
 - L-boc-nanoMIPs 49
 - techniques for generating 44–49
- nanocapsules, poly(alkylcyanoacrylate) 40
- Nanocytes technology 54, 55
- nanodevices 34
- nanoparticles
 - benefits 33, 51–54
 - biodegradable 40
 - biofunctionalization 42, 56
 - biomimetic 31, 33, 42, 56
 - controlling the size and morphology 34–36
 - core materials 31
 - gold 31, 34, 39, 54, 234, 235, 237
 - limitations 52
 - mannose-coated 53
 - metal oxide 9
 - poly(cyanoacrylate) 41, 54
 - properties required 52
 - solid phospholipid 41
 - surface functionalization 35, 36, 54, 56, *see also* biofunctionalization
- nanocircuits 20
- nanoprecipitation 39, 40
- nanorings
 - formation 17
 - structure 16
- nanotechnology 1, 31, 70
- nanotemplate hybridization 18
- nanowires 12, 13, 22, 23
- natural killer T (NKT) cells 158–165
- NF- κ B 139
- nucleation
 - by engineered virus 13
 - of wurtzite ZnS 12, 13
 - of ZnS nanocrystals 13
- neurotransmitter 101

o

- odorant-binding proteins (OBPs) 289–293
- optical microscopy 87
- optical tweezers 70
- orbital shakers 83
- organic core materials
 - fullerenes 37, 42
 - lipids 37, 41
 - polymers 37–39
- organic shell 31, 32, 42
- Oswald ripening 47

p

- cytolytic pore-forming toxins (PFTs) 179, *see also* PDAs
- Parkinson's disease 101
- peptides
 - A7 12, 13
 - A β
 - – aggregation kinetics, methods of determining 199
 - – inhibition 195, *see also* aminopyrazoles
 - – role in Alzheimer's disease 194
 - aminopyrazoles 195
 - antimicrobial 247, 251, 253, 254, 256, 258
 - anti-streptavidin 17
 - hexahistidine 17
 - membrane-active
 - – applications 247
 - – mode of action 249–252
 - – properties 249
 - natural 247, 252–254
 - peptidomimetics 256
 - supplementation fusiogenic 54
 - synthetic 247, 254
- Percoll 69
- Pfeiffer, Richard 138
- phage display 7
- phospholipid membrane 70
- photostability 84
- pig odorant-binding protein (pOBP)
 - functional characteristics and applications 292, 293
 - structural characteristics 291, 292
- PMB, effect on lypopolysaccharide toxicity 144
- polyaniline (PANI) 14, 16
- polycrystalline 12
- polydiacetylene (PDA)
 - advantages 178
 - in development of biosensors for toxin detection 179–181
 - in fabrication of “turn-on” fluorescence sensors 181–185, *see also* fluorescence
- poly(lactic acid) 40
- poly(lactico-glycolide) 40, 41
- polymer(s)
 - amphiphilic 40, in protein surface recognition 210
 - conjugated 177, *see also* CPs
 - copolymer 40, 122, 124, 134, in protein surface recognition 210, 214
 - polymer-directed enzyme prodrug therapy (PDEPT) 120–122
 - polymer-drug 121
 - sol-gel 101
 - synthetic 44
- polymerization
 - copolymerization, radical 32
 - emulsion 39
 - interfacial 40
 - miniemulsion 32, 44, 47–49
- polysaccharides 69, 82
- polyvinylpyrrolidone polymer 69
- prodrugs 203, *see also* prodrug activation
- prodrug activation 111–114
 - conversion of a drug to a prodrug 116
 - etoposide, antibody-mediated 118
 - in antitumor therapy, *see* cancer therapy
 - prodrug 1 112, 115
 - prodrug 4 112, 113
 - prodrug 7 113, 114
 - prodrug 11 115, 116
 - prodrug 14, *see* etoposide
 - prodrug 19 126
 - single triggered trimeric prodrug 125
 - with antibody 38C2 114–116, 118–120
- primary cervical carcinomas 72
- probe–cell contact 74
- probe–cell interaction 78
- proinflammatory cytokines 139
- protease inhibitors 203
- protease probes, QD FRET-based 269–274
- proteoglycans 82
- protein-fragment complementation assay (PCA) 323–326
- proteins, *see also* coat proteins; fusion proteins; peptides
 - abnormal folding 210
 - A7 engineered P8 13
 - artificial protein binders 210
 - β -sheet, role in Alzheimer's disease 193
 - CD14 138, 139, 144, 148
 - D-galactose/D-glucose-binding protein (GGBP) 282–285
 - D-trehalose/D-maltose-binding protein (TMBP) 287–289
 - FhuA 148
 - fluorescent, *see* BFP; CFP; GFP; RFP; YFP
 - glutamine-binding protein (GlnBP) 285–287
 - gold staining 32
 - immobilization 42, 43, 54
 - lipid-binding proteins (LPBs) 138, 148
 - – structure 148–152
 - lipocalins and odorant-binding protein (OBP) 289–293
 - misfolded components 194
 - myeloid differentiation-2 (MD-2) 139, 149
 - – MD-2/lipid IVA complex 149

- MD-2/TLR4 complex 149–152
- odorant-binding proteins (OBPs) 289–293
- P3 3, 7, 12, 17
- P6 7
- P7 8
- P8 3, 7, 12
- P9 7, 8, 17
- photoproteins, *see* luciferases
- purification 33
- solute-binding, functions and examples 281
- surface recognition 210–214
- transport system 281–282
- viral synthesis 7
- protein phosphorylation, probes for determining 319
- protein–protein interactions
 - methods for determining
 - by BRET 321, 322
 - by FRET 318
 - by PCA 323–326
 - by two-hybrid systems 314
 - probes for determining 319
- protein tagging 314, 317
- pulsed field-gradient longitudinal eddy-current delay techniques 211
- pyridoxal-5'-phosphate (PLP) 155

q

- quantum dots (QDs)
 - as alternatives to traditional molecular fluorophores 269
 - as reporting elements in chiral templates 105
 - incorporated in molecularly imprinted polymers 105
 - in imaging applications 34
 - in development of bioanalytical probes 265
 - in lypopolysaccharide synthesis 147
 - luminescent QDs
 - characteristics and types 266–268
 - in development of protease probes 269–274
 - linked to molecular fluorophores 265
 - use in cancer detection 265
 - surface functionalization 267
 - water-soluble QDs, applications 267, 268

r

- reactions
 - alkaline hydrolysis 35
 - carbodiimide coupling 5, 43

- chemical reaction vs transition state analog 114
- copper-catalyzed azide–alkyne cycloaddition 5
- covalent conjugation 43
- doxorubicin prodrug 11 activation 115
- molecular imprinting 33
- *retro*-aldol-*retro*-Michael 115, 116, 118, 125, 126, *see also* prodrug activation
- uncatalyzed 116
- sol-gel 32, 35
- reactive immunization, *see* immunization
- real-time biomolecular interaction analysis 219
- receptors
 - artificial 97
 - biomolecular 32
 - CD14 138, 139, 148
 - CD1d 158, 163–167
 - FhuA 148
 - macrophage phagocytic 53
 - natural killer T cell 158, 159–161, 166, 167
 - ligand, interaction with 159
 - T cell receptors (TCRs) 158–168
 - TLR4 139, 145, 147, *see also* TLR4–MD-2 complex
 - tumor-related 54
 - variable lymphocyte receptor (VLR), hagfish 152
- red fluorescent proteins (RFPs) 301, 302, 304, 306, 307
- refractive index 220–222, 224, 230, 234, 237, 293
- reflectometric interference spectroscopy (RiFS) 212
- region of constant compliance 72

s

- “sea grass effect”, mechanism 82, 83
- selective enzymatic activation of a nontoxic drug to a toxic drug 112
- selectivity, in drug delivery 123
- self-assembled monolayers (SAMs) 224, 225, 227, 228
- self-immolative dendrimer(s) 125
- sensors, protein-based, *see also* biosensors; drug sensors
 - for explosive compounds 284
 - for glucose 284
 - for glutamine 286
 - for gliadin 286
 - optical 286, 294

- sepsis
 - causes 139
 - cost 139
 - mortality 140
 - serine palmitoyltransferase (SPT) in sphingolipid biosynthesis 155–157
 - shells
 - functional 42–49
 - organic 31, 32, 42
 - sick cell anemia 210
 - signal transduction methods 103–107
 - silanes, functional 35
 - silanol groups 69, 82
 - silica 69
 - colloidal 69
 - crystalline 69
 - fused 69
 - organically modified 31
 - pure 69
 - silica ball 74, 82
 - silica matrix 84
 - silica nanoparticles 70
 - silica particles 69, 70, 73, 74, 75, 80, 83–85, 87–89
 - silica probe 80, 82
 - silica sphere 73–75, 82, 83
 - silica toxicity 69
 - silica-coated polymeric beads 69
 - silicon acid 70
 - silicosis 69
 - single-stranded viral RNA 7
 - small angle X-ray scattering (SAXS) 15
 - solute-binding proteins, functions and examples 281
 - solvent displacement 39
 - specific capacity 22
 - specific optical absorbance 31
 - sphingolipids
 - biosynthesis 154–157
 - glycosphingolipids (GSLs) 154–168
 - structure, function and metabolism 153
 - square wave voltammetry (SWV) 101
 - steric repulsion 78, 82
 - stimulators
 - natural 137
 - synthetic 137
 - Stöber process 35, 36
 - streptolysin O (SLO), detection of 179–181
 - sulfonamide Edonentan 130
 - superconducting quantum interference device (SQUID) 37, 38
 - superparamagnetism 34, 37, 38, 50
 - supramolecular assembly of polydiacetylenes 177, 179–181, *see also* PDAs; SLO
 - surface plasma resonance (SPR), *see also* biosensors
 - bioassays for enhancing sensitivity and limit of detection (LOD) 233
 - biorecognition elements 223
 - properties required 229
 - compared with localized SPR (LSPR) 236
 - in biomolecular interaction analysis 219, 220, 227–230
 - in mass sensors 107
 - working principle 220–222
 - surfactant molecules 84
 - surfmers, functional 43
- t**
- T cells
 - immunity 53, 54
 - natural killer 158, *see also* receptors
 - templates
 - biological 5
 - chiral 97
 - molecular 33, 44, 97
 - template/analyte rebinding 105
 - template–monomer complex 44
 - tetraethyl orthosilicate (TEOS) 35
 - thiopene 15
 - Thudichum, Johann 153
 - thymidylate synthetase 112
 - time-resolved small angle X-ray scattering (TR SAXS) 15
 - TLR4–MD-2 complex 149–152
 - tobacco mosaic virus (TMV)
 - capsid monomer 6
 - coat proteins, cysteine-substituted 2, 7, 9
 - composite fibers, TMV/PANI (polyaniline) 14
 - C-terminus 7
 - native TMV 9, 10
 - head-to-tail assembly 14
 - nanoarrays fabrication 17
 - nanotemplates 18
 - Toll receptor 139, 146, *see also* receptors, TLR4
 - transmission electron microscopy (TEM), in composite fiber study 14, 15
 - D-trehalose/D-maltose-binding protein (TMPB) 287–289
 - tumor necrosis factor- α (TNF- α) 43
 - in cancer therapy 54, 55
 - in sepsis 139
 - type 3 library 8, 12
 - type 8 library 8, 12
 - tyrosine 5

u

“UAG” stop codon 7

v

vaccine development 1, 53
 van der Waals attraction 82
 van der Waals force 72
 van der Waals interactions 89
 virus, *see also* M13 bacteriophage; TMV
 – A7–P8 engineered 13
 – bifunctional 17
 – capsid 4
 – cowpea chlorotic mottle virus 5
 – cowpea mosaic virus 5
 – hybrid 7
 – hybrid virus–inorganic nanostructures 20
 – multifunctional 1
 – pVIII engineered 12
 – rod-like 19, 20, 22
 – tomato mosaic virus
 – virus-like particles (VLPs) 1

– wild-type 13, 18
 variable lymphocyte receptor (VLR) 152
 viscoelastic effects 73

w

wet-spinning process 16
 wurtzite CdS and ZnS phases 13
 wurtzite ZnS structure, hexagonal 13

x

xMAP technology, *see* luminex
 X-ray crystallography 1, 308

y

yellow fluorescent protein (YFP) 300, 303,
 304, 318, 319, 322, 323
 Young’s modulus 78

z

ZnS nanocrystals 20
 ZnS systems, mineralization 12

