

INDEX

- (1-trichlorosilyl-2-*m-p*-chloromethylphenyl)ethane 392
[2.2]paracyclophane 394
1-hydroxycyclohexylphenyl ketone (HCPK) 65
2,3-dicarboxaldehyde (NDA) 230
2-acrylamido-methylpropanesulfonic acid (AMPS) 391
2-deoxy-2-[18F]fluoro-D-glucose ([18FFDG]) 185
2-hydroxyethyl methacrylate 392
2-morpholinoethanesulfonic acid 388
2-oxoglutarate 144
2-phenylethyl β -D-thiogalactoside 141, 147
3-aminopropyl-triethoxysilanes (APTES) 392
3D layered structures 24
3D microchannel networks 22
3D microfluidics 259
- acetaminophen 141, 250
acetaminophen glucuronide 141
acetyl pepstatin 141
acetylcholine 122, 161
acetylcholine esterase (AChE) 196
acetylcholine receptors (AChRs) 296
acetylcholinesterase inhibition 149, 160
acetylthiocholine 161
acoustic streaming 302
acrylic acid (AA) 422
actin 96
active fluid flow 89, 96
active mechanical microvalves 63
active nonmechanical microvalves 63
adenosine deaminase 143
adherent mammalian cells (HEK 293 cells) 206
affinity capture 42, 49
agrin 122
alkaline phosphatase 149, 152, 210, 281
alveolar epithelial cells 97
Alzheimer's disease 112
amperometric detection 6, 235, 432, 435
angiotensin-converting enzyme (ACE) 141, 155
antibiotics 45

- antibody/dinitrophenyl (DNP)-conjugated lipids 390
antibody-antigen binding 102
anti-CD19 423
anti-DPIV antibodies 139
anti-insulin antibody 102
antipain 148
anti-rat IgG 308
ApoA1 279
apooaldehyde dehydrogenase (apo-AdDH) 464
array-based sorting 44
arrayed posts 53
arrayed sieves 53
arrayed weirs 53
artificial cerebral spinal fluid 229
astrocytes 115
asymmetric cell division 112
atom transfer radical polymerization (ATRP) 392
atomic force microscopy (AFM) 370
attenuated total reflectance Fourier spectroscopy (ATR/IR) 390
AutoCAD 275
axogenesis 292
axon guidance 112
axons 112, 288, 294
- Baeyer-Villiger oxidation 170
band broadening 221
 β -D-1-thiogalactopyranoside IPTG 205
benazeprilat 146
benzopinacol 172
 β -galactosidase 140–142, 146, 158, 209
 β -glucuronidase 140
bienzyme HRP-Gox-modified NCAMs 464
biochemical gradients 93
bioMEMS 104
biomimetic structures 96
biosensor 131
bioterrorism detection 2
biotin 465
biotoxins 412
biphasic reactions 174
b-lactose 140
blood cells (lymphocytes) 111
 β -mercaptoethanol (BME) 230
Boltzmann coefficient 273
bovine liver rhodanese 144
bovine serum albumin (BSA) 334, 372
Boyden chamber 89
branched network microchannels 94
Brucella cocacilli 318
- C2C12 myoblasts 114
CA-074 148
Cabomba caroliniana 250
calcein 310
Campanot chambers 119
capillary array electrophoresis 139
capillary electrochromatography 138
capillary electrophoresis 72, 485
capillary isoelectric focusing (CIEF) 500
captopril 141, 145, 157
carbonic anhydrase II (bCAII) 196
CD microfluidics 306
CD/DVD drive 317
CE-ESI-MS 486
CE-immunoassay 225
cell affinity chromatography 43
cell capture 69
cell collection 31
cell culture 18, 88–90, 353
cell genetic analyzer 77
cell lysis 5
cell manipulation 67
cell patterning 67
cell separation 30
cell sorting 4, 30, 31, 32, 35, 37, 53
cell-cell interactions 23, 86
cell-cell junctions 11
cell-matrix interactions 22
cellular microenvironment 11, 14, 84
central nervous system 112
centrifugal microfluidics 301
centrifugation 353
cerium-catalyzed radical polymerization 391
cetyltrimethylammonium (CTAB) 145
channels 62
chaotic advection 180
chemical sensors 215
chemical vapor deposition 386, 393
chemical warfare agents 132
chemiluminescence 242
chemotaxis 89

- chitosan 96
chromel 357
cilazaprilat 141, 157
click chemistry 196
CNS axons 119
CNS neurons 119
coatings 489
coculture spheroid arrays 95
collagen 96, 117, 290
competitive inhibitor 135
computer numerical controlled (CNC)
 millint 357
conductivity 433, 437
conductivity detection 6, 442
condumetric detection 235
confocal fluorescence microscopy 455
continuous engagement EMMA 145
continuous flow microreactors 181, 193
control layer 273
coupled scanning confocal fluorescence
 microcapillar electrophoresis 77
C-reactive protein (CRP) 334
cycloadducts 191
cytokines 95
- D-Ala-D-Ala 470
D-amino acid oxidase apoenzyme
 (apo-D-AAO) 464
Debye length 448
diazotization 170
diclofenac 250
dielectrophoresis 22, 44–49, 71
diethylenetriaminepentaacetic acid
 (DTPA) 146
difunical 250
digital fluidics 452
dip pen nanolithography (DPN) 370
dipeptidyl peptidase IV (DPIV) 139
DNA analysis 379
DNA detection 440
DNA hybridization 470
DNA micro spot-array hybridization
 assay 318
DNA microarray 19
DNA sample pretreatment 421
DNA sequencing 72
DNA synthesis 187
DNA-functionalized gold nanopores 461
dorsal root ganglion (DRG) 118
- Dow Corning Sylgard 184 273
droplet approach 180
droplet-based continuous flow system 194
Drosophila 93
D-saccharic acid-1,4-lactone 140
- ecto*-nucleoside triphosphate
 diphosphohydrolase (NTPDase) 146
elastomeric membrane valves 64
electrical detection 73
electrical recording from whole cells 76
electrochemical AFM Dip-pen
 (E-DPN) 370
electrochemical biosensors 438
electrochemical detection 242
electrochemical sensors 73
electrochemiluminescence 6
electrohydrodynamic (EHD) pumping
 302
electroless plating 459
electromagnetic actuation 63
electroosmosis 36
electroosmosis 302
electroosmotic flow (EOF) 354,
 386, 490
electroosmotic flow switching 38
electroosmotic pumping 303
electroosmotic switching 302
electrophoresis 36
electrophoresis microchips 441
electrophoresis-based immunoassay
 channels 102
electrophoretically mediated microanalysis
 (EMMA) 138, 142, 151
electrospray ionization (ESI) 485, 487
electrostatic actuation 63
electrowetting 302
Elodea densa 250
embryoid bodies (EBs) 89, 100
embryonic flow-structure interactions 99
endothelial cells 95, 96
enzymatic assay 229
enzyme assays 134, 138
enzyme immunoassays 281
enzyme inhibition 131
enzyme inhibition assay 139, 150
enzyme inhibitors 131, 135
enzyme lithography 372
enzyme-catalyzed reaction 132, 138

- enzyme-inhibitor (EI) complex 135
enzyme-linked immunosorbent assays (ELISA) 102, 228, 280, 308
enzyme-modified NCAMs 464
eosinmaleimide (Eo-MI) 161
epidermal growth factor (EGF) 113
epithelial cells 12
epoxy resin stamps 357
erythro-9-(2-hydroxy-3-nonyl)adenine (EHNA) 143
erythrocytes 98
Escherichia coli cells 207
extracellular matrix 13, 112
- F-actin immunostaining 116
ferritin 334
ferritin monoclonal antibodies 343
fibrin 96
fibroblast growth factor (FGF) 113
fibroblasts 92, 95
fibronectin 117
FITC 438, 455
FITC-insulin 225
flow cytometry 30, 474
flow layer 273
flow sorting 41
flow switching 33
fluid manipulation 3
fluid mixing 274
fluid volume to cell volume ratio 84
fluidic control 62
fluidic switching 32
fluorescein isothiocyanate-labeled insulin (FITC-insulin) 102
fluorescence imaging of whole cells 76
fluorescent enzymatic assay 309
fluorescent imaging 478
Fourier transformation infrared spectroscopy (FTIR) 391
frit pocket 265
fruit fly embryos 88
functionalized NCAMs 457
Fv1k-1-positive mouse ES cells 98
- gel channels 103
gene expression 102
gene expression analysis 75
gene ligation 205
gene therapy 203
gene transformation 206
genetic analysis of single cells 73
genetic engineering 203
glial fibrillary acidic protein (GFAP) 116
glucose gradients 93
glucose-6-phosphate dehydrogenase 138
glycidyl methacrylate (GMA) 392
gram-positive bacterium 470
green fluorescent protein (GFP) 116, 205, 371
- halokane dehalogenase 145
hematopoietic stem cells 99
Henri-Michaelis-Menten 133
hepatocyte spheroids 95
hepatocytes 85, 92
hepatocytes 95
HepG2 cells 95, 103
herbicides 132
heteroduplex analysis (HA) 416
heterogeneous enzyme inhibition assay 140
high throughput screening (HTS) 301
hippocampal neurons 125
hippuryl-his-leu (HHL) 156
HIV protease 196
HIV-protease substrate 141
homeostasis 224
homogeneous enzyme inhibition assay 142
horizontally oriented mini-reservoir pump (HOMR) 94
horseradish peroxidase (HRP) 209, 464
hot embossing 354, 363
HPLC 413
human embryonic stem cells 92, 111
human embryos 99
human mesenchymal stem cells 116
human neural precursor cells 100
human neural stem cells (NSCs) 113
hybrid microfluidic/nanofluidic networks 447, 450
hydrodynamic flow switching 32, 35
hydrodynamic focusing 34
hydrogel matrices 22
hydrogel microvalves 63
hydrogels 103
hydrostatic pressure 97, 99
hydroxyethylmethacrylate (HEMA) 422

- IC50 135
immunoassays 6, 102, 413, 469
immunohybridization reactions 269
in vitro fertilization 99
inhibition constant (K_i) 135, 144
insecticides 132
insulin 102, 225
integrated assays 101
interferometric lithography 450
intermittent field effect 37
ion indicator dyes 72
ion-selective electrodes (ISEs) 434
irreversible inhibition 137
islets 224
isoelectric focusing (IEF) 500
- Joule heating 219
- kcat 132
Kemptide 148
keystone effect 323
Knoevenagel reaction 175
Kruppel-like factor-s (KLF2) 97
Kupffer cells 85
- lab-on-a-chip 31, 270
lactose 159
laminar flow 15, 17, 61, 92, 180, 277, 469
laminin 117, 290
laminin-1 292
laser ablation 294, 354, 359
laser microdissection 51
lauryl gallate (LG) 251
layer-by-layer (LbL) films 389
layer-by-layer deposition 23
layered structures 96
leupeptin 148
LIF 142, 149, 209, 225, 235
LIGA 357
ligase 205
light-emitting diode (LED) 151
limits of detection (LOD) 469, 488
Lineweaver-Burk 134
liquid chromatography 138
liquid junctions 496
lisinopril 145
long-term culture 96
low flow push-pull perfusion (LF-PPP) 231
- L-selectin 86
L-*trans*-3-carboxyxoxirin-2-carbonyl-L-leucylglutamate (E-64) 148
Luria-Bertani (LB) agar plate 205, 472
- macrophage cells 102
magnetic beads 141
magnetic manipulation 52
magnetic particles 470
magnetic-based sorting 39
malaria 99
MALDI-MS 315
mammalian (CHO-K1) cells 322
mammalian cells 83, 92
mass spectrometry (MS) 485
matrigel 96
matrix-assisted laser desorption/ionization (MALDI) 194, 470
MC3T3-E1 osteoblasts 114
MCE-PAD 441
mechanical environment 22
mechanical machining 361
membrane proteins 269
membrane scaffold protein (MSP) 270
micellar electrokinetic chromatography (MEKC) 247
Michael addition 172
Michaelis constant (K_m) 133, 208
Michaelis-Menten 132
microarray 116
microarrayed bioreactors 95
microbeads 469
microchip capillary electrophoresis 5, 241, 243, 250, 434
microcontact printing 20, 67
microdialysis 228
microelectromechanical systems (MEMS) 1, 301, 354
microenvironment gap 83
microfabricated heaters 67, 77
microfluidic biosensors 438, 443
microfluidic assays 137
microfluidic bioreactor 93, 96, 99, 101
microfluidic device 1, 115, 118, 138, 147, 221, 287, 434
microfluidic diodes 348
microfluidic immunoassays 328
microfluidic septum 341
microfluidic stem cell culture platform 94

- microfluidic vias 337
 microheater 36
 micromixer 180
 microplasm-optical emission detection (OED) 235
 micropumps 33
 microreactor 4, 77, 169
 microthermoforming 357
 microtubule-associated protein 5 (MAP5) 119
 microvalves 63, 262
 microvalves 287
 microvascular endothelial cells 97
 mitogens 115
 mitotic inhibitors 113
 MMP-8 413
 morphogenesis 98
 mouse embryonic stem cells 92
 mouse P19 embryonic carcinoma stem cells 116
 multicellular tumor spheroids 89
 multilamination 180
 multilayer soft lithography 33, 259
 multiplexed microfluidic fluorescence immunoassays 331
 multistep reactions 173
 murine skeletal muscle cells 115
 muscle cells (myocytes) 111
 myoblasts 96
 myotubes 93

N-(3-dimethylaminopropyl)-*N*-ethylcarbodiimide hydrochloride (EDC) 470
N-6-diethyl- β , γ -dibromomethylene-ATP (ARL67156) 146
 nano fountain pen 369
 nanocapillary array membrane (NCAM) 451, 453
 nanofluidics 448
 nanofountain pen (NFP) 370
 nanografting 370
 nanopure 459
 Nd:YAG laser 411
 near-field scanning optical microscopy (NSOM) 371
 nerve cells 111
 nerve growth factor (NGF) 118
 nested bioarrays 343

 neuromuscular synapse 122
 neuronal adhesion 289
 neuron-glia cell adhesion molecule (NgCAM) 292
 neurons 99, 111, 115, 290
 neurotrophin-3 (NT-3) 294
 neurotransmitters 216, 298
 neurotrophin-2 (NT-3) 120
 neutrophils 89
 microme 357
 NIH-3T3 fibroblast 114
 noncompetitive inhibitor 135, 155
 noncontact heating 66
 nonparenchymal cells 85
 nonrounded vias 341
 nonspecific protein adsorption 388
 nordihydroguaiaretic acid (NDGA) 251

 octyl gallate (OG) 251
 off-line enzyme inhibition assay 140
 oligodendrocytes 115
 on-chip immunoassay 102
 on-chip PCR 418
 on-line enzyme inhibition assay 140
o-phthaldialdehyde (OPA) 230
 optical detection 71
 optical switch 42
 optical trapping and switching 42
 optical tweezer 70
 optode membrane 306
 osmotic loading 99
 osteoblasts 96, 97

 paracrine effects 95
 paraffin microvalves 63, 65
 parallel reactions 188
 parenchymal cells 85
 Parkinson's disease 112
 partial filling technique 144
 passive mechanical microvalves 63
 passive nonmechanical microvalves 63
 patch-clamp 112, 124
 PCR 6, 39, 66, 269, 313, 353, 417
 PCR amplification 5, 75
 PDMS 3, 37, 42, 64, 74, 88, 92, 95, 103, 116, 125, 150, 180, 186, 207, 228, 232, 244, 247, 260, 274, 289, 292, 309, 321, 332, 386, 451, 474
 PDMS/borosilicate device 100

- PDMS-parylene hybrid 92
PEEK Tee junction 195
perfluoropolyether (PFPE) 187, 261
perfusion channel 116
perfusion culture 95
perindoprilat 145
perisinusoidal cells 85
peristaltic pump 210, 224
phase transfer reaction 175
phenolic compounds 241
phenotype 100
phenylethyl β -D-thiogalactoside (PETG) 159
phospholipid polymers 389
photochemical reactions 172
photopatterning 396
photosensitive biodegradable polymer (*p*CLLA acrylate) 103
p-hydroxymercuribenzoic acid (PHMG) 159
piezoelectric actuation 63
piezoelectric pumping 302
pinched-flow fractionation 43
PKI-(6-22) 140
plasma polymerization 391
plasmid DNA 206
plug-plug EMMA 143
pluripotent stem cells 111
pneumatic actuation 63
point-of-care (POC) diagnostics 2
point-of-care (POC) testing 327
Poisson-Boltzmann equation 448
poly (diallyldimethylammonium chloride) 389
poly(cyclic olefin) 65
poly(ethylene glycol) (PEG) 103, 388
poly(methyl methacrylate) 306
poly(methyl methacrylate) (PMMA) 308, 355, 357, 361, 386, 389, 452, 465
poly(*N,N*-dimethylacrylamide (PDMA) 388
poly(*N*-isopropylacrylamide) (PNIPAAm) 460
poly(*p*-styrenesulfonate) (poly-PSS) 393
poly(*p*-xylylenes) 394
poly(VBTAC) 393
poly(vinyl chloride) 306
poly(vinylpyrrolidone) 388, 453
polycarbonate 386
polycarbonate membranes 95
polycarbonate nuclear track etched (PCTE) membrane 453, 457
polyester membranes 95
polyethylenetetraphthalate glycol (PETG) 355
poly-L-lysine (PDL) 290
polymer membranes 416
polymer microlenses 379
polymer stamp 67
polyornithine (PLO) 292
polystyrene 380
polyurethane 386
polyvinylchloride (PVC) 355, 386
porous polymer monoliths 413
positron emission tomography (PET) 185
potentiometric detection 235, 434
presynaptic neuron 296
primary amine neurotransmitters 229
probenecid 141
propyl gallate (PG) 251
prostate-specific antigen (PSA) 334
protein kinase A 140, 148
protein photocrosslinking 294
protein printing 371
protein surface gradient 289
protein tyrosine phosphatase inhibitors 145
proteomic 131, 269
pulsed amperometric detection (PAD) 242, 432, 441
pulsed flow 34
pumps 63
pyridoxalphosphate-6-azophenyl-2', 4'-disulfonic acid (PPADS) 146
quinaprilat 146
rat basophilic leukemia cell line RBL-2H3 102
rat hippocampal neuron 292
recombinant DNA 203
replication techniques 357
resistance temperature detectors (RTDs) 67, 74,76
resorufin β -D-galactopyranoside (RBG) 209

- reverse phase-high performance
 liquid chromatography (RP-HPLC)
 486
- reversible addition-fragmentation
 chain transfer polymerization
 (RAFT) 393
- reversible inhibitor 135
- Reynolds (Re) number 469
- r-hirudin 397
- rhodamine B 220
- ribozymes 131
- RNA 204
- rotary confocal scanning 72
- rotary mixer 204
- RT-PCR 117
- salicylic acid 250
- sample introduction channel (SIC)
 229
- sample stacking 145
- scanning probe microscopy (SPM) 369
- SDS-PAGE 412
- self-assembled monolayers (SAMs) 115,
 370
- separation-based sensor 215
- sequential synthesis of β -peptides 183
- sheath flow 34
- Shewanella oneidensis* 275
- Shipley SJR 5740 273
- Sifel 266
- SIGMA FAST OPD 281
- signal transduction 92
- silanization 391
- single cell 3, 61, 92, 104
- single molecule 138
- single nucleotide polymorphism
 (SNP) 416
- single strand conformation polymorphism
 (SSCP) 416
- single-base extension (SBE) 416
- single-stranded DNA 69, 416
- singlet oxygen 173
- sodium dodecyl sulfate (SDS) 247,
 388
- sodium pump 194
- sol-gel microvalves 63
- sol-gel monolith 141
- solid polymeric monoliths 408
- soluble, cell culture 18
- soluble, gradients 15
- sorting strategies 30
- spatial gradients 112
- spatial micropatterning 21
- spatio-temporal patterning 92
- spheroids 89
- spinal ganglion (SG) neurite 294
- spray emitters 491
- sputter coating 459
- src-kinase 140
- Staphylococci* 319
- stem cells 18, 21, 111, 115
- stencil-based patterning methods 20
- streptavidin 465
- stretching energy 271
- styrenesulfonate (SS) 393
- suramin 146
- surface interactions 20
- surface plasmon resonance (SPR)
 235
- Swern oxidation 182
- symmetric cell division 112
- synapse microfluidic device 122
- synapses 111
- synaptic junction 122
- synaptogenesis 112
- synaptogenic factors 295
- T channel 36, 37
- teicoplanin 469
- temperature control 65
- temporal gradients 112
- tetrabutylammonium chloride
 (TBACl) 388
- theophylline 151
- thermal metal evaporation 459
- three-dimensional (3D) architectures
 447
- three-dimensional (3D) microchannel
 network 190
- three-dimensional culture 103
- three-dimensional microfluidic
 constructs 98
- three-electrode system 494
- T-injector 244
- tissue engineering 22
- total analytical systems (u-TAS) 167,
 353, 385, 447
- transfected cell microarray 206

- transient engagement EMMA 143
trimethylammonium chloride
 (VBTAC) 393
trypsin 131, 374
two-electrode system 493
two-layer photolithography 115
- uncompetitive inhibitor 135
uridine diphosphate glucuronosyltransferase
 (UGT) 141
UV-induced polymer grafting 390
- valproate 141
vancomycin 470
vascular endothelial growth factor
 (VEGF) 334
VE-cadherin 97
- vector 205
V_{max} 133
voltammetry 434
wax mold 264
wax printing 260
wire imprinting 354, 357
- X junction 34, 38
X-ray photoelectron spectroscopy
 (XPS) 391
- Y junction 34
Y-shaped intersection 148
- Zebrafish egg chorion 116
Zigmond chamber 89
Z-Phe-Arg-AMG 148

