

INDEX

A

- Agarose gel electrophoresis.....65, 71–72, 192, 229
- Antibody coated microbeads259–260, 265–266
- Atomic force microscope (AFM)
 - of DNA..... 3, 17, 26–30, 105–112, 190, 209–219, 235, 255
 - imaging.....3, 28, 29, 44, 106, 176, 235
 - volume measurements..... 112

B

- B-DNA
 - modeling..... 321, 322
 - structure..... 321
- bBSA Slide Treatment..... 274
- Bottom-up assembly..... 170, 187, 199, 291
- BSA surface treatment.....274, 278–279
- Butyl-trichlorosilane modified glass 155–156
- B-Z transition80, 81, 83–89

C

- Cacodylate buffer81, 84, 86
- CHARMM..... 319–321, 324, 333, 337, 339
- Chemical ligation of DNA.....36, 38, 41–42
- CircLigase 152–154, 158, 160
- Circular dichroism spectroscopy.....64, 70, 87, 88
- Circular single-stranded DNA (ssDNA)..... 2–6, 151–155, 158–160, 162, 164–166, 183, 188, 189, 211–213, 215, 217, 218, 306, 307, 311, 325, 326, 340, 346, 348, 356
- Confocal microscope observation..... 301
- Contour length estimator237, 241, 242, 244
- Coupling of DNA to microspheres155, 160–161

D

- Deposition of DNA on mica..... 239, 240
- Dielectrophoresis (DEP)224, 226, 228–233
- Dielectrophoretic (DEP) trapping.....224, 226, 229–233
- Diphenylphenanthroline 37
- Dithiopyridine..... 258, 261
- DNA
 - annealing6, 16, 23–24, 31, 155, 162, 227, 296
 - binding on metal nanostructures 143

- combing.....50, 51, 54–56
- concentration determination..... 14, 17, 18, 85, 98, 158, 216
- conformations..... 6, 80, 81, 86, 89, 240, 257, 318, 340, 341
- contour length235–247, 306, 311
- enzymatic labelling.....66, 74, 75
- fluorescent labeling..... 226, 229, 292, 294, 296, 297
- helix handedness..... 79–90
- immobilization at surfaces 102, 179, 183, 292, 296
- labelling by PCR 296
- metallization 49–51, 56
- mineralization..... 51, 56
- nanografting 209–219
- nanopatches211, 215–217, 219
- nanoswitch..... 61–76
- nanowires..... 115–139
- origami preparation 188, 190
- overstretching 257, 258
- persistence length 236, 242
- polymerase I 121, 122, 124, 134, 307
- strand annealing..... 6, 14
- strand titration..... 23
- triangles 33–47, 193, 194, 306, 311, 352
- DNA contour length, measurement of..... 235–247
- DNA-directed immobilization..... 211
- DNA-nanomachines2, 62, 66, 80
- DNA nanostructure..... 1–10, 13–31, 34, 45, 79–90, 93, 94, 96, 102, 117, 151–166, 187, 209–219, 291
 - design79, 80, 94, 318
 - preparation..... 8, 34, 151–166, 188–192
- DNA-protein conjugates..... 211, 213, 216, 217
- DNA-protein coupling.....259, 260, 264–265
- DNA-wrapping.....236, 237, 292
- Double-helix structure..... 1
- Drosophila cell culture..... 65, 72
- Drosophila larvae..... 72

E

- Electric field computation 345
- Electroelution of DNA..... 238
- Electron beam lithography..... 187, 224, 225, 227
- Electron beam writing.....170, 173–175

Electrophoresis tracking dyes mobilities..... 5
Exonuclease VII 36, 47

F

Flow cell realization..... 275
Fluorescence microscopy 16–17, 24–26, 30,
66, 73–74, 179–180, 292
of DNA 16–17, 24–26, 292
imaging buffer for..... 279
Fluorescence resonance energy transfer (FRET)..... 62, 67,
71, 73, 74, 89, 273–289, 291–302
Fluorophore choice for DNA labelling..... 295
Force-induced DNA melting 306, 307, 311, 312
Force loading-rate..... 258

G

G4-DNA..... 116, 117, 123–125, 135–138
GENOgold 142, 144–147, 149
Glass slide cleaning and preparation..... 179, 277
Gold-nanoparticle modified G-wire 141–149
Gold nanoparticles 50, 65, 71, 141–149, 152, 187–196
concentration 188
oligonucleotide coated 143, 152
oligonucleotide-coated Gold Nanoparticles,
preparation of 190
Gold/palladium nanodots..... 170, 176–180
Gold surface passivation 142, 144–146
G-protein coated microparticles..... 260, 265
G-quadruplex 93–103, 106, 107, 117,
123–125, 135–138, 142
G-rich oligonucleotides..... 105, 108–110, 117
G-rich oligonucleotides, assembly of..... 105, 107–110
G-rich sequences 94, 96, 117
G-wire..... 93–102, 106–111, 141–149
alignment..... 96
applications of..... 96
growth 106, 107, 142, 144,
146, 149
immobilization on mica..... 143–147
immobilization on silicon 142, 144, 145
preparation..... 110, 141–149

H

Helical induction 82, 83, 88
 α -Hemolysin 318, 322, 324, 325, 327–331,
340–342, 345–349, 354–356
 α -Hemolysin modeling 318, 322, 324,
325, 327–331, 340–342, 345–349, 354–356
Hexamethyldisilazane surface passivation 50
Hexamethyldisilazane (HMDS) 50, 52–57,
189, 192–196
Higher level structural organization of DNA..... 292
HPLC purification of DNA..... 63, 97, 98, 121,
122, 124, 125, 133–135, 137–139

I

Intracellular pH measurement 73
I-switch 62–64, 66–71, 73, 75, 76

K

Klenow fragment..... 96, 120–122, 124, 132, 134, 136, 307

L

Lambda phage DNA..... 52, 307
Lift-off lithography 142
Lipid membrane modeling 329

M

MALDI-TOF. *See* Matrix-assisted laser desorption/
ionization time-of-flight
Matrix-assisted laser desorption/ionization
time-of-flight..... 36, 39–40, 98, 102
Mechanical manipulation of single molecules 268
Metal deposition..... 49, 173–176, 182
Metallic nanowires 49–57
Metal nanostructures..... 49–57, 170, 177, 183, 224
Metal surface functionalization 170, 172, 177
Mica
cleavage..... 143, 144, 146, 148
surface passivation 144–147
Microscope
data analysis..... 275
flow cell construction..... 275, 278
slide cleaning 299
Molecular dynamics (MD)..... 259, 318, 319,
323–325, 331, 346–348
Molecular dynamics (MD), grid-steered 318, 323,
325, 346–348
Molecular handles 255–270
Mononucleosomes..... 291–302

N

NAMD software 319, 320, 327, 329, 330, 335,
336, 338–340, 345, 346, 348–350, 353, 355, 356
Nanoarray fabrication 2, 210, 211, 217
Nanoarrays..... 2, 210, 211, 217
Nanofabrication..... 169–184, 212, 213, 216, 217
Nanopore..... 317–357
DNA sequencing..... 317–357
translocation data, analysis..... 349, 350
Nucleosome exchange reconstitution 297–298
Nucleosome core particle (NCP)..... 292–295, 297, 299
Nucleosome reconstitution..... 292–294, 297–298
Nucleosomes..... 292–302

O

Oligonucleotide purification by electrophoresis 2–3
On-chip oligonucleotide synthesis 200

- Optical tweezers255–270, 305–314
Optical tweezers, alignment and operation 309–310
- P**
- Palladium 50, 171
Palladium oxide 50
Palladium oxide reduction 50
Phi29 DNA polymerase 152, 153, 157, 164, 165
Phosphothioate modified oligonucleotides 155, 165
pH sensor 62, 67
Piranha solution 52, 53, 155, 156, 162, 166, 172, 173, 177, 201, 203
PNA 79–90
 chirality 83, 84, 89
 helix handedness, prediction of 87
PNA:PNA duplexes 83, 84, 87, 88, 90
Poly(dC) 115–117, 120–122, 132–135, 138, 139
Poly(dG) 115–117, 120–122, 124, 132–139
Polyacrylamide gel electrophoresis 2–3, 15–16, 20–23, 35, 44, 97, 154, 158–160, 259, 264, 293, 298–299
Polyacrylamide gel electrophoresis, denaturing 2–3, 35, 154, 158–160
Polymethylmethacrylate mask 227
Protein-DNA interaction 183, 236
Protein unfolding 256, 258, 266, 268
Purification of DNA 2–6, 10, 34–35, 38–40, 139, 188–190, 216, 238, 263, 292–293, 296–297
- Q**
- Quadruple helix 6, 7
- R**
- Relative DNA concentration, determination of 14
Rolling circle amplification 151–166
- S**
- Self-assembled monolayers (SAMs) 169, 170, 177, 183, 210, 211, 213, 215–217, 219
Silanization of silicon oxide 50, 53
Silica nanopore modeling 203
Silicon 36, 45, 53, 54, 144, 145, 188, 189, 192, 195, 199–206, 212–214, 219, 224, 227, 276, 321, 332–334, 337, 339
 alkylation of 200, 204
 hydrogen terminated 201–202, 204
 porous 201, 203–204
Silicon dioxide modeling 318
Silicon nitride
 modeling 318, 324, 331
 nanopore 331
Silicon oxide 189, 194
- Single molecule fluorescence 273–289, 292
 alternating laser excitation method 275, 283–287
 data analysis 275, 280–283, 287
Single-molecule force spectroscopy 255
Single-molecule manipulation 257
Single-pair fluorescence resonance energy transfer (spFRET) microscopy 292
Single-stranded DNA modeling 322, 325, 326, 341
Size exclusion chromatography (SEC) 65, 69, 71–72
Solid phase DNA synthesis 34–35, 38
SOLVATE software 320, 326, 328, 329
Stigmatism adjustment 174, 182
Streptavidin-coated beads 260
Structural DNA nanotechnology 2, 33
Surface bound rolling circle amplification 152, 153
Surface contact-angle, measurement 54
Surface hybridization of oligonucleotides 205
SYBR Green II staining 153, 154, 157, 164–165, 264
Synthesis of polymeric proteins 260, 262–263
Synthetic nanopores 318, 325, 348–349
- T**
- Thermal annealing of DNA nanostructures 16, 23–24, 31
Thiol-modified DNA 188, 228, 230, 231
Thiol modified oligonucleotides 216
Time-resolved fluorescence measurements 64–65, 71
TIRF microscopy. *See* Total internal reflection fluorescence (TIRF) microscopy
Top-down and bottom-up merging 170
Total internal reflection fluorescence (TIRF) microscopy 30, 273–289, 292, 295
Triple helix preparation 116
Triple-stranded structures 116
Trolox 288, 294, 300
- U**
- Ultraflat gold substrates 211–214
UV analysis of G wire 98–99
UV spectroscopy 5, 15, 39, 40, 42, 84, 86, 87, 89, 99, 190
- V**
- VMD software 319, 321, 323, 325–329, 331–335, 337–345, 347, 349–351, 353, 355
- Y**
- YOYO-1 17, 25, 31
- Z**
- Z-DNA
 induction 89
 structure 88