Index

Symbols

2D materials 126, 127
2D molecular aggregates 144
3D
Printed microfluidics 95
Printing 96

A

Absolute Concentration Measurement 15
Accelerator 25
ADCs *See* Analog-to-digital converters
Agarwal, Anuradha M. 139, 155
Akinwande, Akintunde I. iv
ALD *See* Atomic layer deposition
Aluminum plasmonics 112
Amorphous substrates 132
Analog circuits 6, 30, 32
Analog front end 6
Analog-to-digital converters 33, 34
Pipelined 32
Anikeeva, Polina 19, 156
Anthony, Brian W. 11, 15
Antoniadis, Dimitri A. 38, 41–45, 157
Apparent mobility 41
Arterial blood pressure 10
Arterial network 4
Atomic layer deposition 75

B

Baldo, Marc A. 71
Ballistic mobility 41
BAN *See* Body-area networks
Bawendi, Moungi G. 71, 137
BCC *See* Body-coupled communications
Berggren, Karl K. ..... iii, 64, 106–113, 133–135, 158
Bioimpedance 6
Biologics 14
Biopotential 28, 31
Block copolymers 110, 111
Body-area networks 7
Body-coupled communications 7
Boiling 81
Boning, Duane S. ..... iii, 15, 101, 102, 159
Boron nitride 141
Bove, V. Michael Jr. 136, 160
Bulović, Vladimir ..... iii, 71, 146, 161
Buonassisi, Tonio 162
Buongiorno, Jacopo 81

C

CAD tools 103
Capsule Endoscopy 11
Capture 18
Carbon nanotubes 117, 119, 120
Vertically aligned 119
Cell concentration 15
Cell sorting 13
Center for Integrated Circuits and Systems 25, 32, 36, 149
Chalcogenide glass 138, 139
Chalk river unidentified deposits 81
Chandrakasan, Anantha P. 12, 26–32, 38, 163
Chaotic flows 18
Chemical vapor deposition 105, 127
Oxidative 68
Chen, Gang ..... iii, 115
Chopper amplifier 28
Circuit design 38
Circuits
Analog 6, 32
Neural 19
Circuit simulation 103
CMOS 86
CMP *See* Chemical mechanical polishing
CNT *See* Carbon nanotubes
Coaxial electrospray 95
Collection efficiency 143
Colloidal nanocrystals 71
Colloidal quantum dots 146
Compact model 86
Computer vision 24
Congestive heart failure 6
Contact resistance 50
Continuous monitoring 9
Convolution 25, 102
Core shell microparticles 95
Cuprate 78
CVD *See* Chemical vapor deposition

D

Daniel, Luca ..... v, 3, 4, 5, 86, 103, 131, 164
Dark-field microscopy 137
DC-DC converter 30
Dean flow fractionation 13
Deep learning 25
Deep reactive-ion etching 85
Deformable parts model 24
Deionization 117
del Alamo, Jesús A. ..... iii, 46–50, 57–59, 165
Density 119
Desalination 94
Design for manufacturing 103
Design optimization 131
Diagnostics 8, 13, 17
Diamond 143
Diamond nitrogen vacancy 121
Dichalcogenides 140
Dielectric waveguide 35
Diffusive mobility 41
Directed self-assembly 110
Displays 135, 136
Distributed sensor 90
Dresselhaus, Mildred S. 60–63, 127, 166
DRIE *See* Deep reactive-ion etching
Dry-out heat flux 118

E

EEG *See* Electroencephalogram
Electrodialysis 94
Electroencephalogram 8
Electromagnetic Analysis 3
Electron diffraction 108
Electron field emission 98
Electron microscopy 106
Electrospinning 89
Electrospray 96
Coaxial 95
Energy
Efficiency 25, 29
Harvesting 30
Energy harvesting 12, 88, 89
Energy storage 74
Englund, Dirk R. 56, 121, 133, 135, 141–143, 167
Epilepsy 8
Etching 85
Extreme Heat Flux 92

F

Fabrication 136
Fang, Nicholas X. ..... iv, 144, 168
FETs *See* Field-effect transistors
Field-effect transistors 41, 42, 44, 45, 57, 58, 61, 86
Tunneling 42–44
Field Solver 3
Flexible photonics 145
Fluorescent decay 144
Flux gate technology 30
Focused ion beam 108
Fuel cells
Solid oxide 76, 79

G

Gallium nitride 33, 34, 51–60
HEMTs 34, 51, 55, 56, 59
Reliability 57
GaN *See* Gallium nitride
Gastric battery 12
Generalized polynomialchaos 131
Germanium 70, 132
Germanium-on-Silicon 70
Gleason, Karen K. ..... iii, 68, 85, 104, 105, 169
Gradečak, Silvija ..... iv, 104
Graphene 60, 112, 123–126, 140, 141
Graphene-Boron Nitride 141

H

Han, Jongyoon 13, 94, 170
Han, Ruonan 35–37, 171
Hardware accelerator 24
Hardware security 26
Hart, A. John 114, 118–120, 172
Heat transfer 81
HEMTs *See* High electron mobility transistors
High electron mobility transistors
Gallium nitride 55
Holographic video 136
Hot electron 72
Hoyt, Judy L. ..... iii, iv, 42, 43
Hu, Juejun 138, 139, 145, 173
Hydrogen silsesquioxane 50
Hyperthermia 19

I

Identification System 4
III-V materials 48, 56
Imaging 5
Implantation 121
Indium gallium arsenide 42, 46–50
InGaAs *See* Indium gallium arsenide
Ingestibles 12
Integrated circuits 101
Integrated magnetics 30
Interaction-free measurement 107, 108
Interferometer 108
Internet of Things 26, 27, 29
Inverter 28
Ion concentration polarization .....

J

Jarillo-Herrero, Pablo ..... iv, 140, 174

K

Khademhosseini, Ali 17, 18, 175
Kimerling, Lionel C. ..... iii, 70, 132, 139
Kim, Sang-Gook 69, 72, 87, 88, 176
Kolle, Mathias 137, 177
Kong, Jing 38, 60, 61, 123, 126, 127, 178, 179

L

Lab-on-chip 137, 146
Lang, Jeffrey H. ..... iii, iv, 90, 179
LEDS *See* light emitting diodes
Lee, Hae-Seung 9, 31–34, 149, 180
LIDAR *See* light detection and ranging
Light emission 146
Light modulators 136
Lithium-air batteries 73
Lithography 105, 109
Liu, Luqiao 181
Logic 48
Low power 24
Circuits 26
Electronics 27
Low voltage 28

M

Magnetic Field
Alternating 19
Magnetic Resonance Imaging 3, 5
Manalis, Scott R. 182
Manufacturing 85, 120
Additive 114
Materials 17, 112, 113, 123
Mean free path 41
Medical device 9
Medical Electronic Device Realization Center 6, 87, 199
MEDRC 9
Michel, Jürgen 70, 132, 183
Microbiology 137
Microfluidics 13, 96, 97
Micro/nanofabrication 85
Micro-Raman 55
Microscopy 17
Microwave sensor 90
MIT/MTL Center for Graphene Devices and 2D Systems 150
MIT/MTL Gallium Nitride (GaN) Energy Initiative 33, 151

Modeling 102
Automated 4
Molecular multilayer structure 144
Molybdenum Ditelluride 127
Monitoring
continuous 9
Monolithic method 145
MRI *See* Magnetic Resonance Imaging
Multiple-mode mass sensing 16

N

Nanocavity 69
Nanoengineering 81
Nanofabrication 106, 109
Nanofibers 89
Nanofluidics 14
Nanomaterials 120
Nanoparticles 18
Magnetic 19
Nanopatterning 110
Nanowires 133, 134
NBTI *See* Negative-bias temperature instability
Near-equilibrium 41
Negative-bias temperature instability 57
Neural networks
Convolutional 25
Neural recording 91
Ni films 116
NV centers 56

O

Object detection 24
oCVD gallium arsenide sensing 104
Optical communication 135
Optical upconversion 71
Optics 137
Oscillator
Low-frequency, bi-stable nonlinear 88
Oxide catalyst chemistry 80

P

Palacios, Tomás ..... iv, 34, 38, 51–54, 60–63, 123, 125, 126, 150, 151, 184
Passivity 4
Pathogen 18
Patterning 105
Perovskite 76
Perreault, David J. 185
Phased array 9
Photodetector 141
Photonic crystals 67, 72, 146
Photovoltaics 68–71
Piezoelectric materials 91
Pipelined Analog-to-Digital Converter 32
Poly(3,4-dimethoxythiophene) 68
Polymers 105
Polymer vapor printing 68
Polyselenophene 68
Process variation 103, 131
Proteins 109
Pulse Wave Velocity 10

Q

QEM *See* Quantum electron microscope
Quality Assessment 14
Quantum electron microscope 107
Quantum information 121

R

RBT *See* Resonant body transistor
Resonant body transistor 86
Resonators 138, 145
Ross, Caroline A. 75, 110, 111
Rubner, Michael F. iii
Ruthenium oxide 75

S

Sampling Circuits 34
SAR *See* successive approximation register
Scanning electron microscope 107
Schmidt, Martin A. 85, 186
Self-assembly 111
SEM *See* Scanning electron microscope
Semiconductors 105
Sensitized triplet-triplet annihilation 71
Sensor nodes 12
Sensors 139
Tactile 90
Sensor skins 90
Shao-Horn, Yang 73
Silicon heteroepitaxy 70
Silicon photonics 141
Silicon vacancy 143
Simulation 5
Single-Photon Detectors 135
SNSPDs *See* Superconducting nanowire single-photon detectors
Sodini, Charles G. ..... iii, 6–9, 87, 187
Solar energy 67
Sol-gel 145
Spectrometer 36
Spectroscopy
Electron energy-loss 75
Phonon 115
Spin-Coating 102
Stereolithography 114
Stress Monitoring 31
Sub-10 nm 110
Subdermal implants 8
Sub-threshold 28
Successive approximation register 3
Supercapacitors 75
Superconducting detectors 113
Superconducting nanowire single-photon detectors 135
Super resolution 23
Surface plasmon polariton 72
Surface tension driven flow 97
Surface treatment 109
Swager, Timothy M. iii
System
Cardiovascular 4
Nonlinear 4
Sze, Vivienne 23–25, 188

T

Taylor, Anthony P. 124
Terahertz
Spectroscopy 36
Waves 35–37
TFETs *See* Field-effect transistors: Tunneling
Thermal imaging 56
Thermal management 55, 92

Thermal processing 110
Thermal radiation 67
Thermoelectrics 115
Thin-film evaporation 92
Thin film structures 79
Thompson, Carl V. 73–75, 116, 117, 189
Threshold voltage instability 57
THz *See* Terahertz
Topography 102
Transducers 87
Transfer 126
Transistors 127
Transition metal dichalcogenides 127
Transmission electron microscopy 108
Transparent conducting electrodes 77
Tuller, Harry L. 76–80, 122
Tunneling 44

U

Ultrasound 9, 10, 91
Endoscopic 11
High-frequency 15

V

Vacuum devices 98
Vacuum pump 98
Varanasi, Kripa K. 190
Velásquez-García, Luis F. ..... iv, 89, 95–98, 124, 191
Verilog-A 86
Vertical nanowire 50
Video compression 23
Voldman, Joel 192
Volume plasmon 75

W

Wakeup receiver 27
Wang, Evelyn N. ..... iii, iv, 55, 56, 67, 92, 93, 117, 193
Water desalination 117
Water splitting 72
Watts, Michael R. iv
Waveguides 139
Wearables 6, 8, 9
Weinstein, Dana 86
Weiss, Ron 194
Wireless 8
Charging 29
Communications 7

Z

Zero-Crossing-Based Circuit 32