
Index

A

- Ab-based immunotherapy
 - neurology applications, 245–247
 - oncology applications, 247–250
- Abolmaesumi, P., 124
- Acoustic cavitation
 - lithotripsy
 - high frequency, 116–117
 - low frequency, 117–119
 - sonothrombolysis
 - Apfel's final golden rule, 348–349
 - classification, 342–344
 - endogenous nuclei, 347–348
 - exogenous nuclei, 348
 - FUS, 347
 - passive cavitation detection, 349
 - sub-megahertz ultrasound, 346–347
 - TCD, 345–346
 - ultrasound catheter, 344–345
- Acoustic radiation force, 342
- Ali, M.Y., 143
- Alzheimer's disease (AD)
 - anti-A β Abs (BAM-10) delivery, 246, 247
 - FUS-mediated BBB opening, 304
 - mice models, 246
 - microbubbles and FUS, 302
 - neurodegenerative disorder, 246
 - neurogenesis, 299
 - neurotrophic factors, 302
 - pathogenesis, 246
- AMDCC. *See* Animal Models of Diabetic Complications Consortium (AMDCC)
- Ammi, A.Y., 346
- Anderson, M.S., 312
- Angle, S.R., 401
- Animal Models of Diabetic Complications Consortium (AMDCC), 311–312
- Antitumor immune response, thermal ablation
 - cryoablation, 145–146
 - HIFU
 - in animal studies, 136–138
 - in cancer patients, 142
 - in clinical studies, 139–141
 - DC infiltration and activation, 139

- H22 tumor vaccines, 139
- immunosuppressive cytokines, 142
- murine hepatocellular carcinoma
 - model, 139
- LA, 144–145
- MWA, 146–147
- RFA, 142–144
- Apfel, R.E., 344, 348
- Apodization methods, geometric ray-tracing
 - BEM, 48–49
 - binarized approach, 47, 48
 - CT, thoracic cage, 47
 - direct detection of scattering, 49
 - phase conjugation, 48
- Aptel, F., 11, 14
- Aubry, J.F., 48, 51
- Aubry, J.-F., 97–108
- Azuma, H., 322

B

- Bader, K.B., 339–355
- Bamber, J.C., 213
- Bandow, K., 397, 401
- Barger, J.E., 98
- Barlinn, K., 346
- Baron, C., 346
- Basic fibroblast growth factor (bFGF), 402
- Beam steering strategies
 - frame-rate imaging, 56
 - MR-based tracking, 55–56
 - optical-flow based algorithms, 56
 - PCA-based motion descriptor, 56
 - real-time image-based motion estimation algorithm, 57
 - US-based tracking, 57
- Bekeredjian, R., 265
- Benjamin, T.B., 180
- Bettinger, T., 191–202
- Bielawski, C.W., 370
- Bilayer sonophore model, 394
- Bioley, G., 213
- Bjorno, L., 178
- Blake, J.R., 179

- Blood-brain barrier (BBB) opening
 CNS, 293–294
 drug delivery, 295–296
 formation, 294–295
 non thermal therapy, 106
- Bluestone, J.A., 312
- BMPs. *See* Bone morphogenetic proteins (BMPs)
- Bohmer, M.R., 265
- Bolle, H., 180
- Bone healing
 definition, 398
 gene expression and signaling molecule release
 angiogenesis, 402
 BMPs, 404–405
 bone remodeling, 405–406
 chondrogenesis, 405
 immune response, 406
 inflammation, 402
 NO and PGE2, 402–403
 ossification, 404
 osteogenesis, 403
 osteoprogenitors and osteoblasts, 403–404
 ultrasound, intracellular signaling pathways, 400–401
- Bone morphogenetic proteins (BMPs), 404–405
- Borden, M.A., 286
- Bos, C., 243–259
- Botros, Y.Y., 47
- Bouakaz, A., 175–186
- Bouchoux, G., 339–355
- Boundary element method (BEM), 48–49
- Breast cancer
 brain metastatic
 HER-2 positive, 249
 trastuzumab delivery, microbubble-assisted
 ultrasound, 249–250
 diagnostic process, 65–66
 MR-HIFU (*see* Magnetic resonance-guided high
 intensity focused ultrasound (MR-HIFU))
 radiotherapy, 66
 treatment efficacy, 65–66
- Brennen, C.E., 179
- Brix, L., 124
- Brown, A.T., 352
- Brujan, E.A., 180
- Brunton, J.H., 180
- Bubble-assisted ultrasound
 applications, 244
 commercial UCAs, 258
 cytokine gene therapy (*see* Cytokine gene therapy)
 delivery methods, 244
 immuno-stimulating molecules, 244
 immunotherapy (*see* Immunotherapy)
 therapeutic ultrasound protocols, 259
 vaccination (*see* Vaccination)
- Bubble dynamics
 gas bubble, 162–163
 linearization, 163–164
 pressure emission, 164
 secondary Bjerknes force, 164–165
- Burgess, A., 293–304
- Busse, J.W., 414, 415
- C**
- Callan, B., 429–447
- Callan, J.F., 429–447
- Cancer
 adjuvant chemotherapy/radiotherapy, 284
 chemotherapeutics, toxicity reduction, 281
 drug resistance reversal (*see* Drug resistance resal)
 enhanced tumoricidal effects, 279–281
 radiation therapy, 6
 thermal ablation therapies, 16
 thermal effects, 7
 trans-rectal HIFU treatment, 6
 vaccination, 284–285
- Cao, W.J., 309–325
- Capacitive micromachined ultrasonic transducers
 (CMUTs), 13
- Cardiovascular system
 CEUS
 gene therapy, 335–336
 microbubble, 336
 migration, 336
 enteral vs. parenteral delivery, 332
 HDL therapy, 333
 LDL therapy, 332–333
 mAb, 332
 proteins, 332–333
 sonoporation
 arterial neointimal formation, 335
de novo HDL Cholesterol, 335, 336
 sonothrombolysis, 334
- Carlisle, R., 266, 274
- Carson, A.R., 276
- Castle, J., 331–336
- CEUS. *See* Contrast enhanced ultrasound (CEUS)
- Chan, A.H., 11
- Chang, W.S., 104
- Chapelon, J.-Y., 21–37, 45
- Chaussy, C., 14
- Chen, D., 179
- Chen, G.S., 11
- Chen, H., 312
- Chen, H.H., 309–325
- Chen, H.Y., 320, 322–324
- Chen, W., 14
- Chen, X., 343
- Chuang, Y.H., 268, 344, 348
- Church, C.C., 347
- Civale, J., 11, 47
- Clement, G., 99
- Cline, H.E., 45
- Clinical devices
 extracorporeal devices, 13, 15
 interstitial devices, 15–16
 trans-rectal devices, 15
- CMUTs. *See* Capacitive micromachined ultrasonic
 transducers (CMUTs)
- Co-administration of microbubbles
 delivery barriers, drug, 209
 drug carrier system, 206–207
 drug penetration, 206
 EG-PEI-plasmid, 209

- focal energy deposition, 206
 - in-vivo* barrier, drug delivery, 207–208
 - intracellular delivery, 207
 - nucleic acid, 206
 - tissue geometry, 209
 - ultrasound-assisted transfection tool, 206
 - Cochard, E., 49, 51
 - Cochran, M.C., 272, 281, 282
 - Collis, J., 178
 - Contrast enhanced ultrasound (CEUS)
 - acoustic microspheres, 333–334
 - gene therapy, 335–336
 - microbubble, 336
 - migration, 336
 - Cosgrove, D., 348
 - Couppis, A., 11
 - Coussios, C.C., 11
 - Craig, S., 370
 - Crouzet, S., 21–37
 - Cryoablation
 - animal tumor models, 145
 - antitumor immune response, 145–146
 - argon-gas cryotherapy technique, 134
 - endotoxin administration, 136
 - host antitumor immunity, 145
 - thermal techniques, 132, 134
 - tumor metastasis, 145
 - Culp, W.C., 351
 - Cyclooxygenase-2 (COX-2), 402–403
 - Cytokine gene therapy
 - host anti-tumor immunity, 255
 - IL-12 based immunotherapy
 - anti-tumor effect, 257
 - bubble liposome-assisted ultrasound, 256
 - IFN- γ secretion, 255–256
 - recombinant protein rhIL-12 therapy, 256
 - tumor regression, 257
 - intra-tumor delivery, 255
 - naked pDNA, 255
 - pDNA delivery and expression, 255
- D**
- Dai, C., 315
 - Datta, S., 344, 348–349, 352
 - Davidson, B.J., 179
 - Deckers, R., 243–259, 372, 375
 - Deep vein thrombosis (DVT), 340, 341
 - De Jong, N., 157–173, 228
 - Den Brok, M.H., 143
 - Deng, J., 137
 - Deng, Z., 282, 283
 - Denis de Senneville, B., 43–59
 - De Saint Victor, V., 352
 - Dewey, W.C., 7
 - Diabetic nephropathy (DN)
 - animal models, 311–312
 - causes, 311
 - endothelial dysfunction, 311
 - glycemic control, 313
 - kidney transplantation, 313–314
 - non-viral gene delivery
 - chemical methods, 317
 - physical methods, 317–318
 - pathophysiology, 310–311
 - RAS blockade, 313
 - UMGD
 - BM-MSCs, 324
 - in-vivo* transfection, 320, 321
 - kidney disease, 322–323
 - microbubbles, 324–325
 - miR-21, 324
 - miRNAs, 321, 324
 - Smad pathway, 325
 - TGF- β 1, 320–321, 325
 - viral gene delivery, 314–316
 - Diaz de la Rosa, M.A., 374
 - Dickinson, L., 14
 - Ding, C., 435
 - Doan, N., 403
 - Dobrzynski, E., 315
 - Doinikov, A.A., 175–186
 - Droplet
 - acoustic diffraction, 166–167
 - activation below boiling point, 172–173
 - geometrical scattering, 166
 - maximal constructive interference, 170
 - nonlinear incident wave, 168
 - nonlinear propagation
 - coordinate transformations, 161
 - FUS transducer, 159–160
 - Khokhlov-Zabolotskaya-Kuznetsov (KZK) equation, 161
 - Laplace operator, 160
 - numerical solution strategy, 161–162
 - pressure field, beam, 162
 - Westervelt equation, 160
 - oscillatory translations, 165–166
 - pressure amplification factor, 169
 - radial vapor bubble expansion, 170–172
 - spherical Hankel function, 168
 - spherical symmetry, 167
 - superharmonic focusing effect, 169
 - Droplet-to-bubble phase transition
 - non-thermal ultrasound therapy, 228
 - in PFCE, 231–232
 - ultrasound irradiation, 227
 - vaporization (*see* Vaporization, PFP droplets)
 - Drug-carrying sonosensitive particles
 - covalent coupling, 213
 - drug-loaded nano/microbubbles, 209
 - electrostatic complexes, 212–213
 - formulations and properties, 210
 - hydrophobic interaction (non-covalent binding), 210–211
 - liposome formulations, 215–216
 - optimal approaches, 216
 - particle-decorated microbubbles, 213–215
 - Drug delivery
 - FUS
 - non-invasive, 299
 - osmotic and chemical opening, 298

- Drug delivery (*cont.*)
 safety, 299
 targeted, 297–298
 transient, 298–299
 phase-shift nanoemulsions (*see* Phase-shift perfluorocarbon nanoemulsions)
 sonoporation-mediated
 anticancer agents, 264
 cavitation process, 265
 cytotoxic/cytostatic antitumor therapeutics, 265
 hydrophobic gas-filled microbubbles, 264
 transvascular-interstitial-intracellular pathway, 265–268
 tumor architecture, 264
 tumor vascular destruction, 268–269
 ultrasound effects
 acoustic streaming and radiation force, 224
 carriers and biological tissues, 225
 cavitation phenomena, 223–224
 diffusion, 225
 localized drug release, 225
 microbubble-based systems, 225
 non-thermal and non-cavitation mechanism, 224
 phase-shift nanoemulsions (*see* Phase-shift perfluorocarbon nanoemulsions)
 thermal effects, 223
- Drug loaded UCA
 chemical conjugation, 195–196
 electrostatic adsorption, 195–196
 formula optimization, 196
 hard shell, 197
 liposomes, 197
 microbubble design, 195
 monosize, 197–198
 nanoemulsion, 197
 nanoparticles, 196–197
 PDT, 196
 protective drug carrier, 196
 SDT, 196
- Drug resistance reversal
 doxorubicin-liposome-microbubble complex, 282
 doxorubicin-resistant MCF-7 breast cancer cells, 283
 nuclear accumulation of drugs, 282–283
 pancreatic adenocarcinoma, 281
 therapeutic genes, 284
 transporter up-regulation, 282
 USMB-assisted transfection, 284
- Du, G., 179
 Dupenloup, F., 11
 Dupré, A.A., 14
 Duryea, A.P., 115
 Duvshani-Eshet, M., 275
- E**
 Eggen, S., 267
 Ehrlich, P., 236, 293
 El-sherif, D.M., 368
 Elder, S.A., 178
 Electroporation, 317, 411
 Elias, W.J., 104
 Ellens, N., 11
 Ellis, A.T., 180
 Endocytosis pathways
 caveolae-dependent, 184, 185
 cell membrane potential
 mechanical pressure, 182, 183
 ultrasound insonation, 182
 cellular reactions, ultrasound activation, 182
 endocytosis routes, 182
 fluorescence and electron microscopy, 182
 free-radical formation, ultrasound-induced, 183
 hyperpolarization, 182
 molecule incorporation, cells, 181–182
 primary reaction mechanisms, 183
 ruptured-patch clamp whole-cell technique, 182
 ultrasound exposure, 182
 U-87 MG cells, 184
 Endothelial dysfunction, DN, 311
 Engelberger, R.P., 353
 Escoffre, J.-M., 243–259
- F**
 Fan, Q., 147
 Feinstein, S.B., 331–336
 Fellingner, K., 372
 Field, J.E., 180
 Filonenko, E.A., 11
 Finegood, D.T., 312
 Fjeld, T., 11
 Focal therapy
 brachytherapy, 31
 cryotherapy, 31
 Edouard Herriot experience, 36
 hemi-ablation strategy
 French experience, 35–36
 UK experience, 35
 hemi-salvage, 36–37
 imaging
 patient selection and treatment planning, 31–33
 post-HIFU local recurrence detection, 33–35
 postoperative evaluation, ablated area, 33
 interstitial laser therapy, 31
 radiation therapy, 30
 sub-total HIFU strategy, 35
 transperineal template biopsies, 31
 uni-and multi-focal strategy, UK experience, 36
 “whole-gland” therapy, 30
 zonal treatment (Belgium experience), 35
 Focused ultrasound (FUS)
 acoustic emissions, 299
 advantages, drug delivery, 297–299
 barrier opening, 296–297
 cytoplasmic channels and vesicles, 300
 drug uptake, 300
in-vivo, two-photon microscopy, 300
 microbubble oscillation, 299
 and microbubbles, drug delivery
 Akt activation, 304

- biological agents, 302, 303
- gadolinium-based MRI contrast agents, 300
- neurogenesis, 302–304
- in primate brain, 302
- in rodent models, 301–302
- paracellular space, 300
- physical and cellular mechanisms, 299
- slow leakage, 300
- treatment, 125–126
- Fowley, C., 429–447
- Fowlkes, J.B., 225
- Francis, C.W., 352
- Frenkel, V., 342
- Fry, F.J., 11, 44, 98, 103, 107
- Fujii, H., 268, 319
- Fung, C.H., 397
- Furusawa, H., 71–73

- G**
- Gac, S.L., 180
- Gavrilov, L., 107
- Gavrilov, L.R., 11
- Gedroyc, W.M., 54
- Geers, B., 215
- Ge, H.Y., 86, 90
- Gélat, P., 48
- Gelet, A., 21–37
- Gene and drug delivery
 - drug loaded UCA, 195–198
 - with free drug, 194–195
 - inertial cavitation, 193
 - non-viral
 - chemical methods, 317
 - inflammatory response, 314, 317
 - physical methods, 317–318
 - optimization, 198
 - physical mechanisms, 193, 194
 - therapeutic agent, 193
 - and ultrasound (*see* Ultrasound)
 - viral, 314–316
- Gianfelice, D., 71, 73
- Gibson, D.C., 179
- Ginhoux, R., 124
- Gleizal, A., 404
- Glioblastoma, 442
- Goertz, D.E., 275
- Goto, Y., 312
- Greco, A., 275, 280
- Guignandon, A., 385–419
- Guo, S., 435, 443, 444

- H**
- Haag, P., 275
- Hachimine, K., 435, 442, 443
- Hacker, A., 45
- Hand, J.W., 11
- Hasanzadeh, H., 372
- Hassan, M.A., 183
- Hayton, M.J., 403
- Head and neck squamous cell carcinoma (HNSCC)
 - cetuximab delivery, microbubble-assisted ultrasound, 248–249
 - clinical progression, 248
 - patient morbidity, 248
- Heat-based tumor ablation
 - antitumor immune response (*see* Antitumor immune response, thermal ablation)
 - antitumor immunity dysfunction, 132
 - biological significance, 132
 - clinical treatment, 132
 - cryoablation, 134
 - HIFU ablation, 132
 - in-situ* after thermal ablation, 132
 - and immune response
 - altered cytokine release, 134–135
 - cellular apoptosis, 134–135
 - direct thermal and non-thermal effects, 135
 - hyperthermia, 134
 - indirect effects, 135–136
 - Kupffer cell activation, 134–135
 - microvascular damage, 134–135
 - physical energy absorption, 134
 - tumor blood vessels, direct thermal effects, 135
 - invasive techniques, 131
 - LA, 133
 - local tumor destruction, 132
 - MWA, 133–134
 - RFA, 133
- Heath, C.H., 276
- Heckman, J.D., 415
- Henglein, V.A., 369
- He, Y., 439
- HIFU. *See* High intensity focused ultrasound (HIFU)
- High intensity focused ultrasound (HIFU)
 - antitumor immune response (*see* Antitumor immune response, thermal ablation)
 - brachytherapy failure, salvage after, 30
 - breast systems types, 68–69
 - clinical usage, 5–6
 - description, 4
 - devices
 - Ablatherm® integrated imaging device, 24
 - FocalOne®, 26–27
 - MRgFUS, 27
 - Sonablate 500® device, 25
 - treatment, PCa, 23
 - ERBT failure, salvage after, 29–30
 - exposure dosimetry, 6–7
 - focal therapy (*see* Focal therapy)
 - FUS beam, 67
 - L-dopa, 4
 - multi-element transducer arrays, 7
 - ophthalmological applications, 5
 - of pancreatic cancer (*see* Pancreatic cancer)
 - Parkinsonism, 4
 - “the point-by-point method”, 68
 - primary care treatment, 28
 - principles, 4, 5

High intensity focused ultrasound (HIFU) (*cont.*)
 salvage after HIFU failure
 EBRT, 29
 retreatment, 29
 salvage surgery, 29
 thermal technique, 132
 transducer characteristics, 13, 14
 trans-rectal treatment, prostate tumors, 6
 treatment delivery
 electronic phasing, signal, 7
 extra-corporeal and interstitial devices, 7
 field simulations, 8–9
 frequency effect, 9, 10
 random arrays, 8
 sparse array, 9
 time reversal/adaptive focusing techniques, 10, 12
 transducer geometries, advantages and disadvantages, 9, 11
 transducer materials, 12–13
 “volumetric heating method”, 68
 Hill, C.R., 9
 Hiraoka, W., 438
 Hitchcock, K.E., 352
 Hohfeld, J., 398
 Holland, C.K., 339–355
 Hölscher, T., 347
 Hossmann, K.A., 350
 Hou, C.C., 322
 Hou, C.H., 400
 Howard, B., 376
 Huang, Z., 446
 Hua, X., 352
 Huber, P.E., 70, 73
 Hughes, D.E., 178
 Human periodontal ligament cells (HPDLC), 407–408
 Hundt, W., 138
 Hussein, G.A., 373–375
 Hu, Y., 181
 Hu, Z., 137, 138
 Hwang, J.H., 83–93
 Hynynen, K., 11, 74, 99, 100, 106, 293–304, 347, 390

I
 Ibbini, M.S., 46
 Ikeda, K., 400, 408
 Ikeda, T., 113–127
 Illing, R.O., 14, 45
 Immunotherapy
 Ab-based (*see* Ab-based immunotherapy)
 cytokine gene therapy (*see* Cytokine gene therapy)
 IL-12 based
 anti-tumor effect, 257
 bubble liposome-assisted ultrasound, 256
 IFN- γ secretion, 255–256
 recombinant protein rhIL-12 therapy, 256
 tumor regression, 257
 prophylactic immunization, 243
 Insulin-like growth factor-1 (IGF-1), 403
 Interleukin-8 (IL-8), 402

Iwabuchi, S., 391
 Iwanaga, K., 276

J

Javadi, M., 210
 Jeanmonod, D., 102
 Jiang, L., 88
 Jordao, J.F., 304
 Juffermans, L.J., 267
 Juffermans, L.J.M., 183
 Jung, S.E., 91

K

Kagawa, T., 315
 Kaneda, M.M., 233
 Ka, S.M., 322
 Khiat, A., 71, 74
 Khokhlova, T.D., 83–93
 Kimmel, E., 179, 393
 Kimmelstiel-Wilson lesions, 310
 King, R.L., 107
 Kinoshita, M., 249
 Klibanov, A.L., 205–217
 Klotz, L., 22
 Knuttel, F.M., 65–78
 Kobayashi, D., 374
 Koizumi, N., 113–127
 Kolarova, H., 435, 442
 Kolb, J., 178
 Komori, C., 435
 Kondo, T., 315
 Kopelman, D., 54
 Kornfeld, M., 180
 Koshiyama, K., 180
 Kost, J., 372
 Kotopoulos, S., 209, 272, 280, 285
 Kovatcheva, R., 14
 Kramer, G., 140, 142
 Krasovitski, B., 179
 Kruse, D.E., 138
 Kruus, P., 369
 Kubota, Y., 125
 Kucher, N., 353
 Kudo, N., 180
 Kumagai, K., 402
 Kurz, T., 179

L

Lafon, C., 11
 Lan, H.Y., 320, 322
 Laser ablation (LA)
 antitumor immune response, 144–145
 thermal technique, 133
 Lauer, C.G., 352
 Lauterborn, W., 179, 180
 Lavine, O., 4
 Lawrentschuk, N., 29

- Leeman, J.E., 344
 Legon, W., 107
 Leighton, T.G., 179
 Lentacker, I., 214
 Leong-Poi, H., 309–325
 Leskinen, J.J., 390
 Lewin, P.A., 178
 Liang, B., 378
 Liao, Z.K., 273, 279, 281
 Li, C., 14
 Li, D., 409
 Li, J.H., 442
 Lin, C.Y., 215
 Lindau, O., 180
 Lipsman, N., 104
 LIPUS. *See* Low intensity pulsed ultrasound (LIPUS)
 Li, R., 124, 323
 Lithotripsy
 cavitation control waveform (C-C waveform), 115–116
 cavitation phenomenon, stones
 high frequency, 116–117
 low frequency, 117–119
 stone fragmentation, 119–121
 ultrasound (*see* Ultrasound lithotripsy)
 Litvinov, R.I., 341
 Liu, F., 138, 141
 Liu, G.X., 323
 Liu, H.L., 47, 277
 Liu, M., 316
 Liu, R.H., 178
 Liu, X., 179
 Liver and kidney physiology
 motion compensation strategies, 53–57
 MR guided thermometry and dosimetry, 57–59
 peristaltic motion, 53
 respiratory motion, 52–53
 spontaneous motion, 53
 Longuet-Higgins, M.S., 179
 Loomis, A.L., 368
 Low intensity pulsed ultrasound (LIPUS)
 bio-effects
 intracellular effects, 393–394
 molecular effects, 394–395
 non-thermal effects, 392–393
 thermal effects, 392
 tissue and cellular scales, 393
 biological response, 416
 bone regeneration
 acoustic shock waves, 411–412
 delivery of growth factors, 412–413
 synergistic effect, 410–411
 ultrasound and tissue engineering, 412
 clinical data
 clinical evidence, 413–415
 health economics, 415–416
 regulatory agreement, 413
 extra-cellular environment, 408–410
 healing, bone (*see* Bone healing)
 mechanotransduction
 ATI receptor, 397
 calcium, 395–396
 cell communication, 397
 chemokines, 397
 definition, 395
 ECM, 396–397
 focal adhesions (FAs), 396
 mechanical loading, 397
 YAP/TAZ, 397–398
 mechanotransduction signaling pathways
 chondrogenesis, 408
 osteogenesis, 407–408
 PGE2 and NO signaling messengers, 407
 transmembrane mechanoreceptors, 407
 physics
 dose, 392
 exposure conditions, 387–388
 in-vitro stimulation, 390–391
 rationale for, 388–390
 stimulation, 416–417
 tissue regeneration, 406–407
 Lynn, J.G., 44
- M**
 Madersbacher, S., 6, 140
 Magnetic resonance-guided high intensity focused ultrasound (MR-HIFU)
 application, 78
 benign lesions, 69–70
 clinical breast studies, 72–74
 fat suppression, 66
 feasibility and safety, dedicated breast system, 77
 hepatic and renal cancers, 44
 HIFU treatment guidance, 67
 hyperthermia, 78
 imaging, breast cancer, 66–67
 invasive breast cancer
 with resection, 70–72
 without resection, 72
 in kidney, 45
 laparoscopic transducers, 45
 liver and kidney (*see* Liver and kidney physiology)
 local ablative therapy, 44
 mammography and ultrasound, 66
 metastatic liver tumors, 44
 MR-Thermometry, 45
 neo-adjuvant therapy, 78
 pathology, 76
 patient selection, 72, 75
 phase 2 clinical trial, 77–78
 pre-clinical application, 45
 primary liver cancer, 44
 radio-embolization and systemic chemotherapy, 44
 sentinel lymph node procedure, 76–77
 thermometry, 75–76
 treatment margins, 75
 treatment planning, 77
 ultrasonic beam path (*see* Ultrasonic beam path
 obstruction, thoracic cage)
 ultrasound imaging systems, 44–45

- Magnetic resonance imaging (MRI), breast lesions.
See Magnetic resonance-guided high intensity focused ultrasound (MR-HIFU)
- Mahfouz, M.R., 124
- Mahoney, C.M., 400, 407
- Makino, K., 369
- Maksimov, A.O., 179
- Marin, A., 373, 374
- Marquet, F., 51, 100
- Maruyama, K., 214
- Master, A., 437
- Matkar, P.N., 309–325
- Matsumoto, Y., 113–127
- Matsuo, M., 276
- Matzinger, P., 142
- Maxwell, A.D., 115, 344, 347, 350
- McAteer, J.A., 119
- McGough, R.J., 47
- McHale, A.P., 429–447
- Mechanical ablation
 types, 106
 by ultrasonic cavitation, 106
 ultrasound interaction, biological tissues, 106
- Mechanisms, barrier permeabilization and molecular delivery
 cell membrane and molecular uptake
 endocytosis (*see* Endocytosis pathways)
 membrane wounds, 184–185
 pore formation, 181
 cell membrane permeabilization, 177
 intravascular tracer, microbubbles, 177
 microbubble acoustic phenomena, 178–180
 ultrasound and microbubble insonation, 177
- Mechanotransduction, LIPUS
 ATI receptor, 397
 calcium, 395–396
 cell communication, 397
 chemokines, 397
 definition, 395
 ECM, 396–397
 focal adhesions (FAs), 396
 mechanical loading, 397
 signaling pathways
 chondrogenesis, 408
 osteogenesis, 407–408
 PGE2 and NO signaling messengers, 407
 transmembrane mechanoreceptors, 407
 YAP/TAZ, 397–398
- Meijering, B.D., 267
- Melodelima, D., 11
- Meng, Y., 435, 443
- Meunier, J.M., 352
- Microbubbles
 applications, 192
 diagnostics, therapeutic purposes, 192
 HIFU, 158
 microstreaming
 around air bubble, 178
 asymmetric collapse, 180
 atomistic molecular dynamics simulations, cell membrane models, 180
 biomedical applications, 180
 laser-produced cavitation, 180
 microjets, 178
 oscillations, 179
 physiological stress, 179
 Rayleigh-Plesset equation, 178–179
 shear mechanism, 179
 stable and inertial cavitations, 178
 sonothrombolysis (STL), 192
 UCA formulation (*see* Ultrasound contrast agents (UCAs) formulation)
- Microwave ablation (MWA)
 antitumor immune response, 146–147
 thermal technique, 133–134
- Misik, V., 439
- Mitsubishi, M., 113–127
- Miyoshi, N., 438
- Moan, J., 372
- Mofid, A., 309–325
- Moonen, C., 43–59, 243–259
- Moore, J.S., 370
- Morch, K.A., 179
- Motion compensation system
 beam steering strategies, 55–57
 gating strategies, 54–55
 induced apneas, 54
 MR-guided HIFU intervention, 53
 therapeutic phase, 54
 ultrasound lithotripsy
 FUS treatment, 125–126
 image-guided motion, 124–125
- Mousa, S.A., 350
- MR-guided transcranial FUS
 dyskinesia, 108
 non thermal therapy, 106–107
 obsessive-compulsive disorders, 108
 parkinsonian tremor, 108
 skull aberration correction techniques, 99–100
 skull bone
 acoustic properties, 97
 diagnostic applications, 99
 local density, 98
 mode conversion and acoustic diffusion, 98
 phase aberrations, 99
 transcranial ultrasonic propagation, 98
 ultrasound imaging devices, 97
 thermal lesioning, 107
 thermal therapy (*see* Thermal therapy)
- Mura, M., 125
- Muto, S., 35
- Myhr, G., 372
- Myocardial infarction (MI), 340–341
- N**
- Nakamura, Y., 124
- Naruse, K., 408
- Naudé, C.F., 180
- Nedelmann, M., 352
- Negishi, Y., 214
- Nelson, J.L., 375

- Neurology
 AD (*see* Alzheimer's disease (AD))
 antibody delivery, 245
 BBB permeability, 245
 microbubble-assisted FUS, 247
 molecular mechanisms, brain diseases, 245
- Neuromodulation
 FUS, 107
 low intensity FUS stimulation, 107
 motor stimulation, 107
 MR-compatible transducer, 107
 non-ultrasonic neurostimulation techniques, 107
- Next generation photodynamic therapy (NGPDT), 445–447
- NGPDT. *See* Next generation photodynamic therapy (NGPDT)
- Ng, Y.Y., 322
- Nie, F., 272
- Nitric oxide (NO), 402
- Nomikou, N., 429–447
- Non thermal therapy
 BBB opening, 106
 mechanical ablation, 106
 neuromodulation, 107
- Nyborg, W.L., 178, 342
- O**
- Oda, Y., 252, 285
- Ohl, C.D., 180
- Ohmura, T., 435, 443, 444
- Okada, A., 54
- Oncology
 Abs activity, 247
 biological characteristics, 248
 brain metastatic breast cancer, 249–250
 cancer therapy, 247
 convection-dependent macromolecules, 248
 HNSCC, 248–249
 interstitial transport, Abs, 248
- Or, M., 393
- Orsi, F., 89
- Ortiz-Munoz, G., 315
- Osada, S., 146
- Osaki, T., 442
- P**
- Padilla, F., 385–419
- Pajek, D., 347
- Pancreatic cancer
 clinical management
 cephalic pancreatoduodenectomy, 84
 desmoplastic reaction, 83–84
 diagnosis, 83
 distal pancreatectomy/total pancreatectomy, 84
 gemcitabine, 85
 non-opioid analgesics, 85
 percutaneous endoscopic gastrostomy placement, 85
 stage I disease, 83
 symptoms, 84
 TNM staging system, 84
 treatment approaches, 85
 gemcitabine and HIFU therapy, 92–93
 HIFU devices
 B-mode ultrasound, 85
 FEP-BY-02 HIFU tumor therapy device, 85, 87
 HAIFU, 85
 HIFUNIT-9000, 85
 tissue thermometry, 85
 tumor ablation, 86
 ultrasound reflectance change, 86
 MR-guided HIFU system clinical trials, 91
 of PNETs, 91–92
 preclinical *in-vivo* studies, 87–88
 treatment systems
 acoustic coupling, 86
 HAIFU system, 86
 MR-guided HIFU system ExAblate, 87
 ultrasound-guided HIFU system, 88–91
 Pancreatic ductal adenocarcinoma (PDA). *See* Pancreatic cancer
- Panje, C.M., 270
- Papa, M.Z., 74
- Park, E.J., 249, 281
- Park, H., 409
- Parvizi, J., 401, 405
- Pasticier, G., 29
- Payne, A., 68
- PDT. *See* Photodynamic therapy (PDT)
- Perfluorocarbon nanodroplet
 chemotherapeutic drugs, 221
 defective tumor vasculature, 223
 drug encapsulation, nanocarriers, 221
 energy delivery, 222
 EPR effect, 222, 223
 imaging agents and targeting moieties, 221
 nanomedicine, 221
 nanotechnology, 221
 phase-shift nanoemulsions (*see* Phase-shift perfluorocarbon nanoemulsions)
 tumor tissue, 222
 ultrasound effects, drug delivery (*see* Drug delivery)
- Pernot, M., 8, 11, 57, 99
- Petit, B., 350
- Pfaffenberger, S., 342
- Phase-shift perfluorocarbon nanoemulsions
 acoustically active perfluorocarbon droplets, 226
 albumin/soybean oil-coated PFP microdroplets, 232
 copolymer-stabilized nanodroplets, 233
 droplet-to-bubble phase transition
 non-thermal ultrasound therapy, 228
 in PFCE, 231–232
 ultrasound irradiation, 227
 vaporization (*see* Vaporization, PFP droplets)
 drug-loaded PFC nanodroplets, 226
in-vivo, PTX, 233, 234
 micro-and nanodroplets, 225
 mouse life span, 235
 paclitaxel (PTX), 232
 PFCE core, 235

- Phase-shift perfluorocarbon nanoemulsions (*cont.*)
 polymer-coated perfluorooctyl bromide (PFOB), 225
 polymeric micelles, 226–227
 small animal MRgFUS device, 234, 235
 surfactants, perfluorocarbons and emulsification, 225
 tissue response, ultrasound-induced heating, 236
 tumor therapy, 232–233
 ultrasound-mediated drug delivery, 233
- Phillips, D.J., 99
- Photodynamic therapy (PDT)
 anti-tumor vaccines, 442
 drug loaded UCA, 196
 hematoporphyrin, 436
 photochemical processes, 432
 Photofrin®, 436
 photosensitizer, 432
 ROS mediated ultrasound-responsive cytotoxicity, 434
 sonosensitizers, 434
- Pickworth, M.J.W., 439
- Pisanti, P., 409
- Pitt, W.G., 214, 372–376, 408
- Platelet-derived growth factor (PDGF), 402
- Plesset, M.S., 179
- Prada, C., 49
- Prat, F., 14, 15
- Preece, C.M., 180
- Price, G.J., 369
- Pritchard, N.J., 178
- Prokop, A.F., 344
- Prosperetti, A., 179
- Prostaglandin E2 (PGE2), 402–403
- Prostate cancer (PCa)
 active watchful waiting, 22
 biochemical control, 22
 brachytherapy, 22
 conformal radiotherapy, 22
 HIFU devices, 23–27
 randomized trials, 22
 therapeutic modality, 22
 treatment, HIFU, 22–23
 ultrasound transducer technology, 22
- Pu, C., 274, 278, 281
- Pulmonary embolism (PE), 340
- Puts, R., 385–419
- Q**
- Qiao, X., 323
- Qin, J., 263–287
- Quesson, B., 45, 47, 59
- R**
- Radiofrequency ablation (RFA)
 antitumor immune response
 anti-CTLA-4 antibodies, 144
 on antitumor T cell responses, 143
 clinical management, solid tumors, 142
 ELISPOT assay, 143
 ovalbumin-transfected melanoma, 143
 reduced myeloid-derived suppressor cells, 144
 regulatory T cell depletion, 144
 tumor cell immunogenicity, 142
 thermal technique, 133
- Rapoport, N., 221–236, 372–375
- Raum, K., 385–419
- Ravindranath, M.H., 146
- Rayleigh, L., 162
- Raymond, S.B., 246
- Real-time MR-thermometry/dosimetry
 gated strategy, 58–59
 HIFU sonication, 57
 motion related errors, thermal maps, 58–59
 real-time 3D isotropic thermal maps, 58
 real-time volumetric MR-temperature imaging, 59
 temperature artifacts, 57, 58
- Reher, P., 402, 403, 417
- Reich, G., 368
- Renin-angiotensin system (RAS) blockade, 313
- Ren, L., 400, 407
- Ren, Y., 437
- Richards, W.T., 368
- Ries, M., 43–59
- Riesz, P., 439
- Riley, N., 179
- Ripert, T., 29
- Rivens, I., 15
- Rivens, I.H., 11
- Rooney, J.A., 178
- Rosberger, D.F., 139, 140
- Rosenschein, U., 351
- Ross, S.A., 408
- Rouvière, O., 21–37
- S**
- Saffari, N., 348
- Saint, R., 348
- Saji, H., 144
- Sakharov, D.V., 342
- Sanghvi, N.T., 14
- Sapareto, S.A., 7
- Saqqur, M., 354
- Sarasohn-Kahn, J., 415
- Sazgarnia, A., 437, 439, 445
- Schlicher, R.K., 185
- Schmid, J., 372
- Schmitz, A.C., 72, 75
- Schueller, G., 143
- Schumann, D., 405
- SDT. *See* Sonodynamic therapy (SDT)
- Sena, K., 401, 403
- Sensitizers, SDT, 434–437
- Shanei, A., 443
- Shi, H., 443
- Shima, A., 180
- Shimada, M., 116
- Shi, W.T., 349
- Shi, Y., 315

- Shock wave lithotripsy (SWL)
accelerated stone fragmentation, 114–115
shock wave pulse, 114
tissue damage, 114
- Shpak, O., 157–173
- Sijbesma, R.P., 370
- Si, T., 146
- Skauen, D., 372
- Skull aberration correction techniques
minimally invasive correction, 99
non invasive correction, 99–100
- Smith, M.J., 375
- Sokolov, D.L., 115
- Sonodynamic photodynamic therapy (SPDT), 445–447
- Sonodynamic therapy (SDT)
cancer
in-vitro studies, 441–442
in-vivo studies, 442–445
SPDT and NGPDT, 445–447
chemotherapeutic drug action, 433
drug loaded UCA, 196
PDT, 432–433
ROS, 437–439
sensitizer, cell membrane destabilization, 440–441
sonoluminescence (SL), 439–440
sonosensitizers
ATX-70, 434
chemotherapeutic drug doxorubicin, 437
FUS, 435
human xenograft tumor models, 436
nanoparticle-based, 437
protoporphyrin IX, 435
selection, 434, 435
solid tumors, 435, 436
tumor-specific delivery, 436
stimulus-dependent approaches, 433
stimulus-responsive therapeutic approaches
HIFU, 431–432
RFA, 431–432
ultrasound, low intensity, 433–434
- Sonoluminescence (SL), 439–440
- Sonoporation
application, cancer therapies (*see* Cancer)
cell-ultrasound and microbubble interaction, 186
cell viability, 176
clinical development, 285
contrast agents, 176
encapsulated contrast microbubbles, 177
gene delivery, 176
gene therapy, 263–264
microbubble jetting, 177
microbubble-tissue interaction *in-vivo*, 285–286
molecular delivery mechanisms (*see* Mechanisms,
barrier permeabilization and molecular delivery)
multifunctional microbubbles, 286
optimization of drug delivery protocol, 286
pharmacological activity, drug, 175–176
safety studies, 287
SonoVue® microbubbles, 285
stabilized microbubbles, 186
targeted drug delivery, 175
therapeutic compounds, 186
treatment approaches, 263
tumor microenvironment and pathways (*see* Drug
delivery)
tumor target location, 264
UCAs, 176
ultrasound system, drug delivery, 286
USMB-assisted chemotherapy, 285
vascular permeability, 176
- Sonothrombolysis
acoustic cavitation
Apfel's final golden rule, 348–349
classification, 342–344
endogenous nuclei, 347–348
exogenous nuclei, 348
FUS, 347
passive cavitation detection, 349
sub-megahertz ultrasound, 346–347
TCD, 345–346
ultrasound catheter, 344–345
acoustic radiation force, 342
cardiovascular disease
DVT, 340
myocardial infarction, 340–341
pulmonary embolism, 340
stroke, 340
drugs, 341
ultrasound therapy (*see* Ultrasound therapy)
ultrasound, thermal effects, 342
- Sorace, A.G., 270, 273, 284
- SPDT. *See* Sonodynamic photodynamic therapy (SPDT)
- Stevenson-Abouelnasr, D., 374
- Stone fragmentation, lithotripsy
C-C waveform, 120
cystine stone, 121
eroded stones and fragments, 120, 121
erosion rate measurement, U-30 model, 119, 120
staghorn stone fragments, 120
tissue heating, 121
ultrasound irradiation, 120
- Stride, E., 348
- Sugita, N., 434, 435
- Sung, H.Y., 89, 91
- Sun, J., 99, 139, 140
- Sutton, J.T., 352
- Suvorov, L., 180
- Suzuki, A., 403, 404
- Suzuki, N., 435, 442
- Suzuki, R., 205–217, 256, 274
- Sylvester, J.E., 30
- T**
- Tachibana, K., 184, 352
- Tachibana, S., 352
- Takeuchi, R., 401
- Tang, C.H., 400
- Tang, W.X., 316
- Tanter, M., 51, 97–108

- TCD. *See* Transcranial Doppler (TCD)
- Tempany, C.M., 14
- ter Haar, G., 3–16
- Thakker, D.R., 246
- Thalamotomy
- movement disorders, 101
 - neuropathic pain
 - bleeding, 102–103
 - FUS, 102
 - passive cavitation detection, 103
 - post-treatment MR, 102
 - TcMRgFUS-induced, 102
 - surgical intervention, 102
 - thermal necrosis, 102
 - tremor treatments, FUS, 103, 104
- Thermal ablation, cancer therapy, 16
- Thermal therapy
- Insightec, 101
 - non-invasive TcMRgFUS thalamotomy, 101
 - SuperSonic Imagine, 101
 - technological developments, 100
 - thalamotomy, 101–103
 - treatment envelope expansion
 - cavitation-enhanced heating, 105–106
 - frequency ultrasound beams, 105
 - massive hemorrhage, 105
 - mode conversion, 104
 - numerical modeling, head, 103, 105
 - transcranial FUS therapy, 103
- Thomas, J.L., 99
- Tho, P., 178
- Thrombus. *See* Sonothrombolysis
- Ting, C.Y., 277
- Todorova, M., 269
- To, G., 124
- Tong, R., 365–380
- Tranquart, F., 191–202
- Transcranial color-coded sonography (TCCS).
See Transcranial Doppler (TCD)
- Transcranial Doppler (TCD), 345–346
- Transvascular-interstitial-intracellular pathway
- interstitial transport, 266–267
 - microbubble cavitation, 265, 266
 - tumor parenchymal cells, 267–268
 - vascular integrity modulation, 265–266
- Tran, T.A., 182
- Treat, L.H., 277
- Tsai, C.L., 417
- Tserkovsky, D.A., 443, 444
- Tufail, Y., 107
- Tumor ablation, MR-HIFU. *See* Magnetic resonance-guided high intensity focused ultrasound (MR-HIFU)
- Tumor vasculature
- cellular uptake of drugs, endothelial cells, 268
 - in-vivo* breast cancer model, 269
 - mechanical destruction, 268–269
 - tumor periphery, 269
 - ultrasound-microbubble-cell interaction, 268
- Tuna, E., 124
- Tyler, W.J., 107
- U**
- Ugarenko, M., 372
- Ultrasonic beam path obstruction, thoracic cage
- acoustic beam path obstruction, 45, 46
 - apodization methods, binarized (*see* Apodization methods, geometric ray-tracing)
 - excessive rib heating, 46
 - focal point heating, 46
 - high acoustic absorption, 46
 - high ultrasound absorption coefficient, bone, 46
 - therapeutic transducer, 47
 - time-reversal operator
 - amplitude/phase combinations, 49
 - automatic detection, beam obstruction, 50
 - cavitation-enhanced back-projection, 51–52
 - DORT method, 49, 50
 - intercostal HIFU, 49
 - pulse-echo detection, 51
 - ultrasonic propagation path, 50
 - transducer design types, 47
- Ultrasound
- assisted drug delivery
 - drug and gas microbubbles, co-administration (*see* Co-administration of microbubbles)
 - sonosensitive drug carrier particle, 206
 - bone healing, intracellular signaling pathways, 400–401
 - bubble-assisted
 - applications, 244
 - commercial UCAs, 258
 - cytokine gene therapy (*see* Cytokine gene therapy)
 - delivery methods, 244
 - immuno-stimulating molecules, 244
 - immunotherapy (*see* Immunotherapy)
 - therapeutic ultrasound protocols, 259
 - vaccination (*see* Vaccination)
 - catheter, 344–345
 - cavitation effect, 367–368
 - cellular reactions, 182
 - delivery of growth factors, 412–413
 - drug delivery and UCA
 - characteristics, 198–200
 - with free drug, 194–195
 - optimization, 198
 - drug nanocarriers, 366
 - focused, 347
 - HIFU, 371
 - imaging, 158
 - irreversible payload release and micelles
 - amplification, 379
 - copolymers, 378–380
 - HIFU, 376–378
 - light-breakable micelles, 376
 - metallo-supramolecular copolymer micelle, 378

- liquid-based agents, 158
- mediated drug delivery
 - acoustic streaming and radiation force, 224
 - cavitation phenomena, 223–224
 - drug carriers and biological tissues, 225
 - drug diffusion, 225
 - localized drug release, 225
 - microbubble-based drug delivery systems, 225
 - non-thermal and non-cavitation mechanism, 224
 - phase-shift nanoemulsions (*see* Phase-shift perfluorocarbon nanoemulsions)
 - thermal effects, 223
- micelle and reversible payload release
 - anti-cancer drug, 372–373
 - CW, 375
 - DOX, 374–375
 - frequency, 373–374
 - HL-60 cells, 375
 - micellar drug delivery system, 375–376
 - paclitaxel, 376
 - pluronic concentrations, 373
 - P-105 micelles, 374–375
 - polymeric micelles, 373, 376
 - ultrasound factors, 373
- microbubble oscillations, 158, 182
- PFC liquids, 159
- pore formation, 181
- sonochemistry
 - degradation, 368–369
 - in-situ polymerization, 370
 - polymerization, 369–370
 - site-specific degradation, 370–371
- SonoVue microbubbles, 182
- stimuli-responsive nanocarriers, 366
- sub-megahertz, 346–347
- thermal effects of, 342, 367
- tissue engineering, 412
- Ultrasound contrast agents (UCAs) formulation
 - clinical translation and regulatory issues
 - acoustic parameters, 201
 - CMC dossier preparation, 200
 - gas microbubble, 200
 - in-vitro*/preclinical tests, 200
 - quality control, 200
 - for therapeutic use, 201
 - in ultrasound imaging, 201
 - drug delivery
 - inertial cavitation, 193
 - physical mechanisms, 193, 194
 - therapeutic agent, 193
 - and ultrasound (*see* Ultrasound)
 - quality control methods, 198, 199
 - shell component selection, 192–193
 - for sonothrombolysis, 348
 - stability and lifetime, 193
- Ultrasound-guided HIFU system
 - acoustic pathway, 88
 - deep vein thrombosis, 91
 - inclusion criteria, patient, 88
 - pain palliation, 89
 - pancreas exocrine secretion, 89
 - pancreaticoduodenal fistula, 91
 - pancreatitis, 88
 - patient positioning, 88
 - PET-CT, 89, 90
 - thermal ablation, 89
 - tumor ablation and viability, 90
 - tumor volume, 88
- Ultrasound-guided microbubble (USMB) treatments
 - animals studies, cancer therapy, 271–277
 - antitumor agent and microbubbles administration
 - intraperitoneal injection, 271, 278
 - intratumoral injection, 271
 - intravenous injection, 271
 - clinical translation, 269
 - drug-loaded microbubbles, 270
 - duty cycles, 278–279
 - exposure duration, 279
 - frequency, 278
 - imaging-guided application, 269
 - intensities, 278
 - mechanical index, 278
 - microbubbles and drug mixture, 269–270
 - schedule, treatment, 279
 - treatment protocol, 269, 270
- Ultrasound lithotripsy
 - motion compensation system, 124–126
 - stone erosion volume, 123–124
 - subharmonic detection
 - air-backed ultrasound transducer, 122
 - C-C waveform sequence, 121
 - concave focused hydrophone, 122
 - eroded model stones and erosion volume, 123
 - lower intensity exposure, 122
 - signal amplitude, 123
 - subharmonic signal level, 123–124
- Ultrasound-mediated gene delivery (UMGD)
 - diabetic nephropathy
 - BM-MSCs, 324
 - in-vivo* transfection, 320, 321
 - kidney disease, 322–323
 - microbubbles, 324–325
 - miR-21, 324
 - miRNAs, 321, 324
 - TGF- β 1, 320–321
 - TGF- β /Smad pathway, 325
 - in-vivo* applications, 319
 - methodology and mechanisms, 318–319
 - microbubbles, 318
 - therapeutic strategy, 310
- Ultrasound therapy
 - 3D CT-scans, 100
 - sonothrombolysis
 - catheter-directed thrombolysis, 353
 - ex-vivo*, 350
 - in-vitro*, 350
 - in-vivo*, 350
 - thrombolytic, microbubbles, 351–352
 - transcranial insonation, 353–354

- Ultrasound transducers
 CMUTs, 13
 medical, 13
 MR guided HIFU, 12
 multi-element pseudo-random array, 12
 piezo-ceramic material, 13
 polyvinylidene fluoride (PVDF), 13
 Umemura, S., 433, 435, 439
 UMGD. *See* Ultrasound-mediated gene delivery (UMGD)
 Un, K., 212, 254
 Urban, M.W., 11
- V**
- Vaccination
- DC based
- Ag-encoding pDNA, 252–254
- bubble-assisted ultrasound, 254
- DNA immunization, 254
- immune-modulating molecules/adjuvants, 251
- killed pathogen-based, 251
- live attenuated, 251
- melanoma-derived Ag proteins, 251–252
- melanoma lung metastasis reduction, 252, 253
- mRNA-based immunization, 254
- prophylactic immunization, 252
- prophylactic and therapeutic immunizations, 244
- Vallancien, G., 45
- van den Bosch, M.A.A.J., 65–78
- Van Velthoven, R., 35
- Vaporization, PFP droplets
- catalytic effect, 230
- droplet-to-bubble transition, 229
- micrometer-sized albumin-coated, 228
- pharmaceutical emulsion formulations, 229
- physical mechanisms, 230
- physico-chemical aspects, 228
- pressure dependence, 229
- superharmonics, 231
- ultrasound-induced vascular permeability, 229, 230
- Vascular endothelial growth factor (VEGF), 402
- Verbeuren, T.J., 350
- Versluis, M., 157–173, 228
- Verweij, M., 157–173
- Vico, L., 385–419
- Vignon, F., 349
- Vincenot, J., 11
- Virchow's triad, 340
- Vogel, A., 180
- Vogl, T.J., 144
- Volkmer, E., 409
- Vyas, B., 180
- W**
- Wang, C., 178
- Wang, F.S., 403
- Wang, J., 378
- Wang, K., 86, 89–90
- Wang, S.J., 417
- Wang, T.-Y., 263–287
- Wang, X., 139, 140, 316, 442, 444, 445
- Wang, X.L., 271
- Wei, M., 312
- Weisel, J.W., 341
- Westermarck, S., 351
- Whitney, N.P., 401
- Wiita, A.P., 379
- Willmann, J.K., 263–287
- Wood, A.K., 268
- Wright, C., 351
- Wu, F., 14, 45, 85, 89, 131–148
- Wu, J., 178, 179, 344
- X**
- Xia, H., 365–380
- Xia, J.Z., 137
- Xiang, J., 442
- Xiao, L., 323, 324
- Xie, F., 344, 352
- Xing, W., 280
- Xing, Y., 137
- Xiong, L.L., 89
- Xi, X., 114
- Xuan, J., 379
- Xu, Z.L., 141, 142
- Xu, Z.Y., 435, 442
- Y**
- Yamaguchi, K., 276
- Yan, F., 273, 281
- Yang, R., 136, 137, 146
- Yang, S.M., 316
- Yao, L.C., 146
- Yen, T.T., 312
- Yoo, S.S., 107
- Yoshino, S.I., 444
- Yoshioka, M., 312
- Yoshizawa, S., 113–127
- Younan, Y., 107
- Yount, D.E., 347
- Yuan, F., 316
- Yuan, G., 315
- Yu, B.F., 272, 280
- Yu, H., 179
- Yumita, N., 433, 435, 440, 442, 443
- Z**
- Zeghimi, A., 175–186
- Zeng, Y., 375
- Zentner, G., 372
- Zerbini, A., 143
- Zhang, K., 211
- Zhang, Y., 137, 139, 315, 320, 323, 324, 376
- Zhao, C., 371

Zhao, Y., 365–380
Zhao, Y.Z., 273, 279
Zheng, L., 442
Zheng, S., 312
Zhong, P., 114, 121

Zhong, X., 323, 324
Zhou, Q., 138–140
Zhou, S., 272, 400
Zhou, Y., 181, 316
Zippel, D.B., 74