

INDEX

A

- Absorbance.....17, 29, 32, 55–58,
61–70, 196, 266, 275, 311
- [2-¹³C]Acetate.....224, 225, 299, 300,
316, 328
- Acid-base flux.....28, 37–40
- Action potentials248–252
- Adenosine triphosphate (ATP) 61, 122, 139,
153, 161, 162, 186, 187, 196, 197, 200, 201, 204–207,
211, 214, 223, 261, 262
- Adiabatic approximation to the tissue homogeneity model
(AATH)..... 271–273, 285, 286
- Amino acids.....12, 74, 75, 84, 87–89,
99–101, 113, 115–117, 121, 125–127, 129, 131, 161,
179, 221, 228
- α -Amino-3-hydroxy-5-methyl-4-isoxazolepropionic
acid (AMPA)..... 236, 238, 239, 250
- Aminooxyacetic acid (AOAA)14
- Anaplerosis122–123, 129, 232,
294, 315–317
- Anesthetics32, 243–246, 280–282, 310
- Arterial-venous difference in oxygen.....273
- Astrocytes2, 25, 45, 74, 108, 146,
196, 218, 248, 300
- Atomic absorption spectrometer (AAS).....219,
223, 224
- Autoquenching.....164–166

B

- Background correction 149, 169
- Bioluminescence.....196, 200–204, 206,
207, 209, 213
- BLAST tool 180, 182, 183
- Bleaching.....148, 149, 156–157, 167
- Bleedthrough correction.....150
- Blood-brain barrier
permeability.....266, 285
transport 344, 347, 354
- Brain
activity 243–244, 246, 251
imaging.....260, 298, 342, 343, 356
- Broadband Continuous-Wave NIRS..... 270, 271,
275–276, 280
- Buffer capacity.....28, 36–40

C

- Calcium (Ca₂₊)
transients259–262
- Calculations of isotopic enrichment109
- Calibration
FRET sensor150
induced metabolic bioluminescence
imaging.....209
pH sensitive electrodes 36–38, 40–42
- Capnograph.....244, 245
- Carbon isotope 91, 92, 96–98, 100, 109, 313
- CCD camera 146, 148, 149, 167, 202, 205, 275
- Cell culture equipment 48, 76, 112, 115
- Cerebellar granule neurons cultures (CGNCs) 46, 47,
50–53, 56–60, 62, 63, 65–67, 70, 75, 113, 114, 118,
119, 136
- Cerebellum 9, 52, 75, 77, 78, 81, 102,
220, 221, 254–256, 259, 260
- Cerebral blood flow (CBF)..... 245–247,
252–262, 266–271, 273–275, 277, 279–284,
286–288, 343, 347, 362, 363
- Cerebral blood volume (CBV) 266, 269, 270,
273, 274, 283
- Cerebral metabolic rate of glucose (CMR_{glc})..... 343, 351,
361, 363
- Cerebral metabolic rate of oxygen (CMRO₂)245,
253, 254, 256, 257, 260–262, 266, 273–277, 279–284,
286, 287, 363
- Chemical shifts..... 116, 300–302
- Chemiluminescence.....14, 196
- α -Chloralose.....244, 245
- Clearance..... 3, 10, 11, 272, 273, 344–349,
351–356, 362
- Co-cultures.....46, 76, 77, 79, 80, 102
- Compartmentation14, 74, 111, 129, 146,
162, 163, 171, 175, 217–239, 249, 271, 272, 274,
293–333, 343–347, 349–356
- Confocal microscopy 146, 148, 149,
157, 162, 169, 170, 173
- Contrast-enhanced imaging 266, 285, 288–289
- Cortical brain tissue slices 220, 224, 239
- Cranial window246–247, 259
- cRNA27–33, 40
- Cryo-preservation.....197

Cyan fluorescent protein (CFP) 146–149, 157
Cytochalasin B 153–155

D

Data scatter 322, 330–332
Decoupling 116, 229–231, 301–305,
308, 331, 332
Differential centrifugation 10–11
Differential pathlength factor 276
Diffuse correlation spectroscopy (DCS) 266,
278–282, 286
3,3'- Dihexyloxacarbocyanine iodide
(DiOC₆(3)) 162, 164, 171–175
Dynamic contrast-enhancement (DCE) 266, 269,
271, 279, 280, 284–288

E

Electrochemical proton gradient 161
Electrodes 3, 17, 28–31, 33–41,
246–251, 254–257, 259
Electroencephalogram (EEG) 250, 251
Electron transport chain (ETC) 161, 171
Electrophysiology 27, 30–31, 33–38, 40,
79, 221, 247, 259, 262
Endothelium permeability 267, 285–286

F

Fick principle 267, 273, 274
Ficoll gradients 3, 4, 7, 9, 11, 12, 17
Field excitatory postsynaptic potential
(fEPSP) 250, 252–254, 258, 260–261
Fitting 3, 11, 16, 36–38, 127,
130–133, 226, 233, 235, 273, 278, 279, 282, 285, 286,
298, 308, 317, 320, 322–323, 325, 332
Flow cytometry 162, 164, 171–173
Fluorescence ratio 146, 149, 150, 156–158
Fluorescent dye for mitochondrial membrane
potential 59
Fluorescent indicator 164
2-Fluoro-deoxy-glucose (FDG) 198
Flux
analysis 107–143
estimation 108, 111, 113–134, 145
Focus drift 149, 157
Foerster resonance energy transfer (FRET) 146–150,
152, 156
Frog 26, 29, 32

G

γ-Amino-butyric acid (GABA) 77, 79, 81,
95, 97, 225, 227, 230, 232, 236, 238, 239, 257, 261,
313–316, 326

Gas-Chromatography-Mass Spectrometry
(GC-MS) 73–102, 113, 126,
127, 129, 134

Gene homology 180, 182
Glial fibrillary acidic protein (GFAP) 12, 46,
47, 50, 53

Glucose

assay 61–63, 66
[1-¹³C] glucose 85, 94, 95, 112, 115,
123, 126, 129, 134, 224, 225, 299, 300, 306, 307, 311,
315–316, 320, 328–329
¹³C glucose 75, 85, 86, 90, 91,
93–99, 117, 122, 303, 311, 315–317, 319, 320, 324, 328
¹⁴C glucose 2, 5–7, 16, 97
imaging by FRET nanosensor 147
phosphorylation 153, 342, 344, 347,
349–357, 359
transporter (GLUT) 146, 150, 151,
153–155, 158

Glucose-6-phosphate dehydrogenase
(G6PDH) 61–63, 201

¹⁴C Glutamate 2

¹³C Glutamate/glutamine 12, 94, 95, 99–101,
129, 308, 313, 316

Glutamate pyruvate transaminase (GPT) 64, 65

Glutathione
disulfide (GSSG) 66–70
reductase (GR) 67, 68

GLUT-block method 153–155, 158

Glycogen 71, 85, 87–90, 117

Glycolysis 85, 94–99, 108, 117,
121–123, 125, 127, 129, 130, 135, 145, 146, 151,
153–156, 198, 199, 213, 315, 316, 347, 349

Glycolytic flux 145, 150, 153, 198

Glycolytic rate 154, 155, 157, 158

Gradient-Enhanced Heteronuclear Multiple
Quantum Coherence (HMQC) 306–307

Guinea pigs 219–221, 223

H

Hemoglobin 257, 274, 275, 284

Heterologous protein expression 25–42

Hexokinase (HK) 61–63, 150–154,
201, 344, 349–351, 355

High-pressure liquid chromatography
(HPLC) 113, 115, 126, 184

Hippocampus 147, 149, 221, 252, 255

I

Immunocytochemistry 47

Indocyanine green (ICG) 266–268, 270,
271, 274–278, 280, 283–287

- Induced metabolic bioluminescence
imaging (imBI) 195–214
- Injection pipette 3, 12, 15, 78,
112, 114
- Inner mitochondrial membrane 161, 162
- Instrument response function (IRF) 277, 278
- In vivo autoradiography 362
- Iodoacetic acid 150
- Ionophore 31
- Isoflurane 244, 282
- Isotopic transient 110–111, 125–134,
138, 139
- J**
- J-coupling 301, 302, 304, 306
- K**
- Ketamine 244, 245
- α -Ketoglutarate/glutamate exchange 293, 329
- Kinetic modelling 270–271, 285, 312, 343
- Kinetics 5, 7, 55, 68, 148–151, 196, 204, 206,
207, 225, 259, 270, 285, 294–296, 298, 304, 307, 311,
312, 317, 320, 330, 345, 349, 353, 355, 358
- Knockdown
verification 189–190
- Krebs cycle flux 394
- L**
- Lactate 2, 5, 7, 16, 25–42, 46, 55–58,
64–66, 84, 94, 96, 98, 113, 115–118, 123, 126, 128–131,
155, 198–201, 203, 209–214, 223–227, 230, 232, 313,
315–316, 319, 320, 328
- Lactate dehydrogenase (LDH) 46, 54–58,
61, 64, 65, 201, 225
- Laser-Doppler flowmetry (LDF) 256–258
- Live cell microscopy 169
- Local field potentials 251
- Luciferase 189, 196, 201
- Luminometry 195–214
- Lumped constant (LC) 344, 345,
350–352, 357–363
- M**
- Magnetic resonance imaging (MRI) 26, 266,
289, 295, 298, 310, 359, 363
- Magnetic resonance spectroscopy
(MRS) 199, 293–333
- Malate-aspartate shuttle 127
- MAP-2 46, 47, 50, 53
- Mass balance equations 321
- Mass spectrometry (MS) 29, 73–102, 109,
110, 113, 126–127, 129, 134
- Mathematical modeling 110, 132, 151,
327, 343, 352
- McIlwain tissue chopper 219
- Membrane potential 28, 162–175, 248, 253
- Metabolic
flux 108–111,
113–135, 145
- flux analysis 107–143
- heterogeneity 196–198, 213, 226
- imaging 196, 213, 343
- model 294, 298, 309, 317–324,
326–329, 333
- network 108, 109, 118–121, 124,
127–130, 136, 137, 140
- network design 108, 117–120, 127–128
- Metabolite
export 45–71
- extraction 112, 114, 115, 126,
127, 197, 229
- local distribution 195–214
- Metabolomics
multivariate statistical approaches 231
- Micromanipulator 29, 30, 34, 40
- Mismatch 182, 183
- Mitochondria
bioenergetics 161–176
- membrane potential 162–175
- non-synaptic 2–4, 11, 12, 15
- redox state 161
- synaptic 2–4, 12, 15
- Monocarboxylate transporters (MCTs) 25–29,
31–34, 37–40, 42, 208, 228
- Monte-Carlo procedure 322, 323
- Multidrug resistance transporter 165
- Multivariate statistical approach 232–236
- N**
- Nanosensor 145–158
- Near-Infrared Spectroscopy (NIRS)
time resolved (TR) 276–278, 285, 287
- Nernst distribution 162, 164
- Neuroanatomy 343
- Neurons 1, 26, 45, 73, 108, 146, 166,
187, 217, 247, 265, 295, 343
- Neuropharmacology 217–239
- Neurovascular coupling 218
- ^{15}N glutamate/glutamine 101–102
- Non-invasive measurement 199, 213, 274, 284
- Nonparametric modelling 267–270
- Non-stationary ^{13}C -MFA 110
- Nuclear magnetic resonance (NMR) 2, 74, 75,
85, 94, 99, 109, 113, 116, 122–123, 135, 219, 224,
226, 229–231, 245, 293, 302, 305–306, 320
- Nuclear magnetic resonance spectroscopy (MRS)
 ^{13}C 293–295, 300, 303–305,
308–310, 313, 315, 317–323, 326, 332, 333
- ^1H -observed, ^{13}C -edited (POCE) 303, 305–306

O

Off-target effects 180–182
 Oocyte
 Xenopus laevis 26, 29
 Oxidation 2, 3, 5, 6, 12–18, 64, 65,
 68, 94, 170, 294, 299, 300, 313, 314, 316
 Oxygen consumption 146, 256, 273, 281, 362, 363

P

Parallel pathways 108, 122–123
 Parameter estimation 130–131
 Parametric modelling 267, 270–273
 Partial pressure of oxygen 256–259
 Pentose phosphate pathway (PPP) 2, 85, 97–99,
 108, 122, 123, 125, 127, 129, 130, 135
 Perfusion chamber 158
 2-Photon laser scanning microscopy
 (2PLSM) 259–260
 pH-sensitive microelectrodes 26, 28–29, 34–42
 Polarization transfer 304–305, 308
 Positron emission tomography (PET) 145, 198,
 199, 286, 341–363
 Primary culture
 astrocytes 3, 45–71, 74–77, 79, 81,
 82, 99, 102, 111, 114, 125, 134
 neurons 1, 3, 45–71, 74–77, 79,
 81, 82, 99, 102, 117, 121
 Promoter 29, 178, 182, 183, 185
 Propidium iodide (PI) 46, 55, 59–61,
 164, 170, 172–175
 Protein assay 15, 113, 116, 219, 229
 Pulse oximeter 244, 245
 Pyruvate dehydrogenase (PDH) 85, 94–101,
 108, 122–124, 129, 135, 201, 225

Q

Quantitative imaging 196, 213

R

Radioisotopes 2, 5, 7, 8, 17
 Rat 1–3, 9, 12–14, 16, 27, 29, 40, 46–53,
 75, 113, 114, 183, 189, 208, 244, 246, 285, 303, 305
 Real-time imaging 149
 Redox state 71, 161
 Rhodamine 123 (Rh123) 162–170, 175
 RNA-induced silencing complex
 (RISC) 177, 181, 183
 RNA interference
 in-vivo 183, 190–191
 small interfering RNA (siRNA) 178, 181–191

S

Serial sectioning 201, 202, 209
 Short hairpin RNA (ShRNA) 178, 181–191

Single Quantum Coherence (HSQC) 306–307
 Spectral editing 306
 Spike 249–252, 254–255, 260, 261, 331, 332
 Steady state 109, 110, 126,
 135, 151–154, 158, 163, 165, 166, 169, 173, 195, 296,
 313, 319, 321, 326, 328, 329, 346, 348, 352, 353, 356
 Subcellular fractionation 11, 299
 Substrate competition 14
 Synaptic activity 251, 253, 254, 260–262
 Synaptosomes 1–22

T

Targeting gene region 181
 TCA cycle flux 325
 Tetramethylrhodamine methyl ester
 (TMRE) 162–170, 173, 175
 Tomography 198, 266, 286, 288, 341–363
 Tracer
 kinetics 5, 270, 271, 345, 353, 358
 Transfection
 efficiency 148–149, 187–189
 Transmembrane rates 108, 116–117, 119,
 120, 122, 131
 Transport 1, 25–42, 48,
 54, 79, 81, 84, 111, 129, 146, 150–153, 155, 156, 158,
 161, 165, 170, 226–228, 236, 239, 271, 272, 279, 294,
 307, 313–315, 320, 332, 344, 347, 348, 350–354
 Tricarboxylic acid (TCA) cycle 2, 75, 85, 94–101,
 117, 121–123, 125–127, 129, 130, 238, 299, 311,
 313–316, 325, 326, 328, 332
 Tumor metabolism 198–199, 211

U

Urethane 244

V

Vascular space 344, 347, 352, 353, 358
 Vectors 27–29, 120, 122, 130,
 148, 149, 178, 181–189, 191, 233, 235, 270
 Viability 46, 53–61, 67, 78, 82, 175, 223
 Vigabatrin 238, 239
 Viral delivery 190–191
 Voltage clamp amplifier 31
 Voltage gated ion channels 248

W

Warburg metabolism 198, 199

X

Xylazine 244, 245

Y

Yellow fluorescent protein (YFP) 146–149,
 156, 157