Index

η/s
  at weak coupling, 38, 165
  examples where $< 1/(4\pi)$, 167
  from lattice QCD, 78
  in $\mathcal{N} = 4$ SYM plasma, 163, 166
  in heavy ion collisions, 16, 37, 166, 168
  in hydrodynamics, 16, 37, 166
  universality of, 163
$\mathcal{N} = 4$ SYM plasma
  η/s, 163, 165
  and the AdS black brane, 109
  at weak coupling, 154, 165
  compared to QCD, 150, 156, 188, 282, 321
  conductivity, 173
  entropy, 154
  heavy quark transverse momentum broadening, 268
  jet quenching parameter, 315, 319
  light quark stopping distance, 302, 306, 310
  no jets in $\mathcal{N} = 4$ SYM theory, 301, 305, 312, 323
  quarkonium in, 299, 356
  quenching a gluon beam, 323
  quenching colorless "jets", 304
  susceptibilities, 156
  thermodynamics, 153, 156, 207
  wake and Mach cone from heavy quark, 293, 296

AdS black brane, 109, 201, 405, 410

baryon number chemical potential μ_B in heavy ion collisions, 12
Bjorken boost-invariant hydrodynamics
  solution for ideal hydrodynamics, 233, 235
  solution for viscous hydrodynamics, 237
Bjorken estimate of energy density, 6
Boltzmann transport theory, 181
bulk-to-boundary propagator, 295, 324

centrality, 18
chiral magnetic effect, 174, 176, 177
chiral vortical effect, 174, 175, 177
conductivity
  $\mathcal{N} = 4$ SYM plasma, 173
  $\mathcal{N} = 4$ SYM plasma with fundamental matter, 173, 389
  quark–gluon plasma, 173

D3/D7 mesons
  black hole embedding, 357
  dispersion relations, 345, 372, 374
  dissociation transition, 358, 366, 383
  in plasma, 356
  in vacuum, 353
  limiting velocity, 345, 375, 384, 392
  Minkowski embedding, 357
  photon emission, 390
  spectral function, 386
  spectrum, 373
  thermodynamics, 360
  widths, 345, 372, 379
D3/D7 system, 144, 149, 158, 265, 301, 347, 349
drag force, 265

eccentricities, 18
entropy current, 203, 210

far-from-equilibrium dynamics
  boost-invariant, 239
  colliding sheets of energy, 254
  constructing initial states, 214
  from gravity, 212, 216, 239, 255
  in heavy ion collisions, 195, 212
flow
  η/s, 16, 166
  elliptic, 21, 25, 34
  event-by-event fluctuations, 24
  higher order, 22, 37
  hydrodynamics of, 16, 25, 34
  hydrodynamization, 16, 36

https://doi.org/10.1017/9781009403504.016 Published online by Cambridge University Press

in heavy ion collisions, 15, 17, 168
initial conditions, 24, 37
observables, 18, 21, 24, 34, 37

gauge/gravity duality
and $\mathcal{N} = 4$ SYM theory, 98, 104
and AdS, 97
and D-branes, 101, 106
and hydrodynamics, 194
and large-N_c gauge theory, 94, 101
and renormalization group flow, 93, 112
and string theory, 98, 114
at nonzero chemical potential, 124, 156
at nonzero temperature, 109, 122
correlation functions, 126, 160, 185, 190, 279, 406
dictionary, 109, 113
flavor branes, 144
for a confining theory, 124
fundamental matter, 143, 147, 265, 301, 347
normalizable vs. non-normalizable modes, 119
one-point functions, 128, 408
real-time two-point functions, 130
symmetries, 116
the AdS/CFT conjecture, 108, 111
the field/operator correspondence, 117
two-point functions, 408
Wilson loops, 114, 134
Green–Kubo formula, 160, 403

heavy ion collisions
baryon number chemical potential μ_B, 12
boost invariance in, 234
centrality in, 18
chemical freezeout, 11
energy density, 6
equilibration, 16, 249
flow, 15
hydrodynamization, 30, 36, 249
J/ψ suppression, 59
jet quenching, 39
kinetic freezeout, 11
multiplicity, 5
quarkonia in, 58, 79
spectra, 8
heavy quark diffusion
density matrix, 271
diffusion constant, 270, 281
diffusion constant from lattice QCD, 283
diffusion constant inferred from experimental data, 285
Einstein relation, 270
in $\mathcal{N} = 4$ SYM plasma, 281
in heavy ion collisions, 284
in weakly coupled QCD plasma, 282
Kubo–Martin–Schwinger relation, 276
Langevin equation, 268
longitudinal momentum broadening, 280
transverse momentum broadening, 279
heavy quark drag
and energy loss, 262, 265, 267
and transverse momentum broadening, 268
hydrodynamic response, 287
response of the strongly coupled plasma, 286
via trailing string, 262, 264
wake and Mach cone, 287, 291
wake and Mach cone in $\mathcal{N} = 4$ SYM plasma, 293, 296
heavy quark static potential, 60, 80, 88, 338, 342, 383
holographic renormalization group, 112
holographic stress tensor, 410
hot wind effect, 63, 344
hydrodynamics
and gauge/gravity duality, 194
and quantum anomalies, 174
and quasinormal modes, 192
as ripples on a dual black brane, 196, 203
boost-invariant, 234, 235
conformal, 32, 33
formulation of, 28, 197
from gravity, 198, 201, 204, 411
holographic stress tensor, 411
ideal, 26, 30, 207
plasma disturbance from heavy quark drag, 286, 287
second order, 32, 170, 211
viscous, 16, 31, 32, 210
hydrodynamization
and horizon formation, 219, 228, 242
and quasinormal modes, 193, 230, 246, 335
before isotropization, 30, 247, 257
boost-invariant, with radial flow, 253
colliding sheets of energy, 254
in heavy ion collisions, 16, 30, 36, 195, 223, 249, 259
isotropization of homogeneous plasma, 216, 222, 224
of boost-invariant plasma, 233, 237, 249
timescale, 16, 195, 222, 228, 241, 244, 252, 258

jet quenching
"lost" energy, 43, 337
and quenching a gluon beam, 337
dijet angular distribution, 43
dijet asymmetry, 41, 42
modeling of, 55, 56
Monte Carlo calculation of, 54
observables, 39, 41–43, 54, 55
R_{AA}, 41, 43, 48
jet quenching parameter $\hat{q}$
and jet quenching models, 56
and parton energy loss, 49–51, 53, 55
and transverse momentum broadening, 312
in $\mathcal{N} = 4$ SYM plasma, 319
in heavy ion collisions, 56
via gauge/gravity duality, 315

https://doi.org/10.1017/9781009403504.016 Published online by Cambridge University Press

Langevin equation
  Einstein relation, 270
  heavy quark diffusion, 270
  momentum broadening, 268
lattice QCD
  conductivity, 173, 188
  heavy quark diffusion constant, 283
  heavy quark static potential, 81, 88
  maximum entropy method, 86
  nonzero μ_B, 66
  phase transition, 68
  quarkonium dissociation, 80, 89
  shear viscosity, 77
  spectral functions, 84, 86, 188
  susceptibilities, 70, 157
  thermodynamics, 65, 66, 156
  transport coefficients, 73
light quark stopping distance
  and quenching a gluon beam, 334
  maximal vs. typical, 310
  via colorless "jets", 306, 310
  via falling strings, 302
longitudinal momentum broadening
  heavy quark, 276

Mach cone, 287, 298

parton energy loss
  and R_{AA}, 48
  BDMPS-Z, 51, 313
  in heavy ion collisions, 48, 54
  in the eikonal limit, 50
  via Cherenkov emission of quarkonia, 392
  via drag, 262, 264, 267
  via heating the plasma, 337
  via radiation, 267
Penrose diagram, 201, 318

quarkonium suppression
  cold nuclear matter effects, 63
  dissociation, 89, 338, 344, 358, 368
  formation time, 63
  hot wind, 63, 340, 344, 372, 378, 383
  imaginary potential, 90
  lattice calculations, 80, 81, 84, 85, 89
  recombination, 64
  sequential, 61
quasinormal modes, 133, 170, 191, 230, 246, 332
quasiparticles
  absence of, 17, 38, 70, 158, 179, 185, 188, 385
  and spectral function, 183
  and transport peak, 179, 184
  in $\mathcal{N} = 4$ SYM plasma?, 185
  in perturbation theory, 180
  in quark–gluon plasma?, 188
quenching a gluon beam
  "lost" energy becomes sound waves, 330, 336
  and jet quenching, 323, 337
  producing a collimated beam of gluons, 324
  stopping distance, 334, 337
  via quasinormal modes, 332, 337
  without the beam spreading, 328, 335
quenching colorless "jets" in $\mathcal{N} = 4$ SYM plasma, 304
quenching light quarks in $\mathcal{N} = 4$ SYM plasma, 302

radiation from an accelerating quark, 266, 324, 327
rapidity vs. pseudorapidity, 14
relaxation times, 171

screening, 58, 59, 79, 81, 85, 338, 368, 378, 383
screening length, 342
susceptibilities
  calculated holographically, 156, 158
  in $\mathcal{N} = 4$ SYM theory plasma, 157
  in QCD, 157
  off-diagonal, 73, 158
  via lattice QCD, 70

trailing string
  drag force, 264
  fluctuations of, 276
  formulation, 262
  Hawking radiation on the worldsheet, 278
  Nambu–Goto string action, 263
  plasma response, 286
  regime of validity, 265
  stress tensor, 293
  worldsheet horizon, 277
transport coefficients
  anomalous, 176
  bulk viscosity, 168
  calculation of, 403
  holographic calculation of, 160, 168
  lattice calculation of, 73, 75, 77
  perturbative calculation of, 74
  second order, 170
  shear viscosity, 163, 210, 403
transverse momentum broadening
  and Hawking radiation on the worldsheet, 281
  and jet quenching, 40, 313
  and light-like Wilson loop, 51, 275, 313
  heavy quark, 268, 270, 276, 279
  light quark, 51, 312

Wilson loops
  and quarkonium suppression, 338, 340
  and screening, 340
  and transverse momentum broadening, 51, 313
  at nonzero temperature, 140
  at zero temperature, 137
  in a confining theory, 141
  light-like, 51, 313, 315
  via gauge/gravity duality, 134, 340

https://doi.org/10.1017/9781009403504.016 Published online by Cambridge University Press