

GLOSSARY, Exploring Black Holes

MANY TERMS ARE ALSO DEFINED INSIDE THE BACK COVER

WORDS NOT USED IN THIS BOOK, EXCEPT IN QUOTATIONS, MATHEMATICAL EXPRESSIONS, OR NEWTON'S ANALYSIS. (SEVERAL TERMS ARE MENTIONED ONCE IN ORDER DISMISS THEM.)

absolute, absolutely, actual, actually, amazing, angular momentum (with no modifier), beam (used for global motion of light only), component (never for global quantities; instead use "r-motion" or "phi-motion"), correct, distance (with no modifier), endless, energy (with no modifier), established, eternal, eternally, everyone knows that, exact, exactly, fact, in fact, forever, geodesic (instead: worldline of a free particle), Hertz, imaginary, impossible (better: forbidden by the current laws of physics), incredible, incredibly, infinite, infinity, infinitely, Minkowski spacetime (instead, say flat spacetime), never, obvious, obviously, permanent, proof, proper time, radius, radial (OK for the non-spinning black hole), real, reality, rest mass, scalar, Schwarzschild radius, space (with no modifier), tensor, time (with no modifier), trajectory, true, truth, vector, why (asking for purpose or intention).

We are not creating a new dogma here. "Why" and "fact" and "truth" are not forbidden in everyday discussion, for example in analysis of human motivation. But our careful definition of words in this physics textbook helps us to enforce the discipline of predicting observation and measurement and the creation, verification, and application of established theory.

WORDS USED IN THIS BOOK.

Each entry is a pointer to a description or to the full definition in context.

aberration, Section 12.5

advanced civilization, Section 19.4

black hole, Box 4 in Section 6.6

bounce orbit, Section 11.4

bounce point, non-spinning black hole, Section 8.4

circle point, non-spinning black hole, Section 8.4

circlear orbit point for light, Section 11.5

conformal transformation, Section 21.2

constant of motion, Section 1.10

critical impact parameter, Section 11.3

curvature of spacetime, Section 1.10

effective potential for a stone, Section 10.4, Section 11.4

effective potential for light, Section 11.4

embedding diagram and light cone diagram, Section 3.8

equations of motion for light, Section 11.3

equations of motion for a stone, Section XX

global equations of motion for a stone in rain coordinates, non-spinning black hole, Section 8.3, Section 11.3

global equations of motion for a stone in Doran coordinates, spinning black hole, Section 18.2

global equations of motion for light in rain coordinates, spinning black hole, Section 11.3

global equations of motion for light in Doran coordinates, spinning black hole, Section 20.1

flat spacetime, Section 1.2

forbidden map energy region for the stone, non-spinning black hole, Section 8.4

forbidden map energy region for the stone, spinning black hole, Section 18.3

forbidden regions for light non-spinning black hole, Chapter 10

forbidden regions for light spinning black hole, Chapter 20

forward and backward orbits of a stone, spinning black hole, Section 18.5

frame, Section 5.7

global coordinate systems, arbitrary and unlimited in number, Section 7.5

global metric, Section 2.5, Section 3.1

gravitational mass, Section 6.5

Hawking radiation, Section 6.6

impact parameter of light, non-spinning black hole, Section 11.2.

human comfort, Section 9.6

impact parameter b , Section 11.2

inertial frame = free-fall frame, Section 1.1, Section 2.1, Section 5.7

inner turning point for light, Section 11.5

innermost stable circular orbit (ISCO), non-spinning black hole, Section 8.5

innermost stable circular orbit (ISCO), spinning black hole, Section 18.7

instantaneous initial rest frame (IIRF), non-spinning black hole, Section 9.2

instantaneous initial rest frame (IIRF), spinning black hole, Section 19.2

intensity, flux, magnification, Section 13.7

interval, Section 1.2

invariant (special relativity), Section 1.2

invariant (general relativity), Section 3.1

observer = inertial observer, Section 1.1, Section 5.7

Kepler's 1-2-3 orbital law, Section 8.7

killer tides, Section 9.7

light cone, Section 1.5

lightlike (null) interval, Section 1.2, Section 1.4, Section 5.7

Lorentz transformation ("Lorentz boost"), Section 1.10

map energy, Section 6.2

mass in relativity, Section 1.9

Minkowski spacetime, another term for "flat spacetime" Section 1.2

momentum in special relativity, Section 1.8

no-hair theorem, Section 3.1

observer = inertial observer, Section 1.1

orbit for a stone around a non-spinning black hole, Section 8.1

orbit for a stone or light flash around a non-spinning black hole, Section 11.2

ouch time, Section 7.9

outer turning point for light, Section 11.14

"outgoing" light flash, Section 7.7

panoramas seen by the rain frame observer, Section 12.7

particle horizon, Box 4 in Section 6.5

patch, Section 5.7, inside back cover

penrose process, Section 19.7

personal planetarium, Section 12.2

photon (Star Trek) rocket, Section 9.8

plunge orbit, bounce orbit, trapped orbit, Section 11.4

primary beam, Section 12.4

primary image, Section 12.4

principle of maximal aging (special relativity = flat spacetime), Section 1.6

principle of maximal aging (special and general relativity), Section 2.4, Section 6.1

prograde and retrograde orbits for the spinning black hole, Section 18.5

quasar, toy model, Section 8.6

raindrop, Section 6.4

rain frame energy of starlight, Section 12.6

rain observer, Section 7.8

room, Section 3.10

ruler distance, Section 1.3

solid angle, Section 13.7

space patch, Section 2.2

spacelike interval, Section 1.2

spacetime patch, Section 2.4

spacetime slice, Section 3.6

stable circular orbit, non-spinning black hole, Section 8.4

stable circular orbits, spinning black hole, Section 18.3

standard map location of an observer, Section 11.5

starlight orbit, Section 11.2

synodic period of a planet, Section 10.6

swoop orbit, Section 9.8

tetrad, Section 7.6

tetrad form of a global metric, Section 7.6

tidal accelerations, non-spinning black hole, Section 9.7

time, standard of, Section 10.9

timelike interval, Section 1.2

trapped orbit, Section 11.4

turning point for a stone, non-spinning black hole, Section 8.4

turning point for light, non-spinning black hole, Section 11.5

turning point, circle point, bounce point, non-spinning black hole, Section 8.4

turning point, circle point, bounce point, spinning black hole, Section 18.3

twin "paradox", Section 1.6

unstable (knife-edge) circular orbit, non-spinning black hole, Section 8.4

unstable circular orbits, spinning black hole, Section 18.3

visual edge of the black hole, Section 12.3

Wheeler's radical conservatism, Section 7.1, back cover

Wheeler's Rules of Writing, Appendix A

worldline, Section 1.5

worldtube, Section 3.10

wristwatch time = aging = proper time, Section 1.2