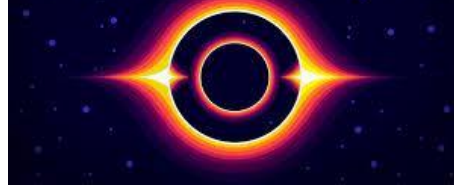


For Further Exploration of
BLACK HOLES



A Reading Guide by Andrew Fraknoi (Sep. 2021)

As a general introduction to astronomical topics, see the free on-line introductory textbook for which I am the lead author, entitled *Astronomy* and published by the non-profit OpenStax Project at Rice University: <http://openstax.org/details/astronomy>

Chap 1: Introduction to the universe and to the scientific method

Chap 24: Black holes (plus Chapter 27 on supermassive black holes)

Gravity Waves are explained in Chapter 24 section 7

Black Holes Readings

Schnittman, J. "A Brief History of Black Holes" in *Astronomy*, Oct. 2016, p. 30. Nice overview.

Talcott, R. "Black Holes in our Backyard" in *Astronomy*, Sep. 2012, p. 44. Different kinds of black holes in the Milky Way and the 19 objects known to be black holes.

Thorne, Kip *The Science of Interstellar*. 2014, W. W. Norton. Explains the movie and the science in it, including the effect of black holes on time and space.

Wheeler, J. C. *Cosmic Catastrophes: Exploding Stars, Black Holes, etc.* 2nd ed, 2007, Cambridge U. Press.

Black Hole Websites

Black Holes FAQ: <http://www.phy.pmf.unizg.hr/~kkumer/BHfaq.html> Frequently asked questions about black holes, answered by physicist Ted Bunn.

Hubble Space Telescope Black Hole Encyclopedia (a good introduction for beginners):

http://hubble.stsci.edu/explore_astronomy/black_holes/encyclopedia.html

Introduction from *Science@NASA*: <https://science.nasa.gov/astrophysics/focus-areas/black-holes>

Event Horizon Telescope (first BH picture): <https://eventhorizontelescope.org/>

On Supermassive Black Holes

Haggard, D. & Bower, G. "In the Heart of the Milky Way" in *Sky & Telescope*, Feb. 2016, p. 16. About observations of the supermassive black hole in our galaxy.

Kormendy, J. "Why Are There so Many Black Holes?" in *Astronomy* (Aug. 2016): 26. Discussion of why supermassive black holes are so common in the universe.

Monsters in Galactic Nuclei: <http://chandra.as.utexas.edu/stardate.html> An article on supermassive black holes by Prof. John Kormendy, from *StarDate* magazine.

Quasar Astronomy Forty Years On: <http://www.astr.ua.edu/keel/agn/quasar40.html> A 2003 popular article by William Keel.

About Gravity Waves from Black Holes

Levin, Janna *Black Hole Blues*. 2016, Knopf. Popular introduction to gravity wave observations by physicist.

Schilling, Govert *Ripples in Spacetime*. 2017, Harvard U. Press. By a noted science writer.

LIGO website and news: <https://www.ligo.caltech.edu/>

From *Scientific American*:

<https://www.scientificamerican.com/report/the-discovery-of-gravitational-waves/>

Drake, N. & Greshko, M. "What Are Gravitational Waves?" on the National Geographic Website: <https://www.nationalgeographic.com/news/2017/10/what-are-gravitational-waves-ligo-astronomy-science/>

Castelvecchi, D. "How Gravitational Waves Could Solve Some of the Universe's Deepest Mysteries" from *Nature*, 2018: <https://www.nature.com/articles/d41586-018-04157-6>

Science Fiction about Black Holes

Baxter, Stephen "Gravity Mine:" <http://www.infinityplus.co.uk/stories/gravitymine.htm> (in distant future, the energy of giant black holes is needed for survival)

Benford, Gregory *Eater*. 2000, Eos. An ancient, intelligent black hole visits our solar system.

Benford, Gregory *Great Sky River*. (1987, Bantam) *Tides of Light*. (1989, Bantam) *Furious Gulf*. (1994, Bantam) *Sailing Bright Eternity*. (1995, Bantam). Books take place in far future, around a super-massive black hole at the center of Galaxy; humanity hunted by complex machine intelligences.

Johnson, Bill "Meet Me at Apogee" in Carr, T., ed. *The Best Science Fiction of the Year 12*. 1983, Pocket Books. Future levels of descent near a black hole; the 2-month level is where 1 day of time for the traveler is 2 months outside. Prospectors & people with diseases hire pilots to take them down.

Landis, Geoffrey "Impact Parameter" in *Impact Parameter*. 2001, Golden Gryphon. On gravitational lenses and wormholes.

Landis, Geoffrey "Approaching Perimelasma" in *Impact Parameter*. 2001, Golden Gryphon. Virtual human is dropped into a black hole to explore space and time. Author is a NASA astronomer. On-line at: <http://www.infinityplus.co.uk/stories/perimelasma.htm>

McDevitt, Jack & Shara, Michael "Lighthouse" in *Cryptic: The Best Short Fiction of Jack McDevitt*. (2009, Subterranean Press) Note: Shara is an astronomer.

https://www.baen.com/Chapters/1596061958/1596061958_8.htm An alien race decides to mark the location of unaccompanied black holes in the Galaxy by putting very strange brown dwarfs around them that could not exist in nature..

Niven, Larry *World Out of Time*. 1976, Ballantine. Using a supermassive black hole to travel into the future.

Oates, Joyce Carol "Passions and Meditations" in *The Seduction and Other Stories*. 1975, Black Sparrow Press. Allegory using black holes as a symbol of being cut off from communication.

Pohl, Fred *Gateway*. 1977, Ballantine. Enjoyable novel with event horizons, and "black-hole guilt".

Sagan, Carl *Contact*. 1985, Simon & Schuster. The protagonist uses a black-hole/worm-hole "subway" system for interstellar travel. (Made into a film with Jodie Foster).

Willis, Connie "Schwarzschild Radius" in Preiss, Byron & Fraknoi, Andrew, eds. *The Universe*. 1987, Bantam. Haunting story combining episodes from Schwarzschild life and black hole images.

See the instructor's website: www.fraknoi.com for his science fiction, radio interviews, etc.