

Grades: 9-12

Nova, “Black Hole Universe Pt. 2”

Join astrophysicist and novelist Janna Levin on a mind-blowing voyage to the frontiers of black hole science, which is shining new light on the most powerful and mysterious objects in the universe. Black Holes are the most enigmatic and exotic objects in the universe. They’re also the most powerful, with gravity so strong it can actually trap light. And they’re destructive. Anything that falls into them vanishes... gone forever. But now, astrophysicists are realizing that black holes may be essential to understanding how our universe unfolded – possibly leading to life on Earth.

After watching this episode, choose from the following questions and/or tasks to extend your learning

Question Box 1

- Provide at least two quotes of evidence that support the main claims.
- What is the central idea of the text? Is there a quote from the TV show that represents the author’s central idea?
- Choose 2-3 unfamiliar words for the program and define them.
- What clues can you point to in the program to explain the author’s purpose? What is the intent or purpose of the writer?
- What is your analysis of the program? What evidence did you identify to support your analysis of the TV show?

Question Box 2

- What the one thing you particularly want people to notice when they watch this TV program?
- Now that it’s over, what are my first thoughts about this show? Are they mostly positive or negative?
- If positive, what comes to mind specifically? If negative, what comes to mind specifically?
- What were some of the most interesting parts to this program? Explain.
- What were some of my most powerful learning moments and what made them so? Explain.
- What surprised you in the program, and why?

Box 3 (Tasks)

- Stellar black holes which are black holes that are formed by the collapse of individual

Continued on the next page...

stars are relatively small, but very dense. A black hole can have 3 times the Mass of the sun within the diameter of a city. These black holes continue to consume dust and gas from surrounding galaxies, which increases their size. If the average city diameter is 21 miles, what is the ratio of volume of the black hole to its mass? What does this look like on a smaller scale? Justify your reasoning using mathematics.

- The Milky Way is estimated to contain a “few hundred million” stellar black holes. How can you make sense of this number and size mathematically for you? Explain your answer using mathematics.
- According to the video...Discuss the tie to Black Holes and Life
- Make a model of a Black Hole and diagram its interaction with light

Box 4 (Enrichment)

- Research and describe a Black Hole in language that an elementary student can understand.
- Gravity is an incredibly weak force. Discuss with evidence the relationship between gravitational force and the size of a black hole
- Describe with evidence the Event Horizon of a Black Hole.

Box 5 (Extend/Real-Life)

- Discuss with evidence why the space anomalies are called “Black” holes
- Explain a “Black Hole Singularity” using a model and in layman’s terms
- NASA has a lot of great information on Black Holes. Consider the questions below while reviewing this website: <https://science.nasa.gov/astrophysics/focus-areas/black-holes>
- What classes have you taken or will take in high school that would help prepare you for a career in astronomy?
- The information on this webpage required many people with varied backgrounds. Brainstorm a list of careers that would have been required to discover, collect, and publish all of that information.
- Were any of the careers you listed outside of science? Look over this list: <http://www.jobsforastronomers.com/careers> and see how many of these careers you listed.
- Would you consider a career in astronomy? Why or why not? If so, what career would you select?