SMART SPIN
Encyclopedias as Adventures

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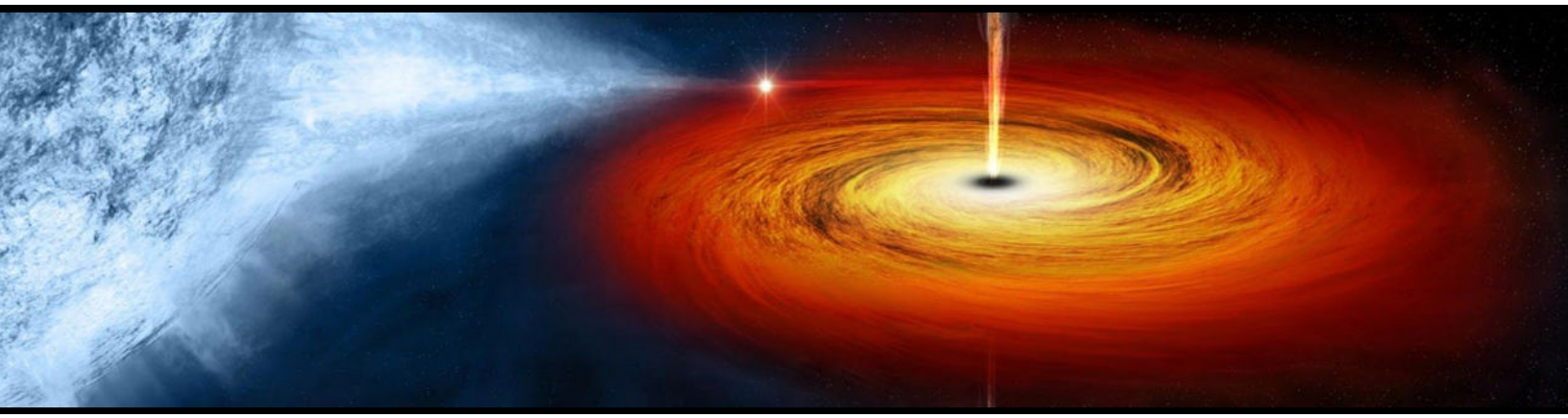
Black Holes Smarty

Black holes are one of the most fascinating things in the whole universe, most likely the most extreme and definitely the most puzzling. Some of the greatest minds in the world are studying (and even observing) these hungry black beasts. There's no reason hungry young minds shouldn't get a glimpse into their amazing secrets being uncovered. Let's dive into the subject, being careful not to get too close.

TO THE COLLECTION > MAIN TOPIC >



Smarties are inspirational guides for educational activities. Click on the red button below to know more about them.

Smarties are complemented by our **Smart Spin** online encyclopedia. Click on the green button below to explore it.

SMART SPIN WHAT'S A SMARTY? MORE SMARTIES

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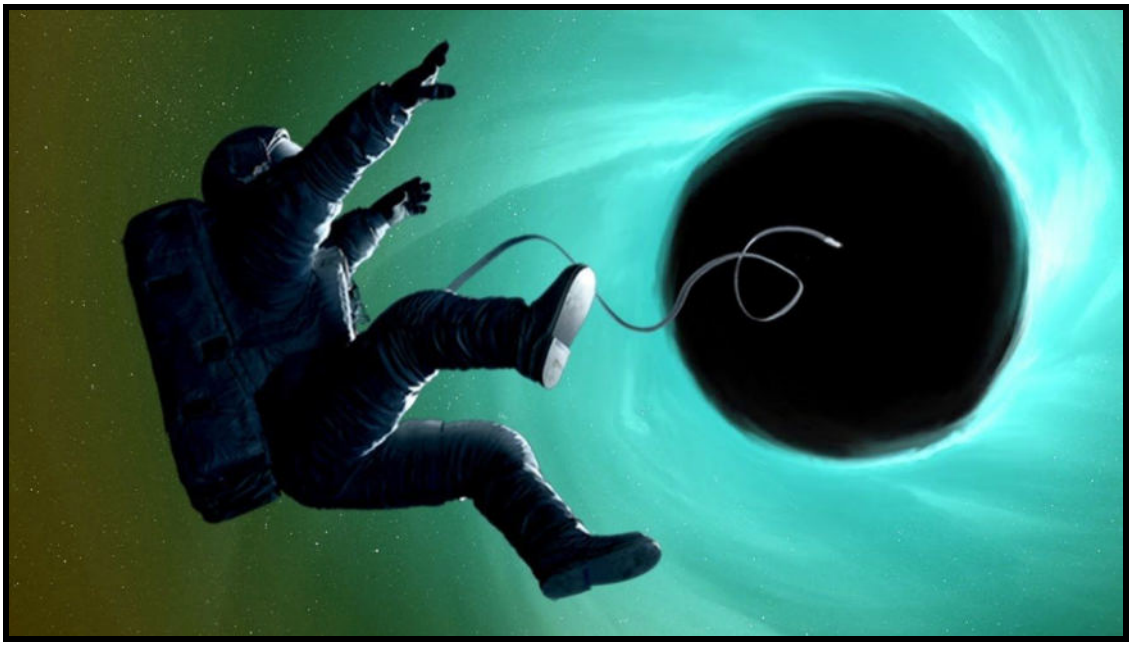

1. Black Holes, Inside & Out

SOMETHING TO ASK

*You may ask your learner the following questions, after they had explore the **collection**, or before - prompting them to find the answers. We have provided some information for you, and links to relevant topics below each question. Other sources are encouraged.*

➔ Why are they called black holes?

- Black holes are called black holes because the pull things in with such incredible gravity that once something gets inside them, that something can never come back. Even light, which is the fastest thing in the universe, cannot escape.

➔ Are black holes actually holes?

- Black holes are not actually holes but stars that collapsed under their own gravity, and any other matter and energy that falls into them. However, some interpretations of the general theory of relativity - the theory which best describes black holes - consider a black hole as a hole, or “tear”, in space and time. According to the theory, gravity bends time and space, and since the gravity deep inside a black hole may become infinite, it might tear a hole in the “fabric of the universe”.

➔ What are black holes made of?

- Black holes can be made out of anything, really. They typically include all the matter and energy of the star that collapsed to form them, but anything that falls into them becomes an inseparable part of them. Once a black hole is formed, we might never know what it is made of because no

information can come out of it (though some theories allow for some information to escape).

➔ How do black holes form?

- Stellar black holes form when the center of a very massive star collapses in upon itself. This collapse also causes a the star to explode and blast parts of it into space. What remains is so dense, with gravity so strong, that nothing else can ever again come out of it. However, there are theories of other ways in which black holes can form, even created by scientists in a lab.

➔ What is at the center of a black hole?

- Spacetime Singularity

➔ Can we see into a black hole?

- Weak Cosmic Censorship Hypothesis

➔ What is the radius of a black hole?

- Schwarzschild Radius

➔ What is at the edge of a black hole?

- Event Horizon

➔ Does anything ever come out of a black hole?

- Hawking Radiation

➔ **What happens when something falls into a black hole?**

- Falling into a Black Hole
- Spaghettification

➔ **If something falls into a black hole, is it lost forever?**

- Black Hole Information Paradox

➔ **Are black holes different from one another?**

- No-hair Theorem

➔ **If light can't escape black holes and we can't see them, how do we know they exist?**

- Discovering Black Holes

➔ **How can a black hole be a shortcut through space? Can it also be a way to go back in time?**

- Wormhole

➔ **What kinds of black holes are there? What is unique about each type?**

- Black Hole Types (mini-collection)

2. Black Holes and Beyond

Invite your learner to research the following questions, in the collection and any other resource available to them (see recommended books below). You are also invited to guide and discuss with them.

➔ What is the largest and most massive black hole we know of? What is the smallest? Where did astronomers find the first candidate of a black hole?

➔ How many black holes are in our galaxy? How many in the whole universe? What is the closest black hole to Earth and is it dangerous to us? What is the farthest and oldest black hole we know about?

➔ What does the General Theory of Relativity have to say about black holes and how did it predict their existence? What does Quantum Mechanics have to say about them, and how do the two theories clash?

➔ What are quasars and how are they related to black holes?

➔ Black holes are the densest things in the universe. What is the densest natural thing here on Earth? What is the densest artificial thing that scientists were able to create in the lab?

➔ What are the latest scientific discoveries and theories regarding black holes? Are we finding new ones in the universe? New understanding of them? What scientific progress contributes to these?

3. Black Hole Books

“The Black Hole War”, by Leonard Susskind

★ Black Hole War

The story of delving into the riddles that are black holes, told through a long-standing debate between Leonard Susskind and Stephen Hawking.

“Black Hole is Not a Hole”, by Carolyn Cinami DeCristofano

★ Black Hole

Many questions, many answers (but many mysteries as well).

“Black Holes & Time Warps: Einstein's Outrageous Legacy”, by Kip Thorne

★ Interstellar Fictional Black Hole

Written by the celebrated theoretical physicist who advised the screenwriters and special effects team of the movie Interstellar about black hole and wormholes.

“Death by Black Hole - and Other Cosmic Quandaries”, by Neil Degrasse Tyson

★ Falling into a Black Hole

Getting too close to a black hole - not a good idea! (But we can read about it.)