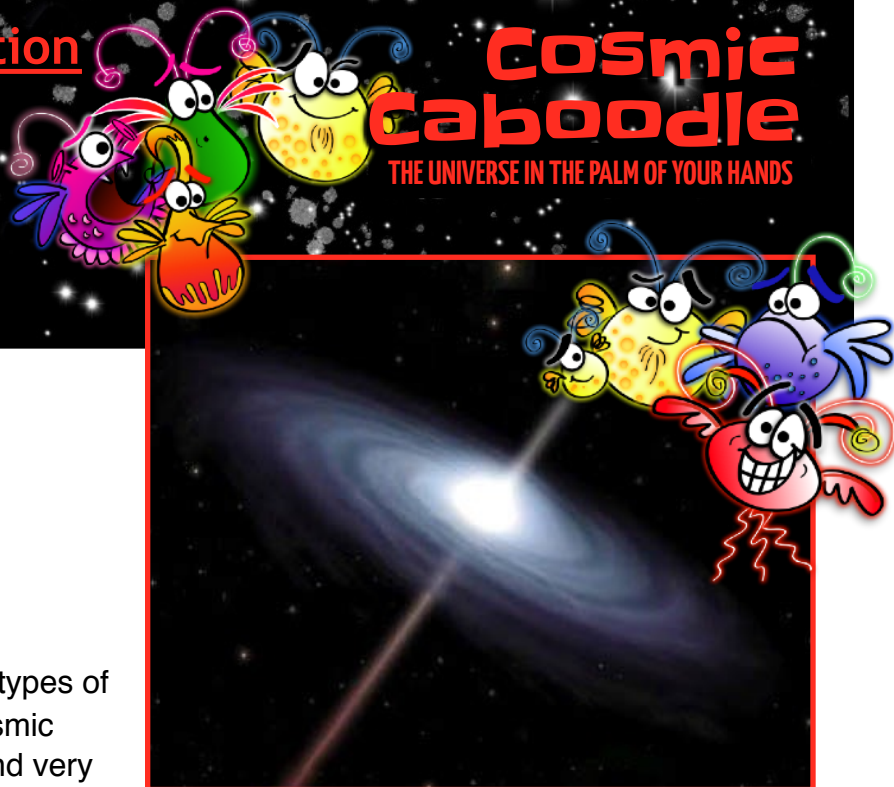


Full product specification

Black Hole

The Sizzler



Artist's impression: "BlackHole". Public domain.

Product Name The Sizzler

Family Member Black Hole

Product Code Siz-BH

Overview

The **Sizzler Black Hole** is one of three types of black holes currently available from Cosmic Caboodle. A black hole is a compact and very dense object in space with a super strong gravitational pull. It is so strong that not even light can escape it. They are commonly formed after the death of a giant star.

Status - Proven & Real

Black holes are real and exist in our very own Milky Way galaxy. Although we haven't actually seen a black hole (because they suck in any light nearby); we do know they exist. What we can see, with big telescopes and satellites, is what they do to the surrounding gases and stars. For example, scientists can observe gases that appear to be vanishing inside a black hole

Physical Properties - Mass & Size

Our black holes are categorised into 4 groups based on size and mass (mass is the amount of *matter*, or 'stuff' that is inside an object)



Name	Mass	Size
Micro black hole	Up to M_{moon}	0.1mm
Stellar black hole	About 10 M_{moon}	Up to 30km
Intermediate mass black hole	About 1,000 M_{Sun}	10km to R_{Earth}
Supermassive black hole	100,000 to $10^{10} M_{\text{Sun}}$	0.001-400 AU

Key

M_{moon} **Moon mass** is the mass of our Moon (7.3477×10^{22} kg). (That's really heavy for something only 0.1mm big!)

M_{Sun} **Solar mass** is mass of our Sun which weighs an amazing nonillion kilograms (1.98855×10^{30} kg)

R_{Earth} **Earth radius** is the distance from Earth's centre to its surface, about 6,371 km (3,959 miles).

AU **Astronomical Unit** roughly the distance from the Earth to the Sun. Its exact number is 149,597,870.7 km

To understand just how heavy a black hole is, imagine if you had a black hole the size of an atom (atoms are so small you can't even see them with the help of a microscope). It certainly is really small, but you couldn't hold it, because it would weigh as much as a giant mountain.

Black Hole

The Sizzler



Cosmic Caboodle
THE UNIVERSE IN THE PALM OF YOUR HANDS

Technical specification



We can't directly see a black hole which means we also can't see what's happening inside of one. However, scientists can **hypothesise** what's actually happening inside a black hole. A **hypothesis** is a bit like a well thought out guess or answer to your question.

Instead of doing a real life experiment, scientists do what's called a **thought experiment**. They imagine what would happen if we say sent some little aliens into a black hole and then they use the language of mathematics to explain what would happen next.

For the case of the **Sizzler** black hole, a scientist called Joseph Polchinski and his team used the mathematics of **quantum physics**, to explain what happens when you enter a black hole.

Quantum physics explains how sub atomic particles work and involves **different** mathematics from the Stretcher black hole (which uses Einstein's theory of general relativity).

Interestingly, this difference in mathematics results in a different answer to 'What happens to the alien who enters into a black hole.'



So back to our little alien friends. As they float past the black hole, gravity starts to pull them closer and closer into the hole. Eventually they will pass what's called the **event horizon** (this is the point of no return where gravity is so strong nothing will get you back out). As soon as the aliens pass the event horizon they get **sizzled** to a **crisp** and that's where this experiment comes to a very abrupt end.

To see what that looks like inside a black hole, be sure to print and construct your Sizzler black hole below.



Black Hole

The Sizzler



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This is one of three black holes available from Cosmic Caboodle. The Sizzler is a special black hole which you can now observe from the safety of your own home. Simply follow the instructions below and take a sneak look inside.



DIFFICULTY FACTOR

- **One** out of **three** cheeky aliens.
- Requires cutting and gluing.
- It takes about **5 minutes** to make.

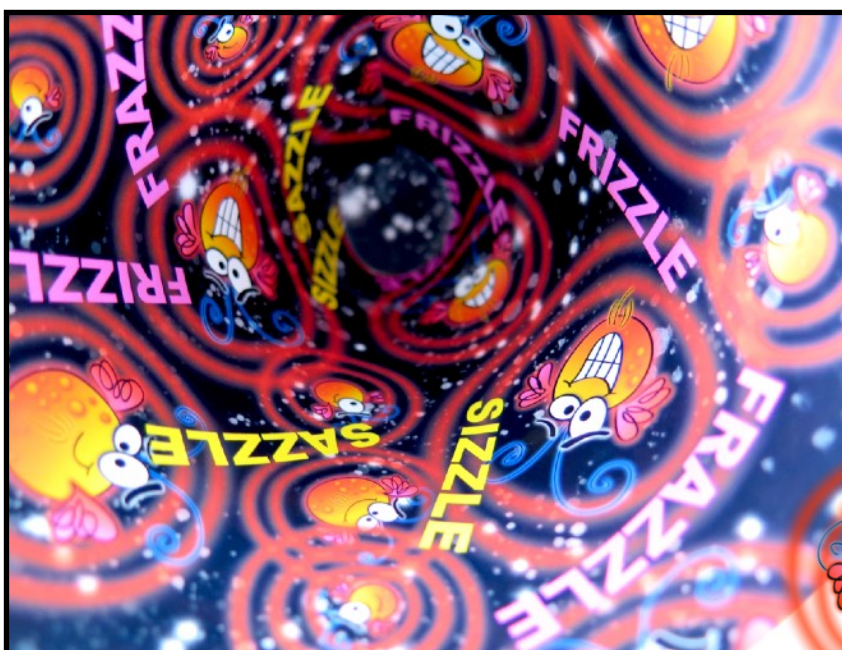
INSTRUCTIONS

YOU WILL NEED

1. Paper (1 sheet for double sided printing, 2 for single sided)
2. Scissors
3. Glue stick
4. A spirit of adventure

METHOD

1. Print the following two pages double sided (or you can print two single sided sheets and then glue them together back to back).
2. Cut out the shape.
3. Roll up into a cone and glue together.
4. Peek into the cone to see what this type of black hole does to our little alien friends.

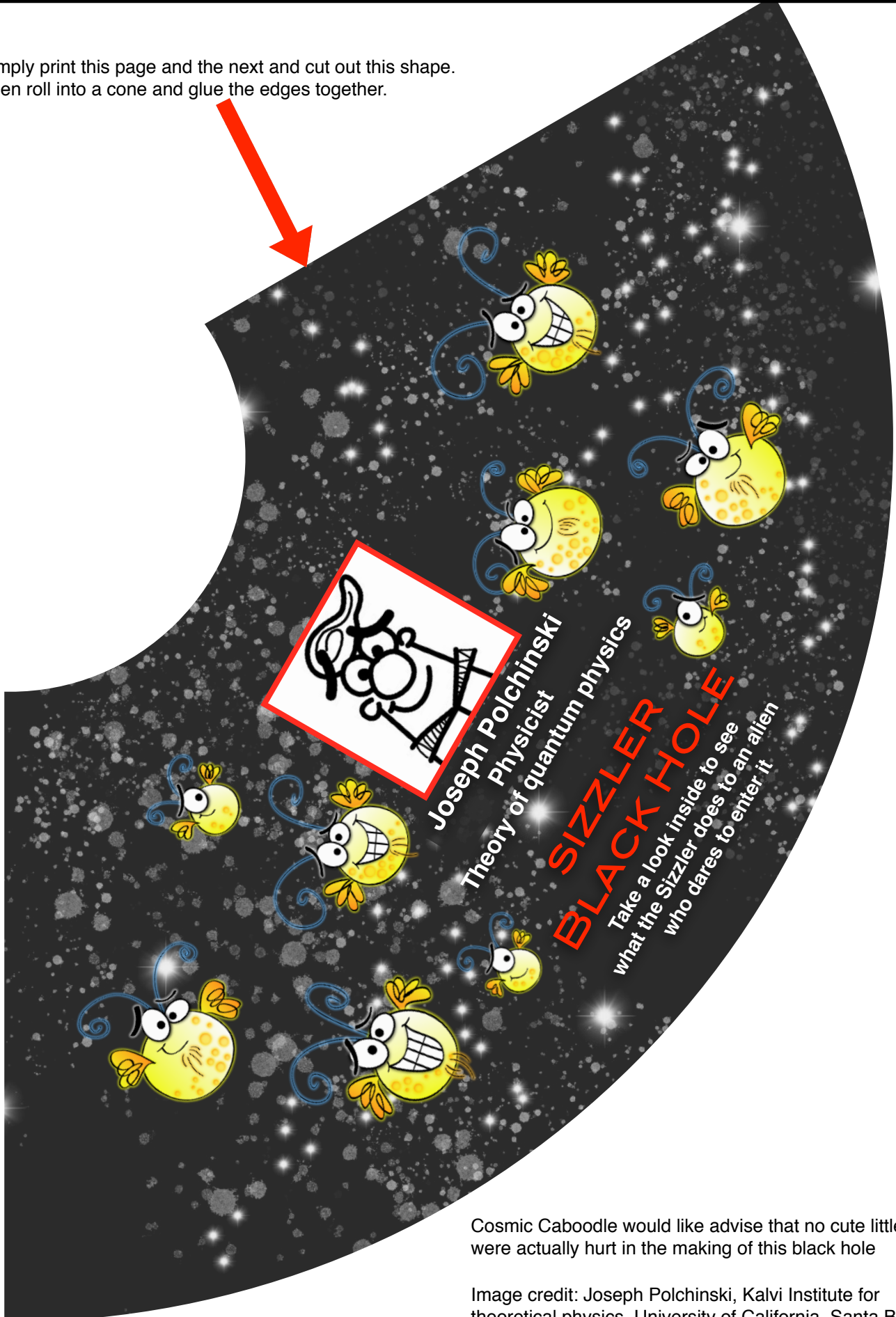


Black Hole

The Sizzler

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Simply print this page and the next and cut out this shape.
Then roll into a cone and glue the edges together.



Cosmic Caboodle would like advise that no cute little aliens were actually hurt in the making of this black hole

Image credit: Joseph Polchinski, Kalvi Institute for theoretical physics, University of California, Santa Barbara

