Full product specification

# Black Hole

## The Stretcher

Cosmic Caboodle

THE UNIVERSE IN THE PALM OF YOUR HANDS

**Product Name** The Stretcher

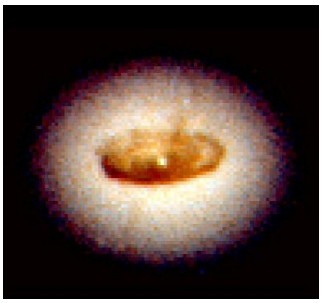
**Family Member** Black Hole

**Product Code** Str-BH

## Overview

*The **Stretcher Black Hole*** is one of three types of black holes currently available from Cosmic Caboodle online. 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.

Artist's impression of a black hole. Credit NASA. Public domain.



The Hubble telescope photo of gas being sucked into a black hole. Credit NASA. Public domain.

## 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 (see photo on left).

## Physical Properties - Mass & Size

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 $10^{10}$ $M_{Sun}$ | 0.001-400 AU |

### Key

$M_{moon}$ **Moon mass** is the mass of our Moon ($7.3477 \times 10^{22}$ 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 ($1.98855 \times 10^{30}$ 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). But you couldn't hold it, because it would weigh as much as a giant mountain.

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## Technical specification

We can't directly see a black hole because gravity pulls all light into it, which means we can't see what's happening inside of one. So to understand what the ***Stretcher*** black hole looks like we need to use our imagination and the language of mathematics. This is what scientists call a ***thought experiment.***

Imagine a small group of aliens traveling in outer space. If they happen to get close enough to a black hole, the forces of gravity will start to pull them towards it. The mathematics used to explain this stems back to the famous physicist **Albert Einstein** who published a paper on general relativity in 1915. Using this mathematics, scientists can explain what happens next.

Gravity continues to pull the aliens into the black hole. Eventually they will pass what's called the ***event horizon*** (This is the point of no return. Gravity is so strong that nothing will be able to pull you back out).

The aliens will now get pulled so much, that they will begin to **s - t - r - e - t - c - h** out like a long piece of spaghetti until they **pop!** The popped pieces will continue to get pulled into the heart of the black hole and eventually get **crushed** into a very teeny, weeny mass.

But don't worry about our little alien friends. They have not been hurt because we only imagined it. Aliens are smart enough to avoid black holes.

To see what the ***Stretcher*** black hole looks like inside, be sure to print and construct your very own by following the simple instructions below.


Illustration of what happens when an alien enters into a ***Stretcher*** black hole.

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**This is one of three black holes available from Cosmic Caboodle. The Stretcher 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 peak 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. Enthusiasm

### 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.

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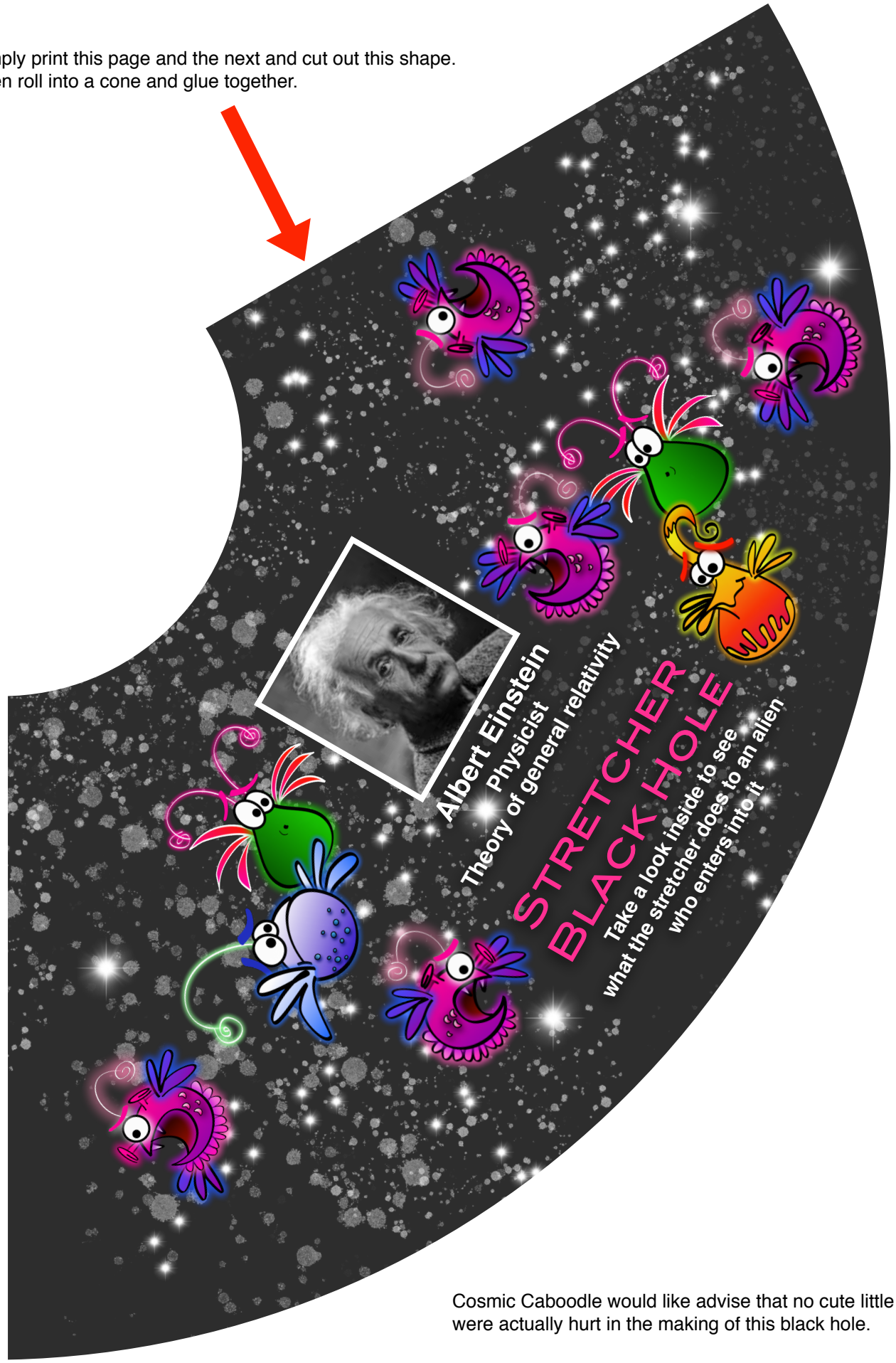
Simply print this page and the next and cut out this shape.
Then roll into a cone and glue together.




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


S-T-R-E-T-C-H
CRUSH
POP!
CRUSH
S-T-R-E-T-C-H
POP!
POP!
POP!
CRUSH
S-T-R-E-T-C-H
POP!
CRUSH
S-T-R-E-T-C-H