



Model of a Black Hole

For sure, many kids have already heard about black holes. They understand them as bottomless wells. If something falls into a black hole it is impossible for it to escape. Even light cannot escape and is swallowed. That is how a black hole gets its name; it is a space in space that does not give out any light. It is not easy to explain black holes in a simple way, but this experience will help children to visualize the concept.

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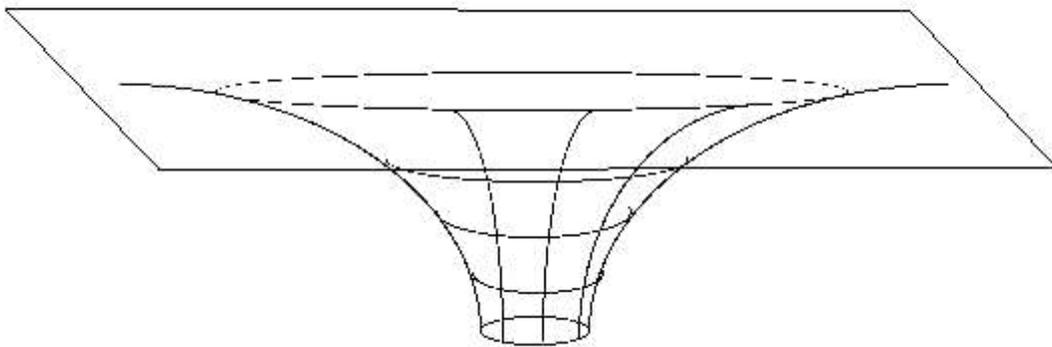


- ★ GOAL:** To build a physical model of the space curvature around a mass and a passing object close to it. To demonstrate what happens to that object if the velocity is not high enough, or if the "well" is deep enough.
- ★ MATERIALS:** Light elastic bandage (i.e. Tubifix), a little marble, a very heavy ball (one used in the game of Boules, Bocce or Pétanque works well).
- ★ AGE GROUP:** Supervised demonstration for 6 years and up.



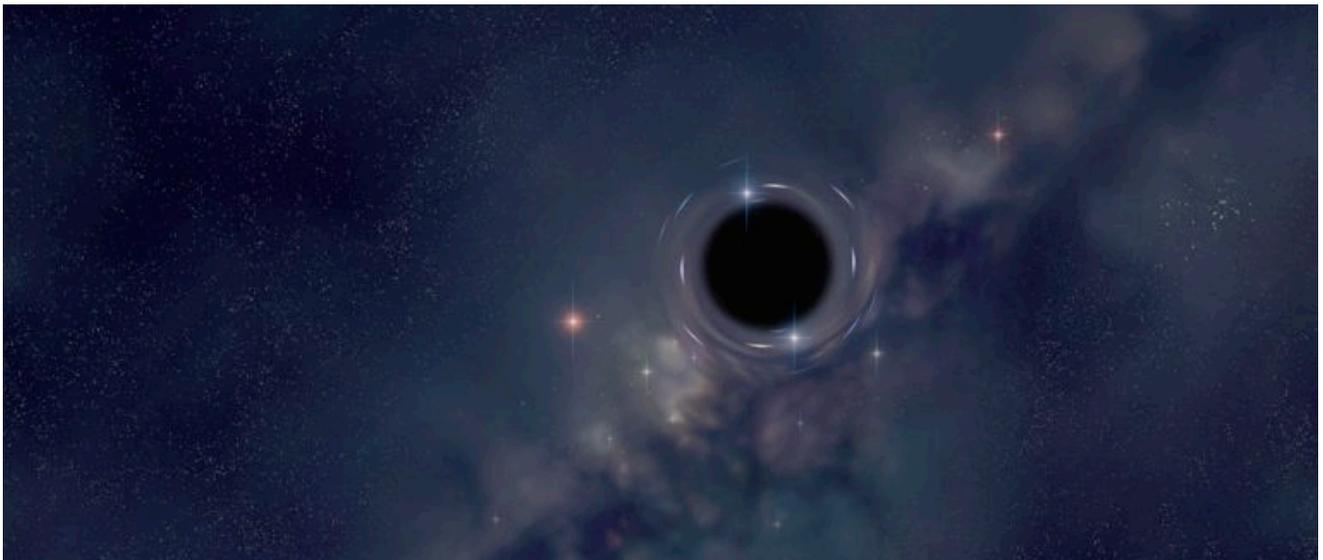
WHAT TO DO:

- For this experience you will need a piece of a very elastic, stretchy fabric or bandage. If you can, look for the bandage sold in chemists that is used for muscular injuries (Tubifix). You can find these in different sizes, but we are interested in the biggest ones, those which are used for the thorax.
- You need to cut ~ 40 cm of the elastic bandage. If it is tubular, you need to cut it through one side, in order to make it flat.
- Ask several students to stretch the bandage horizontally until it becomes taut. In this way two dimensional 'space' is represented.
- Make a marble (little ball) roll superficially across the surface of the bandage: its trajectory should be rectilinear similar to that of a light ray travelling through space.
- Place a heavy metal ball on the bandage and you will see how it deforms the fabric of space. 'Space' becomes curved around the heavy mass.



- Make the same little marble roll close to the mass. Its trajectory should be deflected by the deformation on the bandage. This is similar to what happens to the light passing close to a massive object which deforms the space surrounding it.

- If the mass is really concentrated, (that is, if the Bocce ball is really heavy) the curvature of the bandage would increase, producing a kind of "gravitational well", from which a marble would not be able to escape.
- As the ball passes close by, it starts to revolve around the black hole and eventually it will fall into it. Once in there you can see that things may fall into a black hole but it is difficult for them to come out. This is what happens with black holes: their gravity deforms the space in such a way that the light or any other object can not escape from it.



(An artist's impression of a black hole)

Source:

Ricardo Moreno, Exploring the Universe, UNAWE Espagna

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Universe Awareness is imagination, excitement and fun in the universe for the very young.