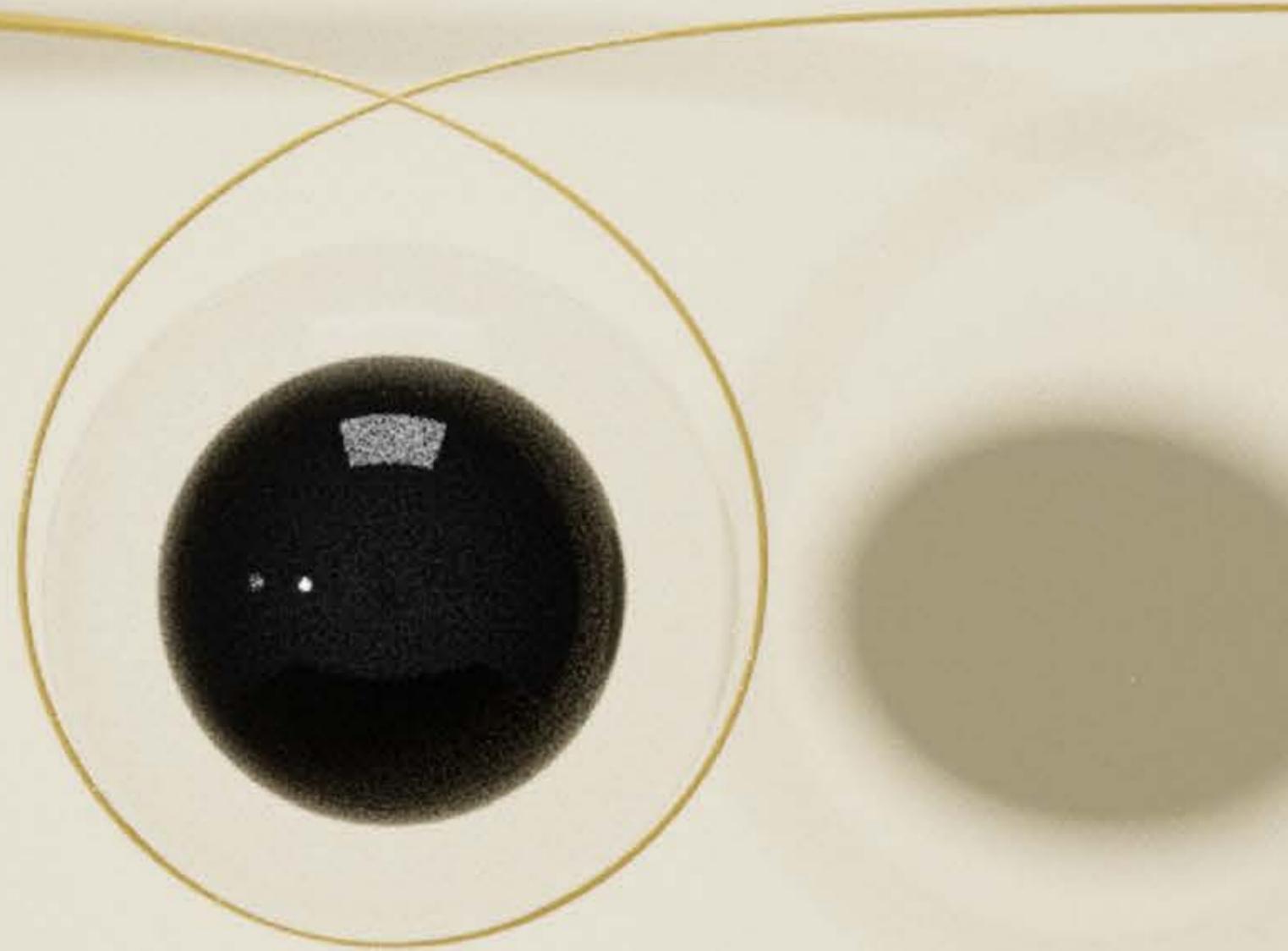
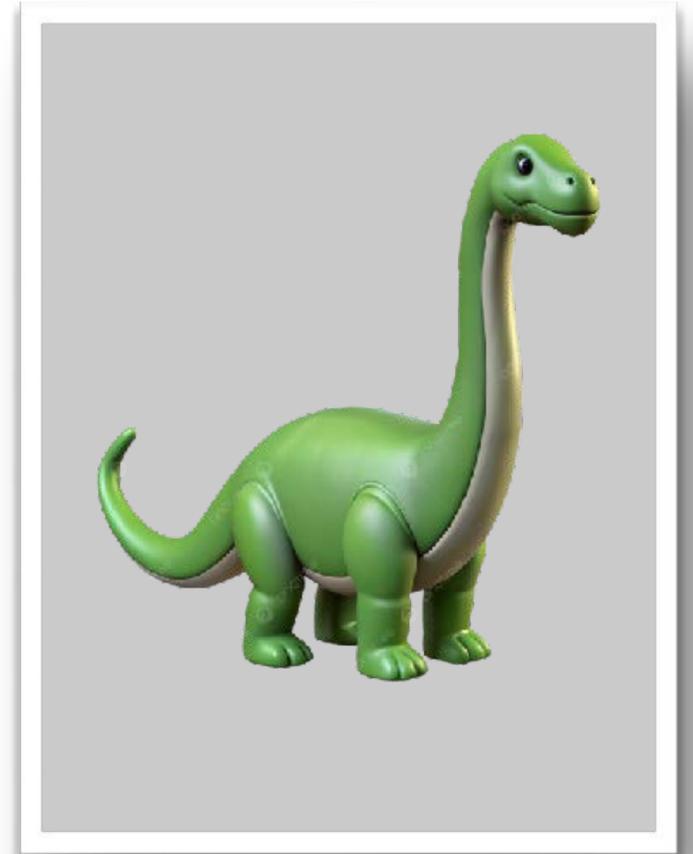


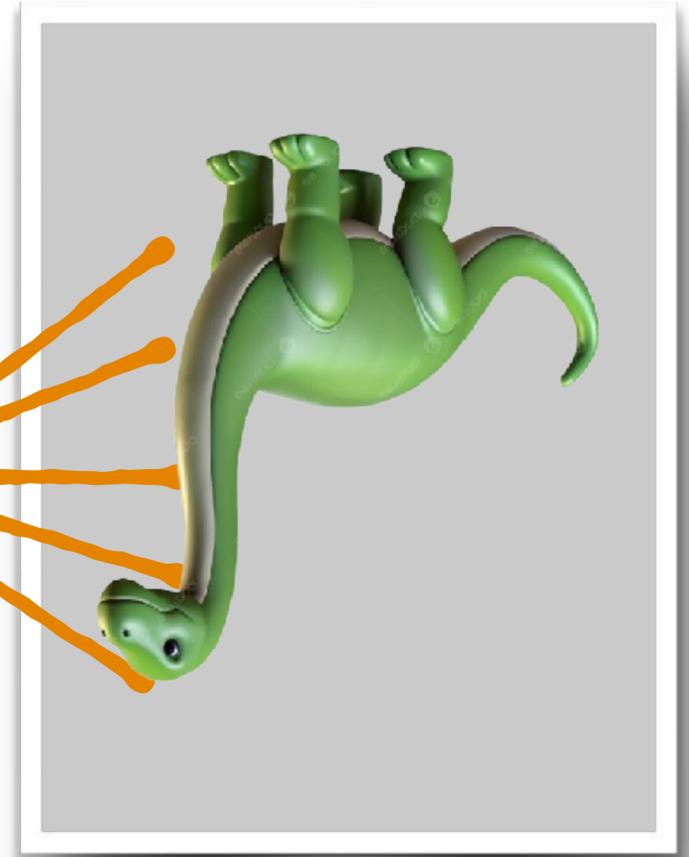
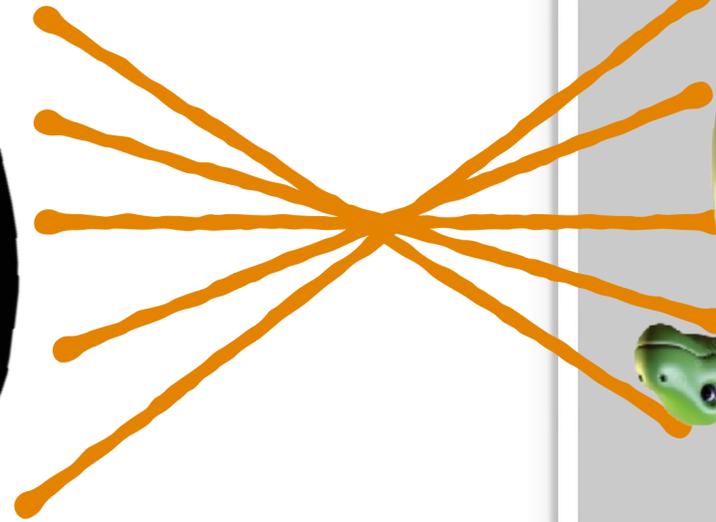
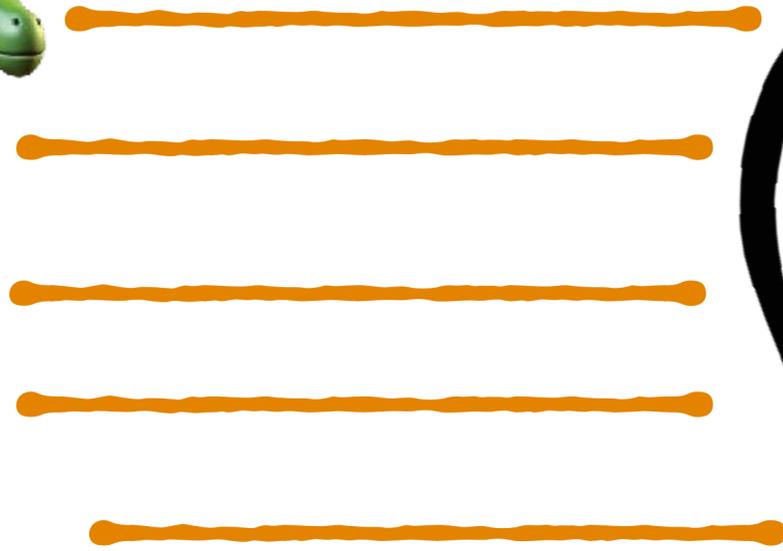
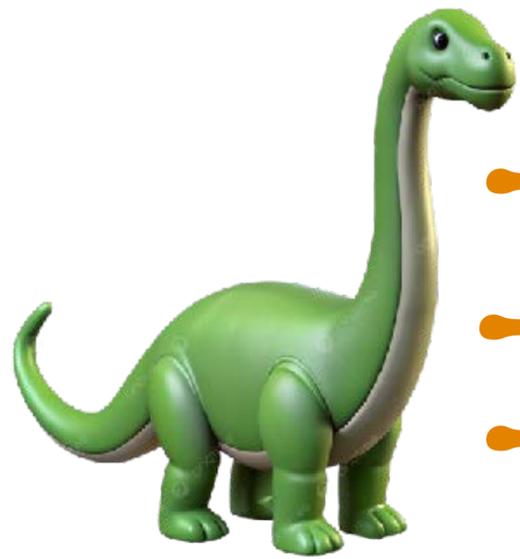
A Gravitational Photograph

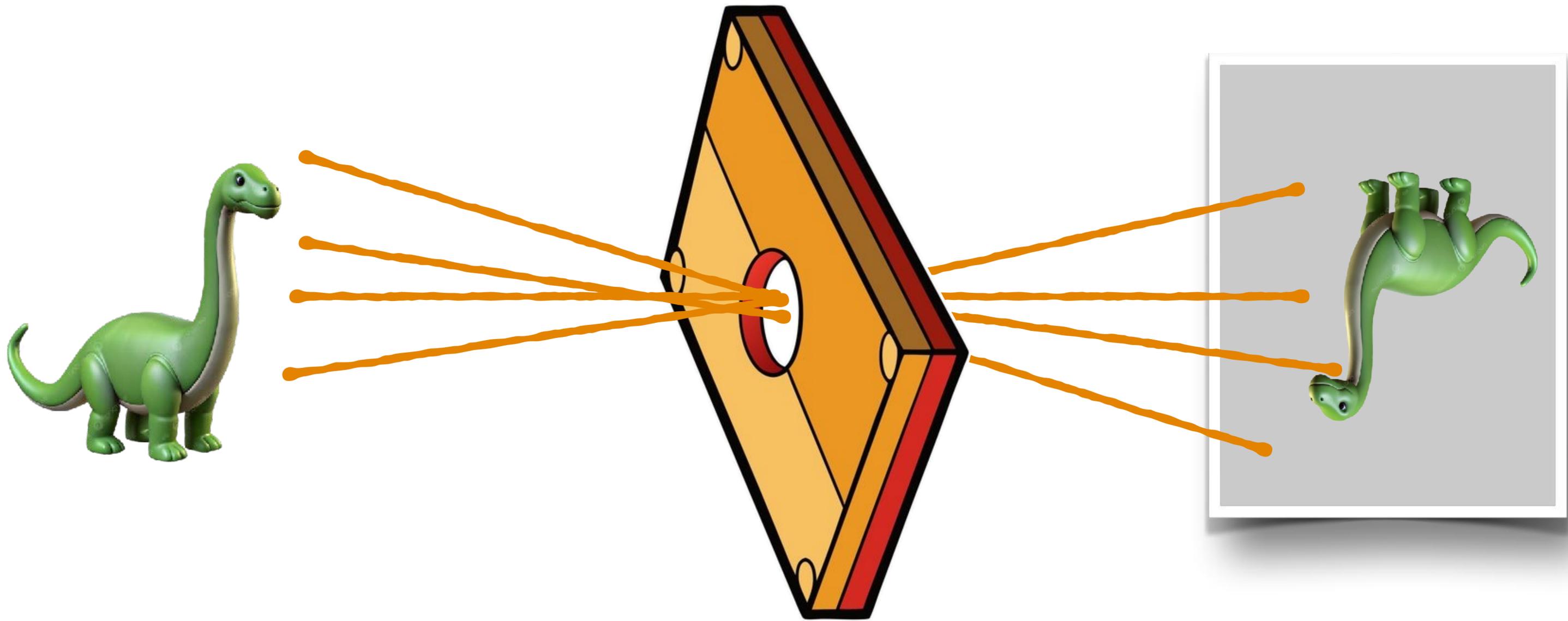
Steve Trettel

University of San Francisco









The First Photograph

1827

Joseph
Nicéphore
Niépce



CAMERA OBSCURA AND HOLOGRAPH GALLERY

OPEN - 11AM TO 5 PM DAILY, (WEATHER PERMITTING) MORE INFO - GIANTCAMERA.COM

NOV
2011



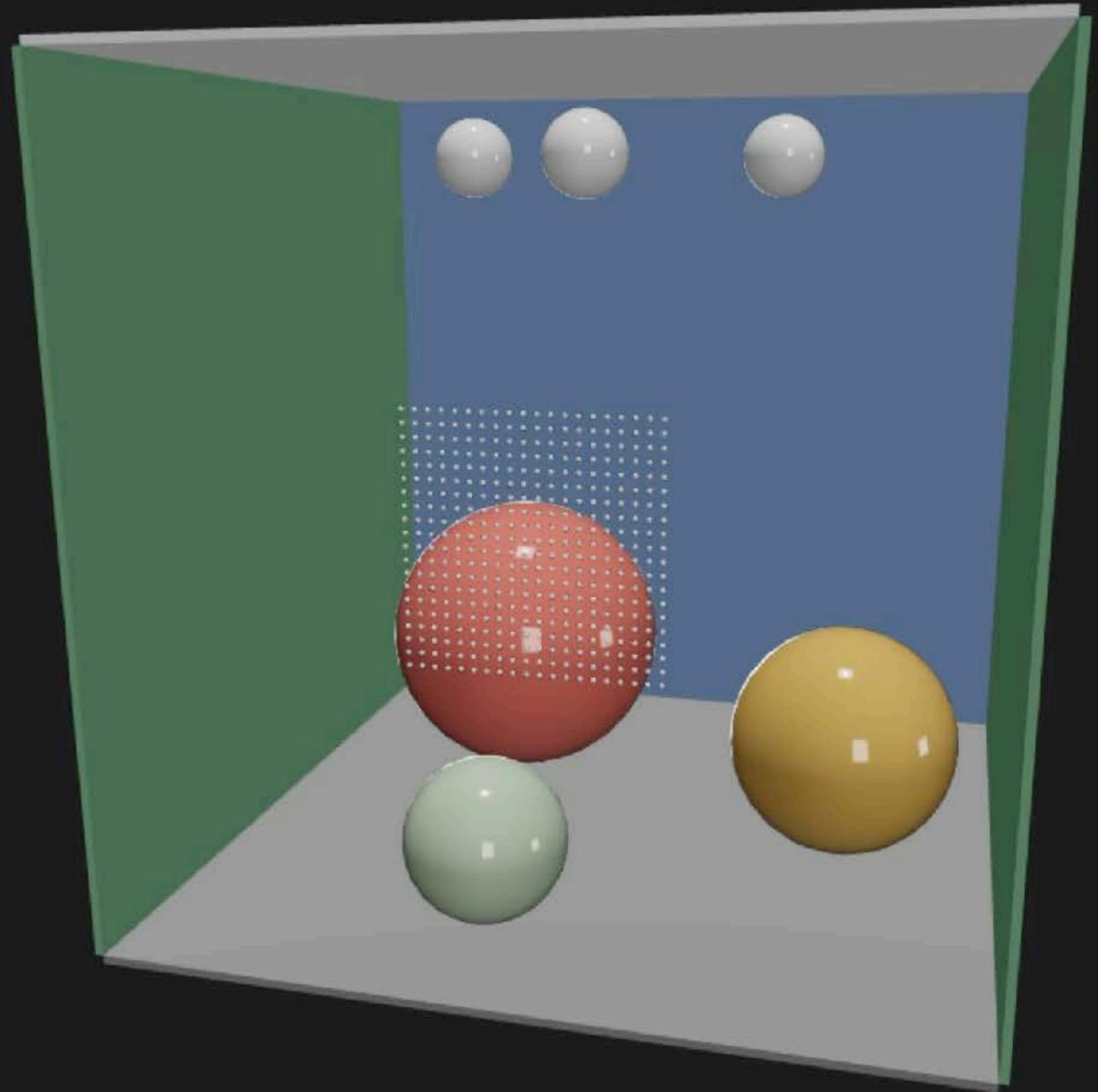
GIANT CAMERA
CAMERA OBSCURA

The Giant Camera is the last
remaining camera that was
part of the original 19th century
Lambert photographic process.
This image of the last day
of the Giant Camera is
used as a sign to Lambert
to show the camera's
location. (Photo taken by
Giant Camera)



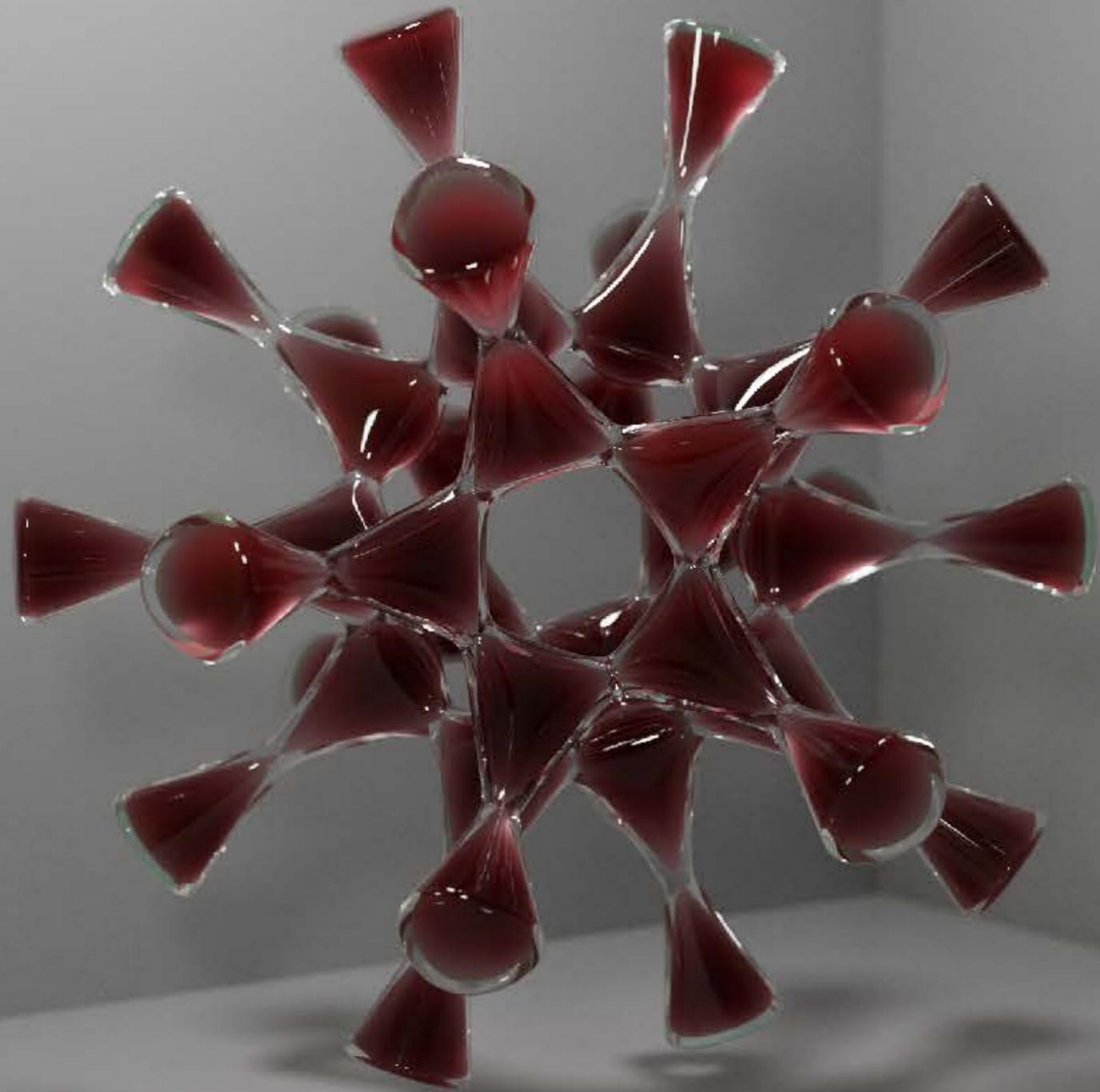
SEE OPEN

As a graphics hobby,
I love simulating
cameras!

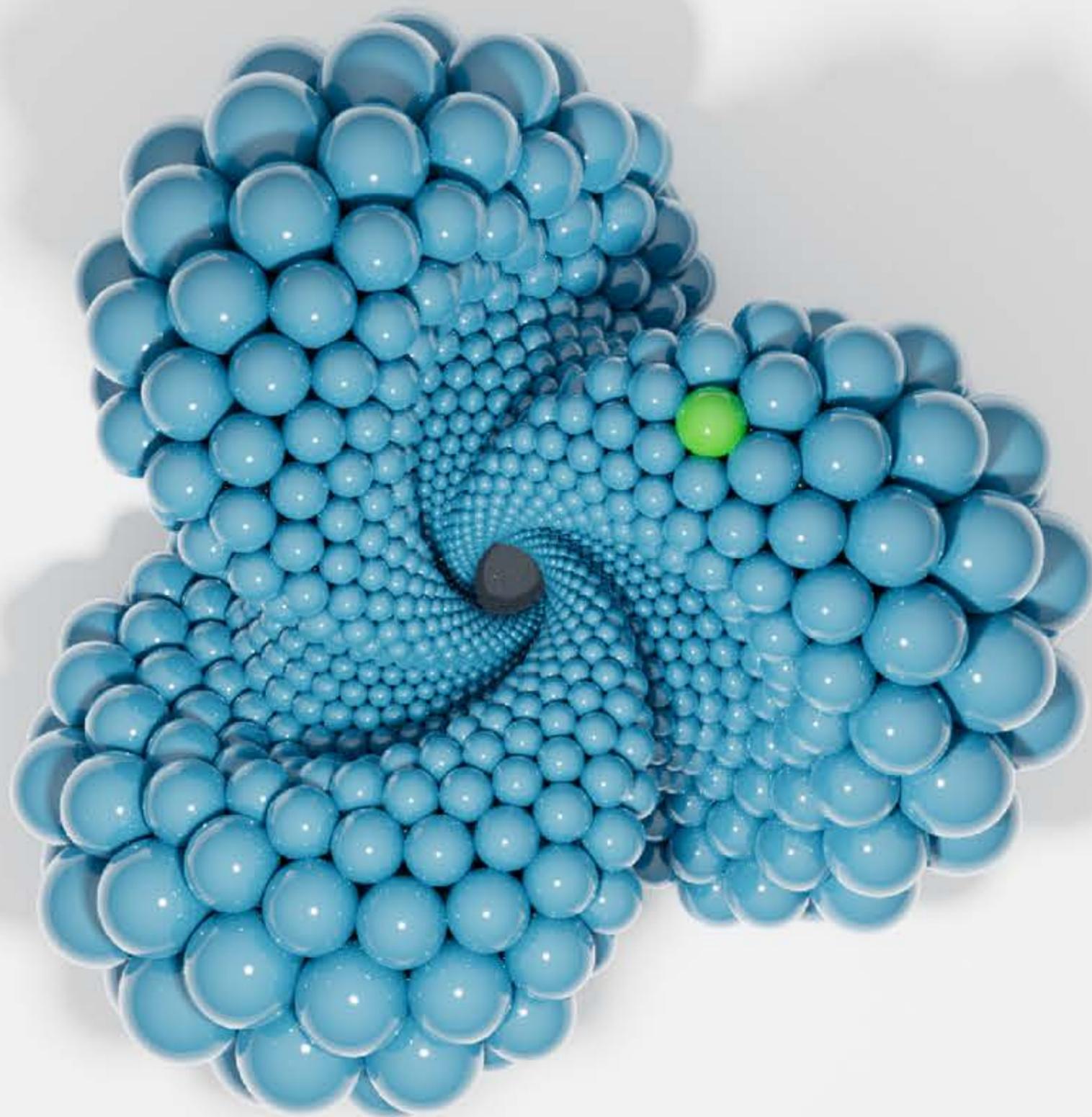








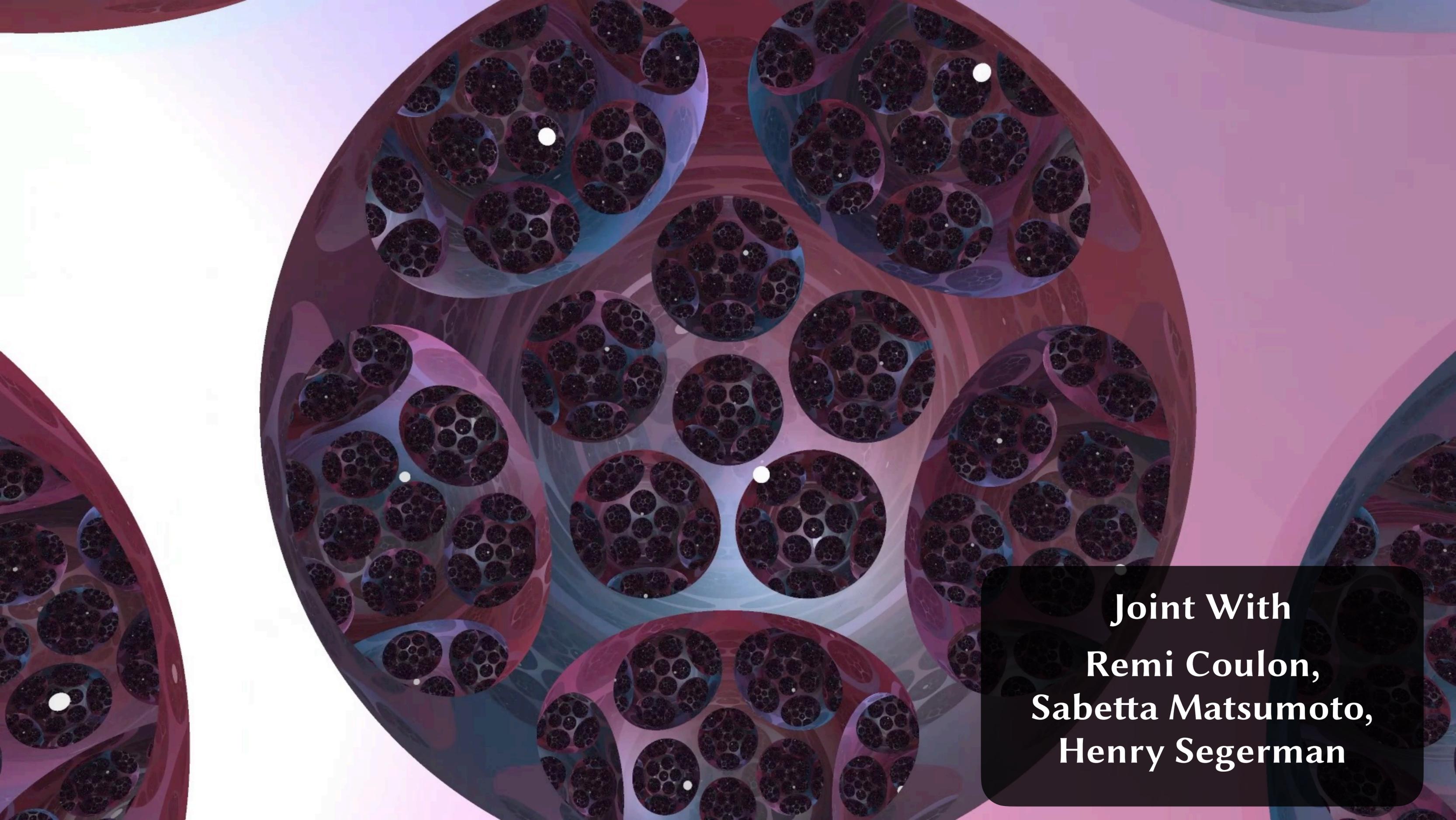




Joint with
Nadir Hajouji

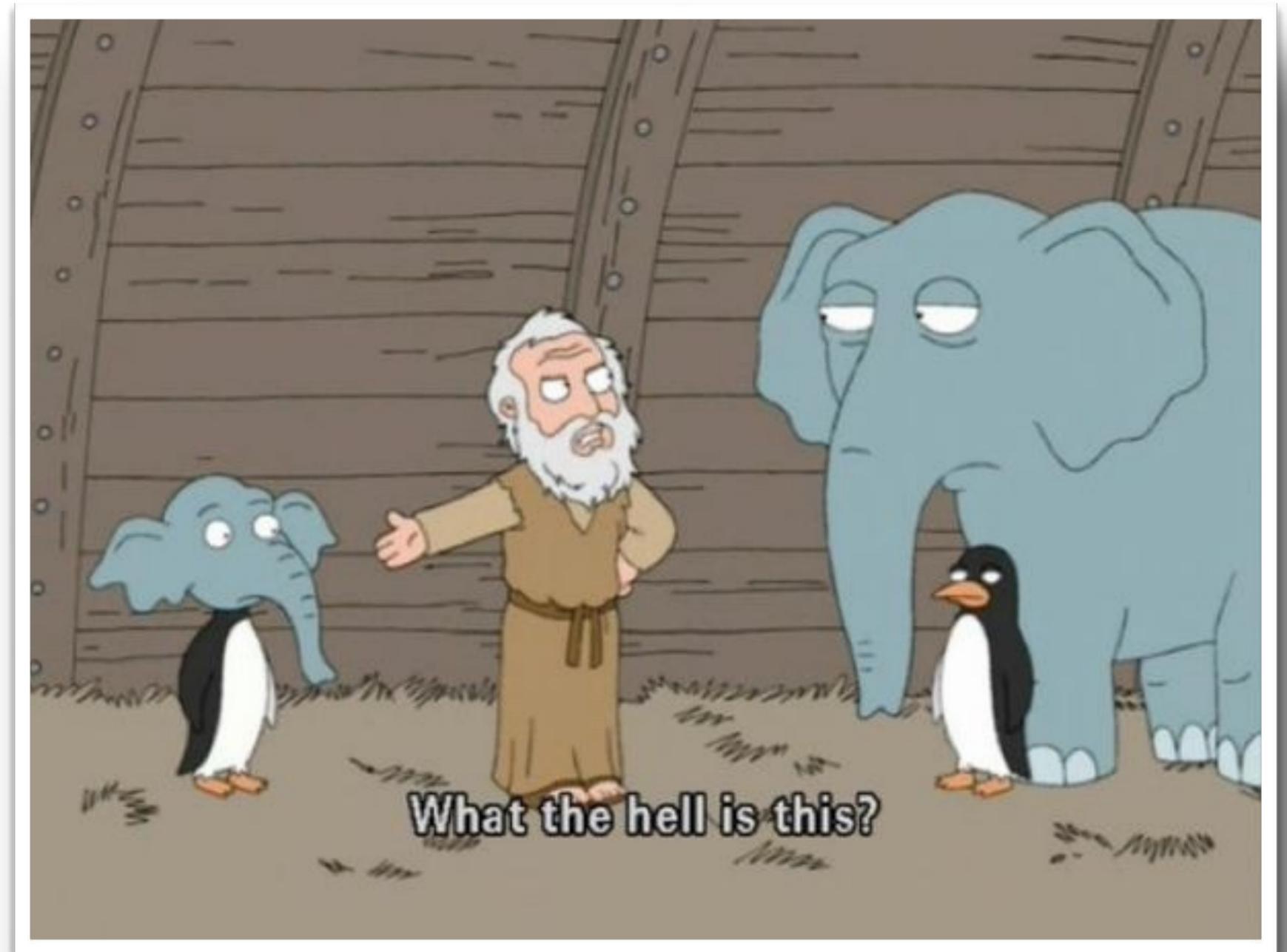


Joint with
Nadir Hajouji



Joint With
Remi Coulon,
Sabetta Matsumoto,
Henry Segerman

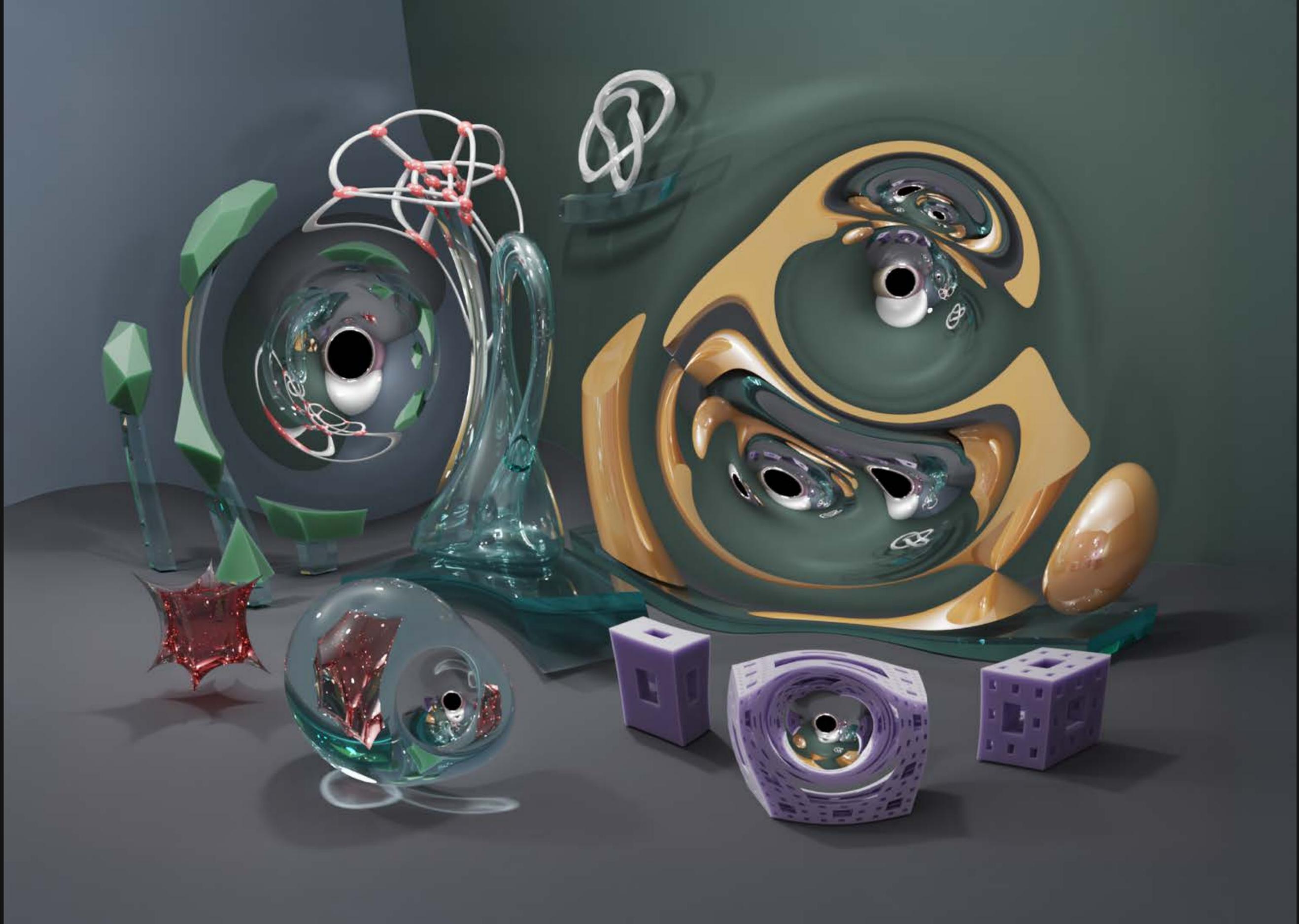
Combining my
interests

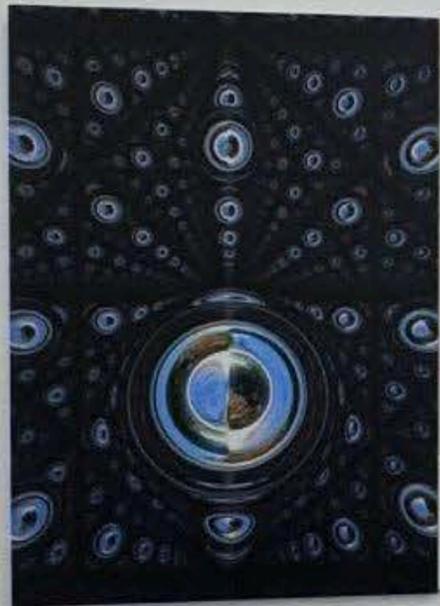












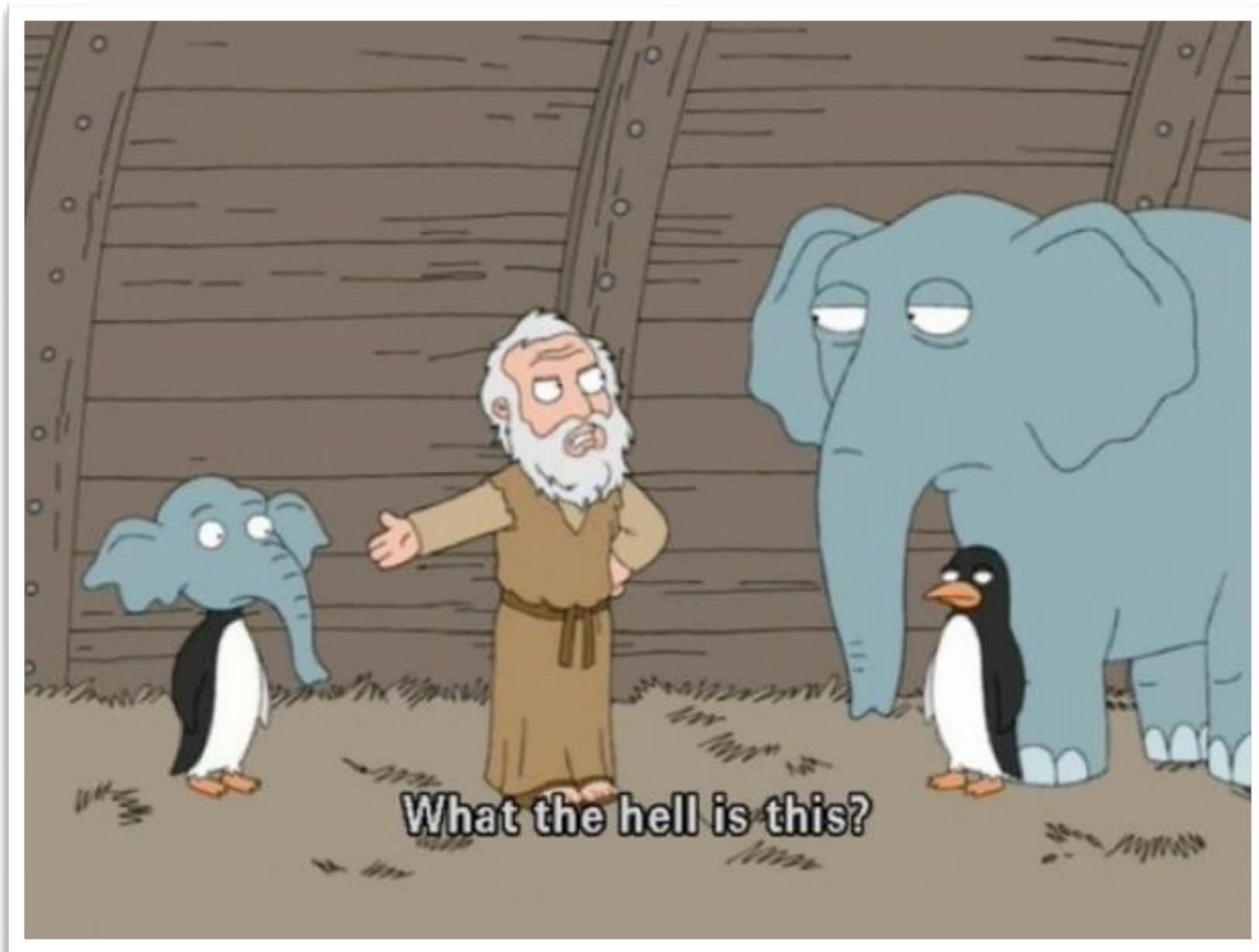
BLACK HOLES IN THE SKY

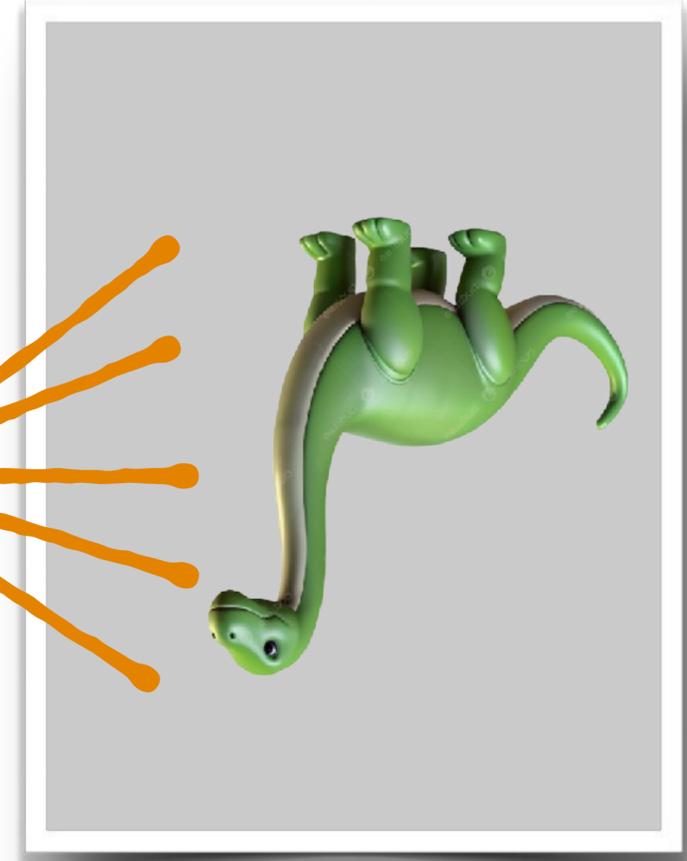
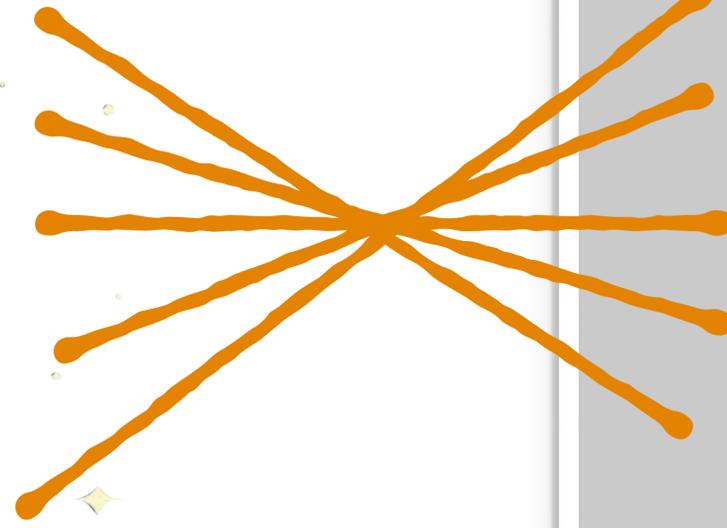
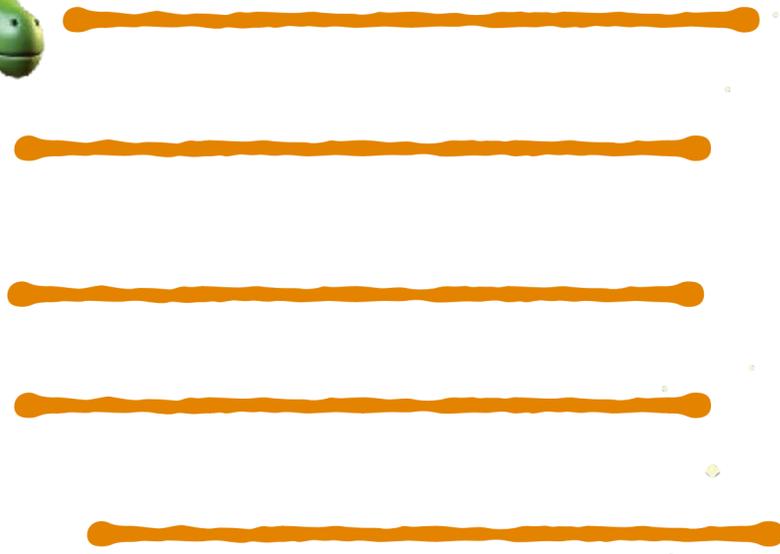
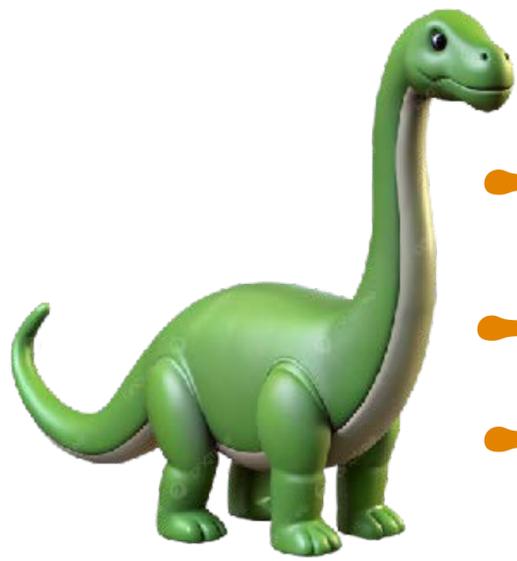
**STEVE TRETTEL,
BLACK HOLES**

Steve Trettel is a mathematician who studies black holes. He has discovered that black holes can be described by a set of equations that are similar to those that describe the motion of particles. This discovery has led to a new understanding of black holes and their role in the universe.



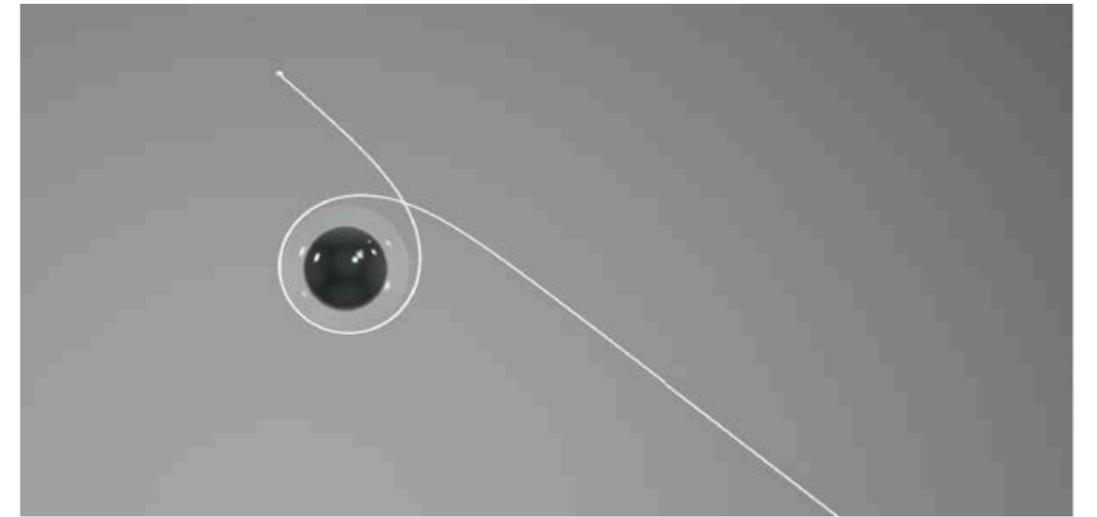
BLACK HOLES IN THE SKY



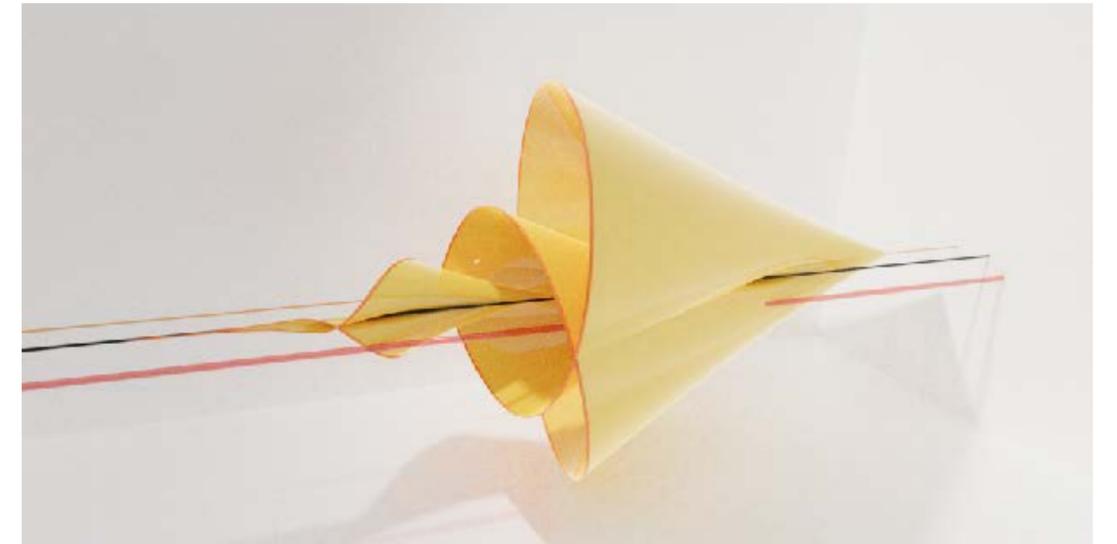




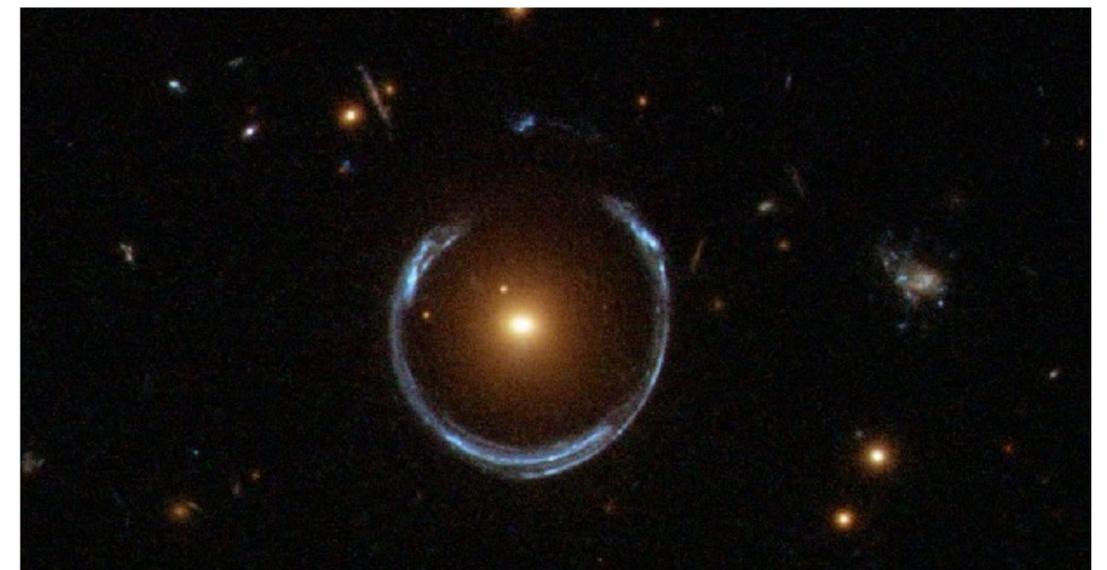
Trajectories around a black hole are complicated



Curvature in the time direction is dominant



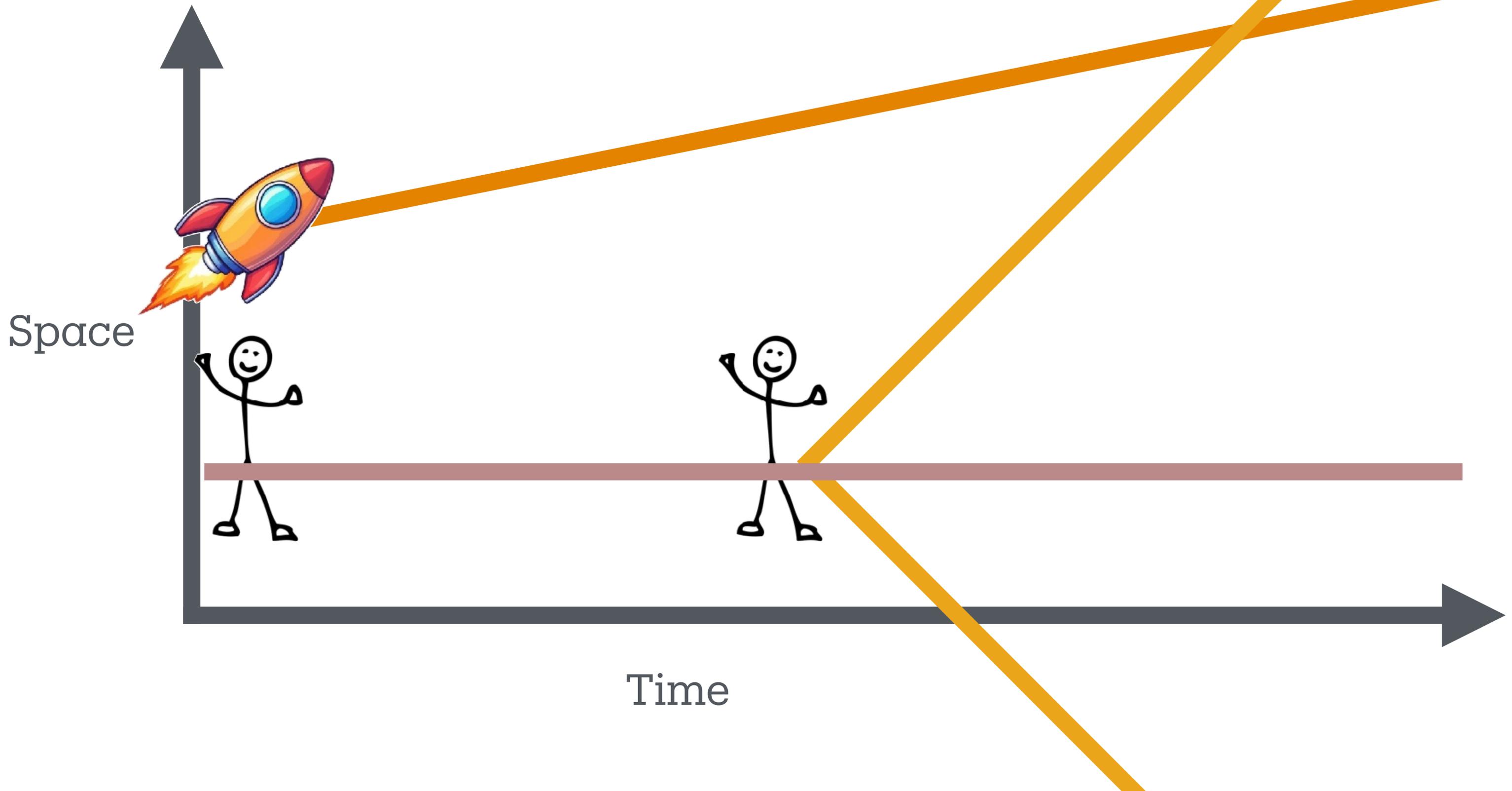
Telescopes see
distorted images



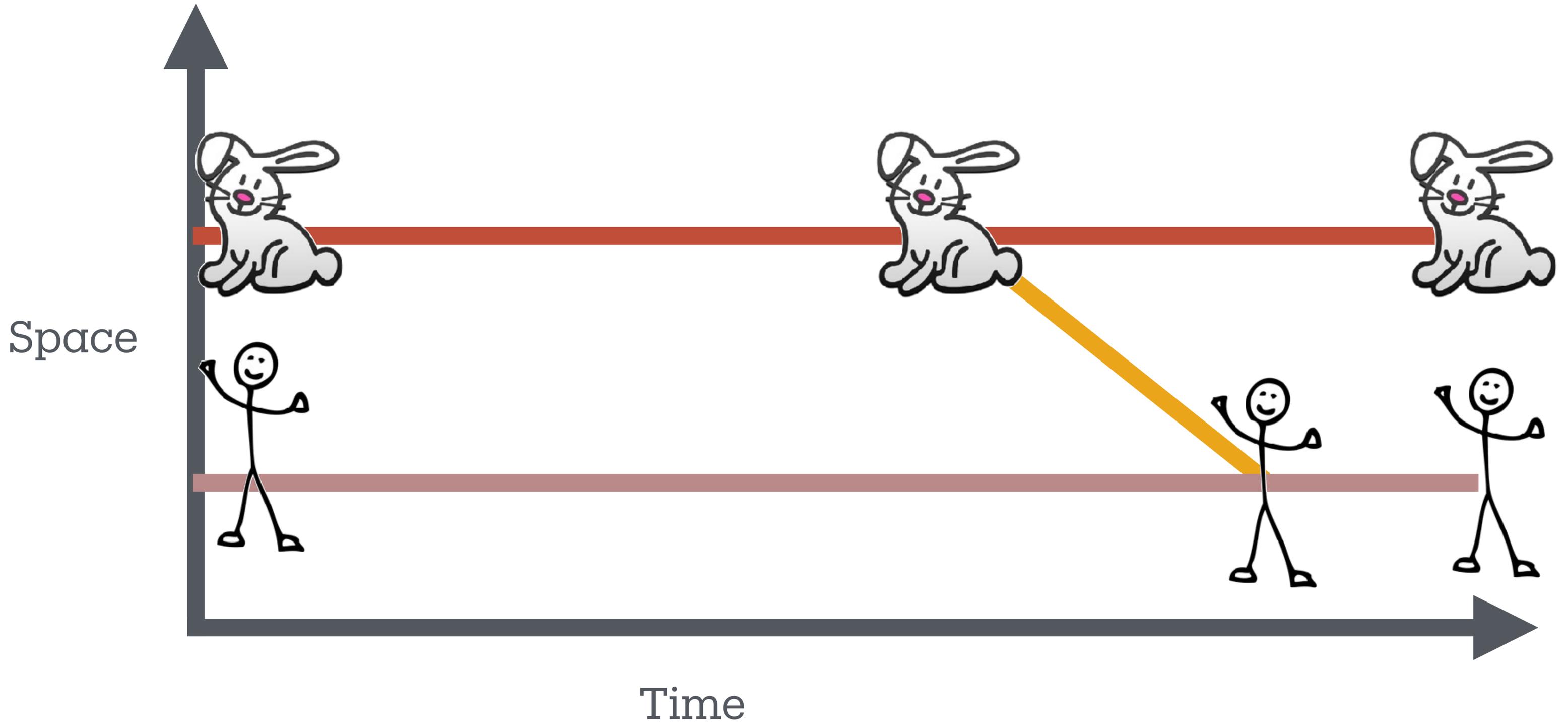


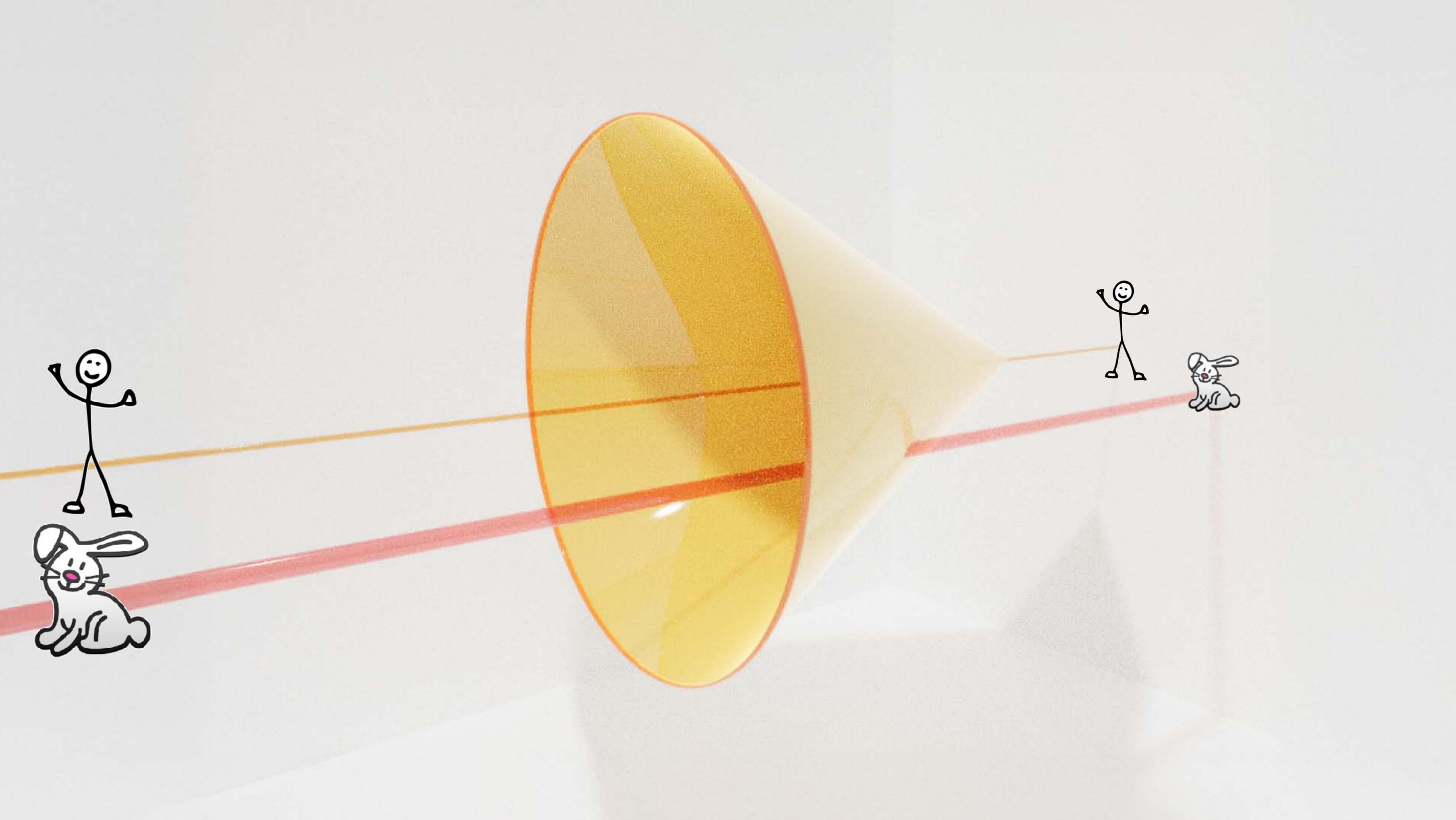
Seeing in
Spacetime

Tracing Light in Spacetime

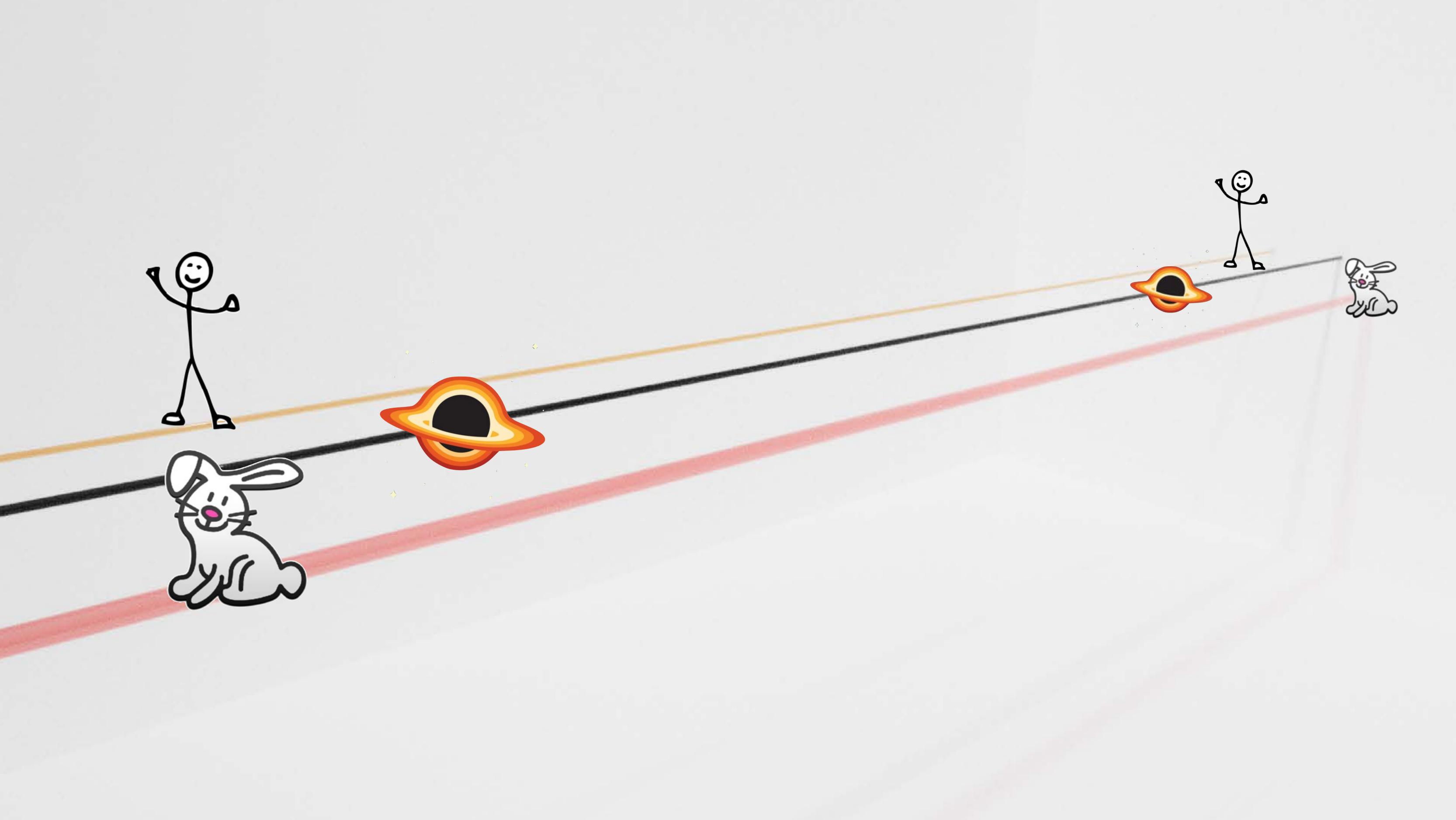


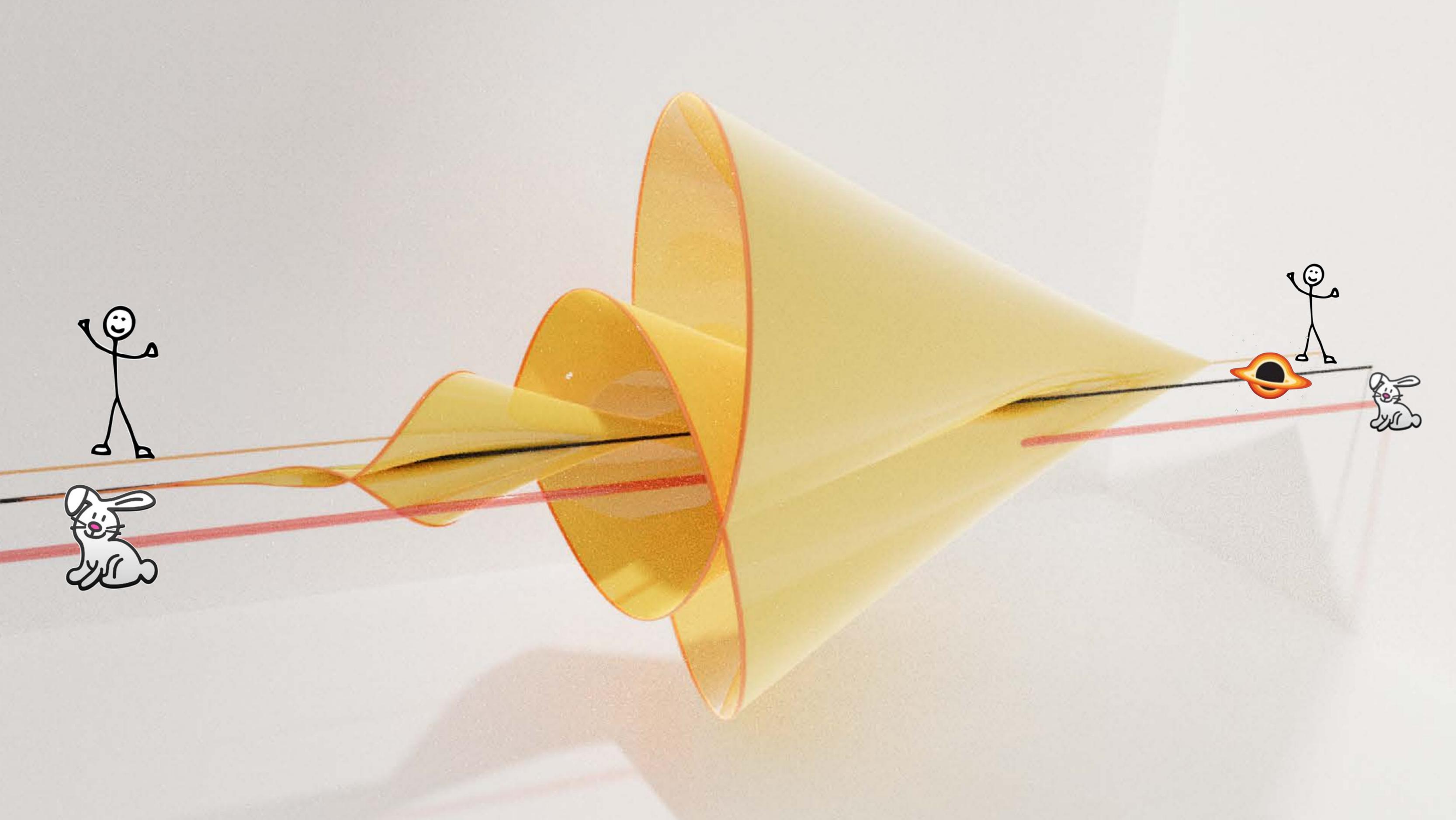
Tracing Light in Spacetime

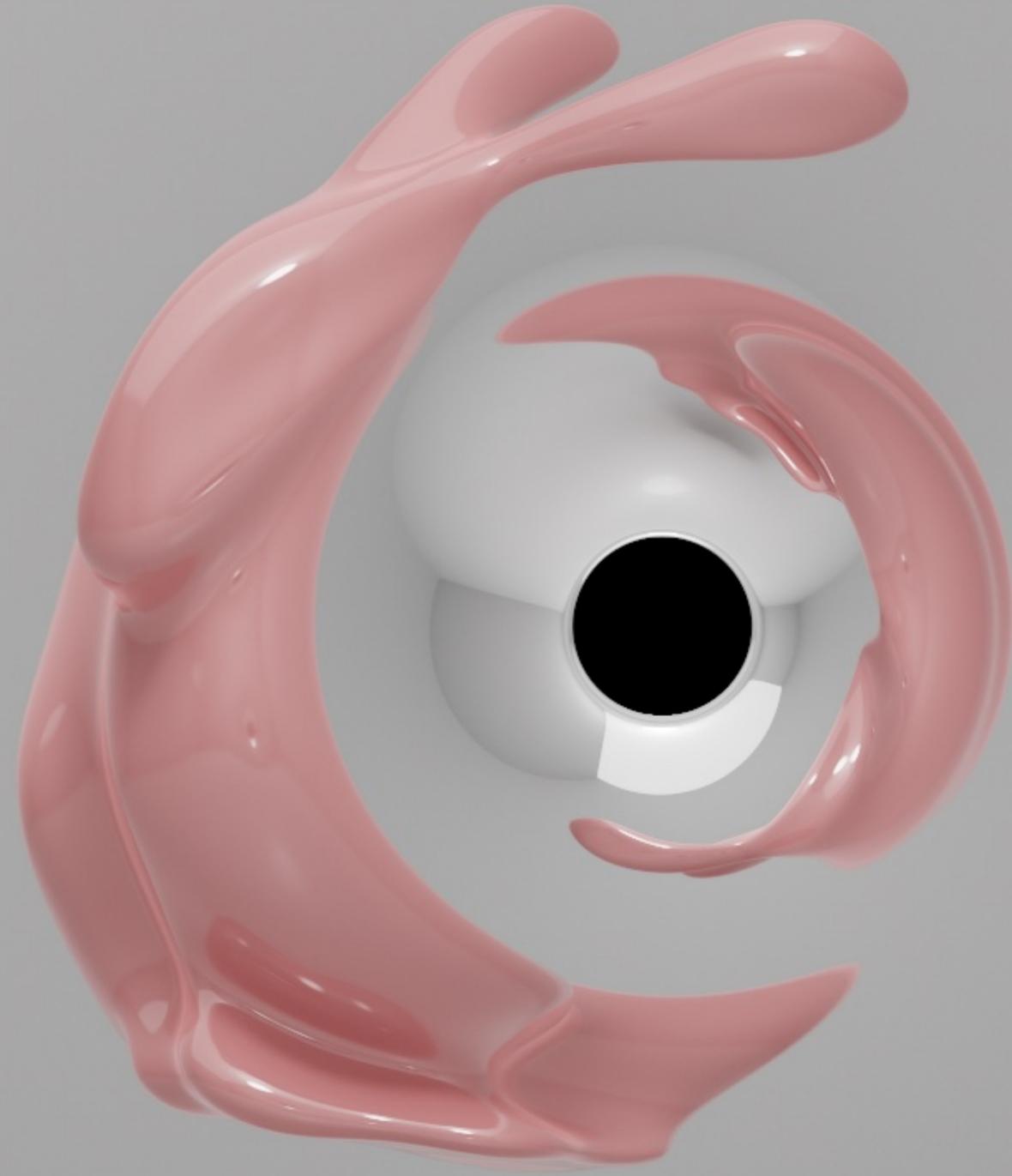






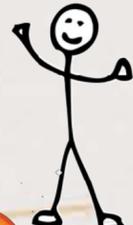
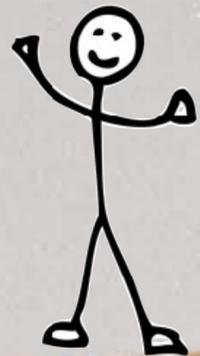
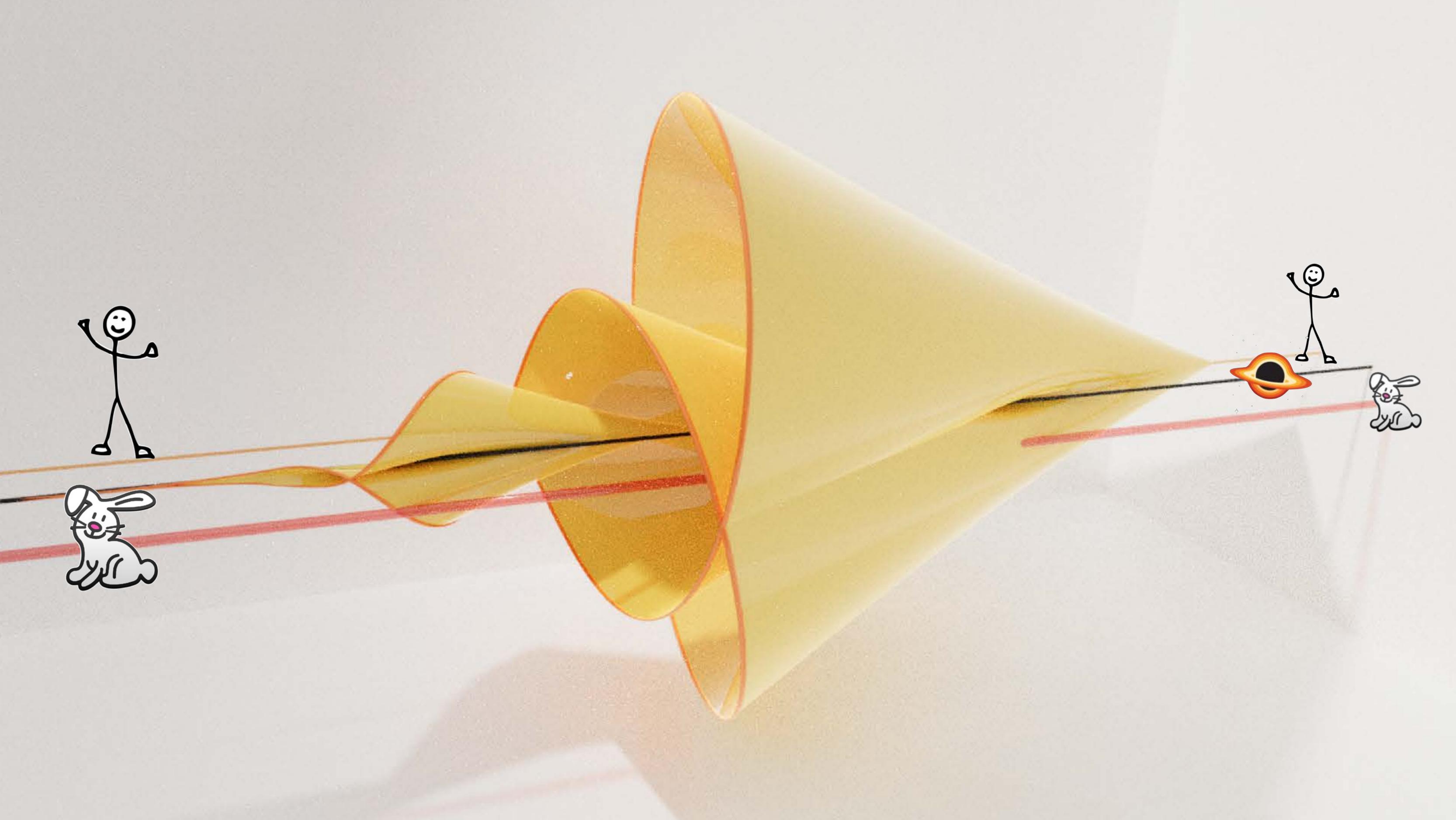


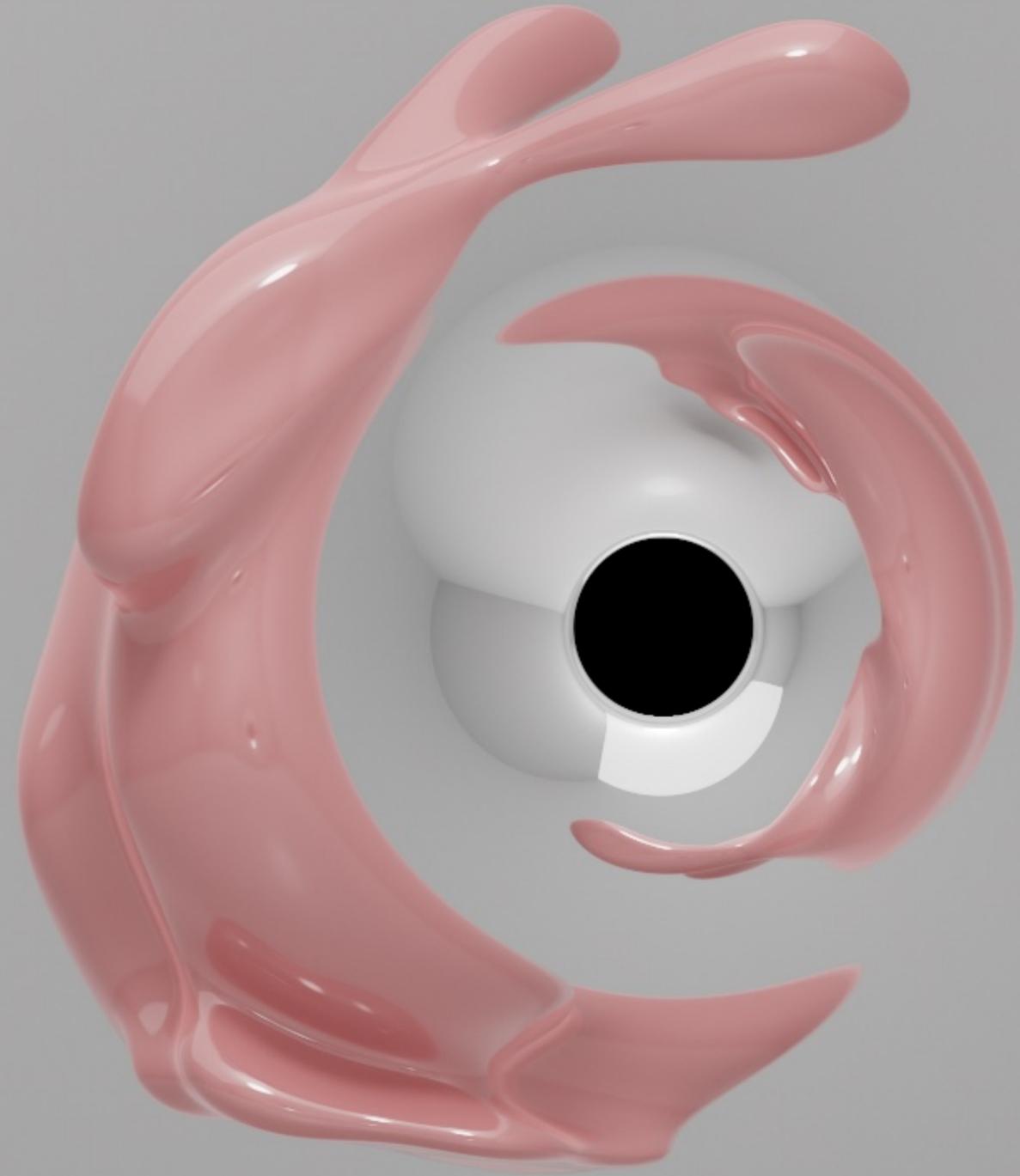
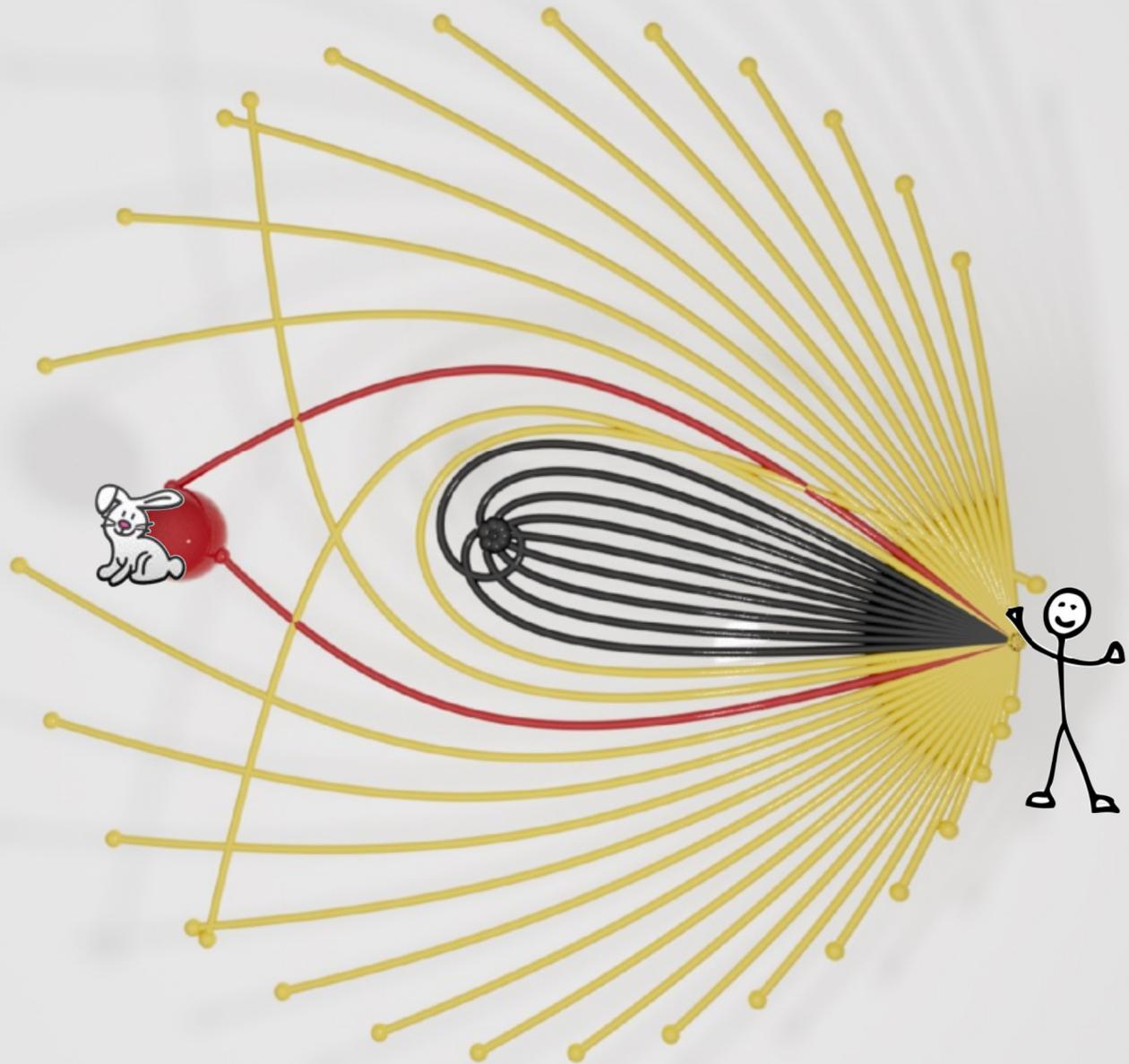


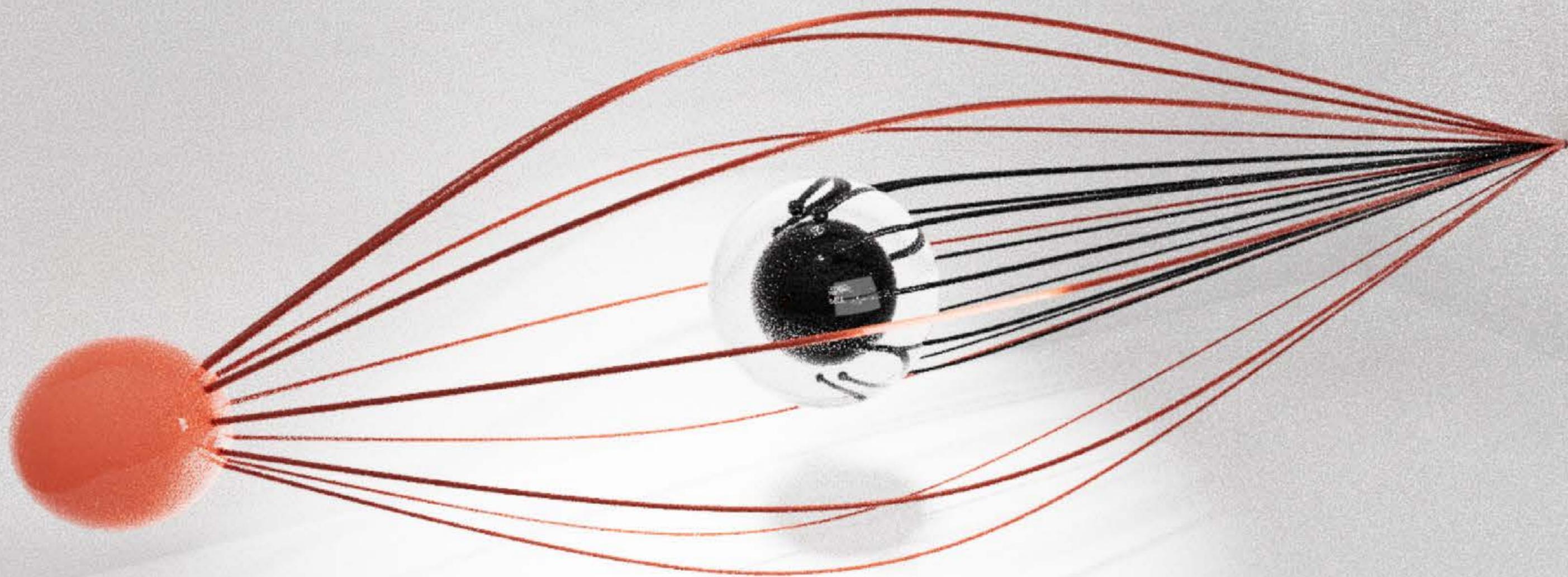


If things are static over time, we can project off the time direction





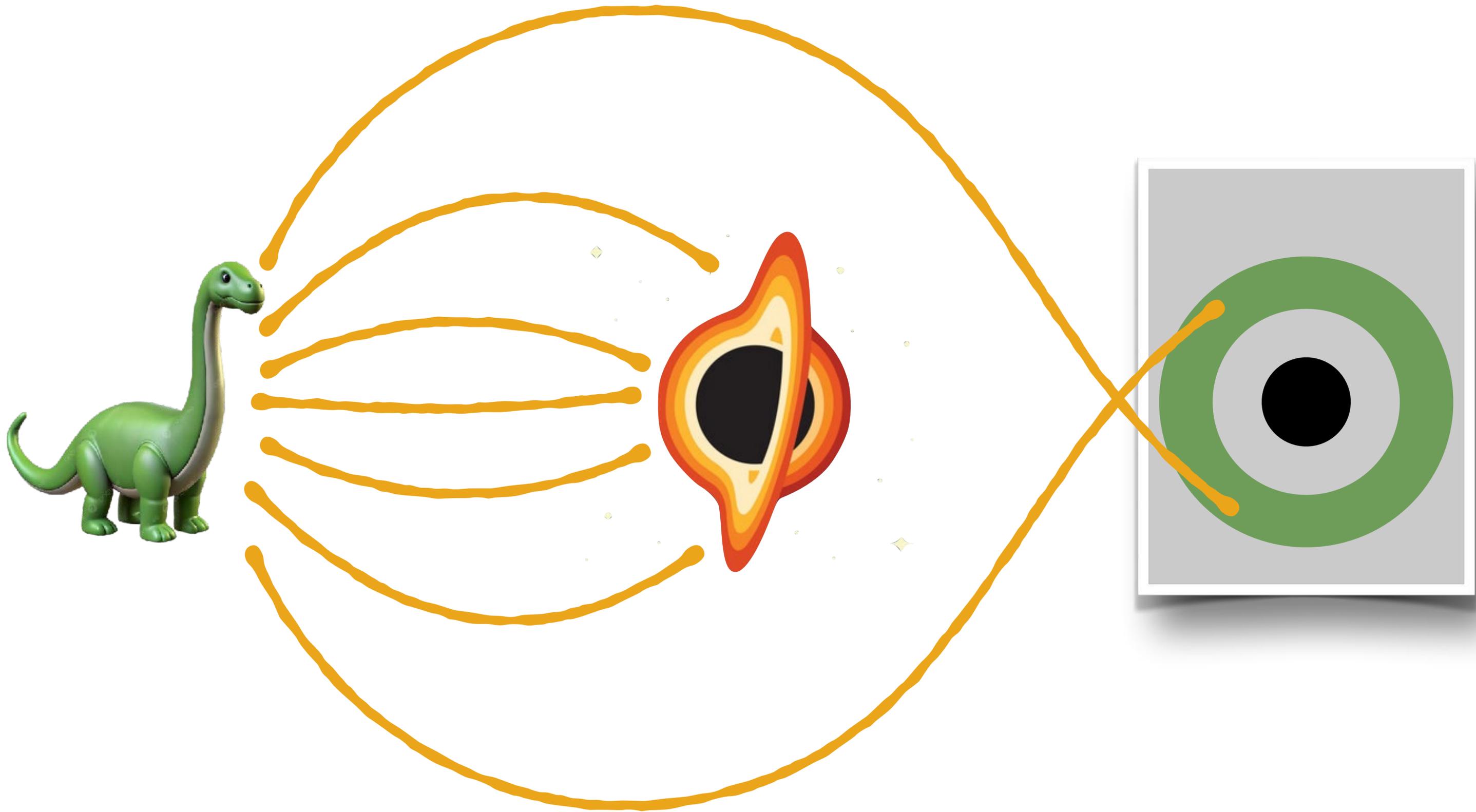


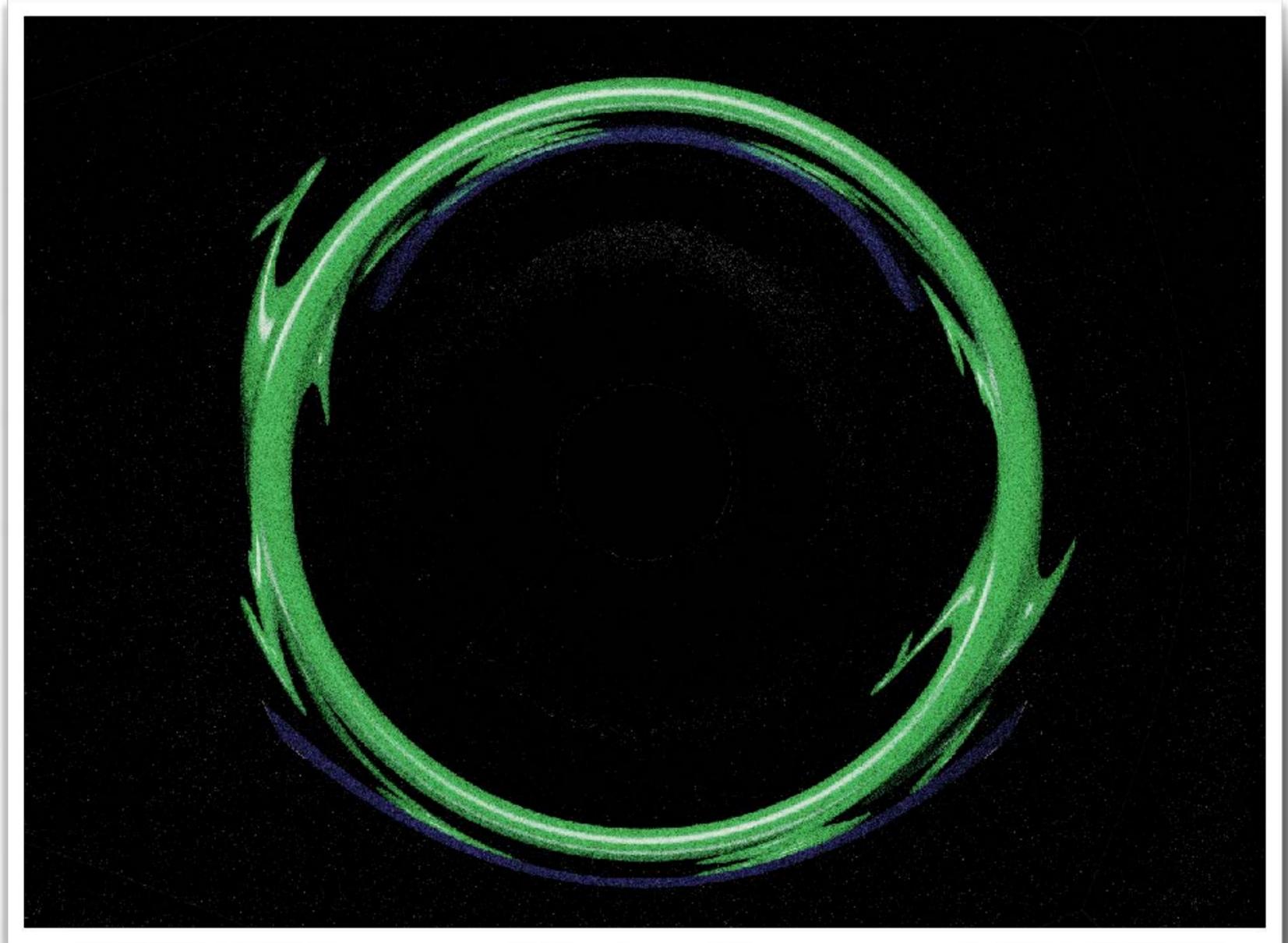




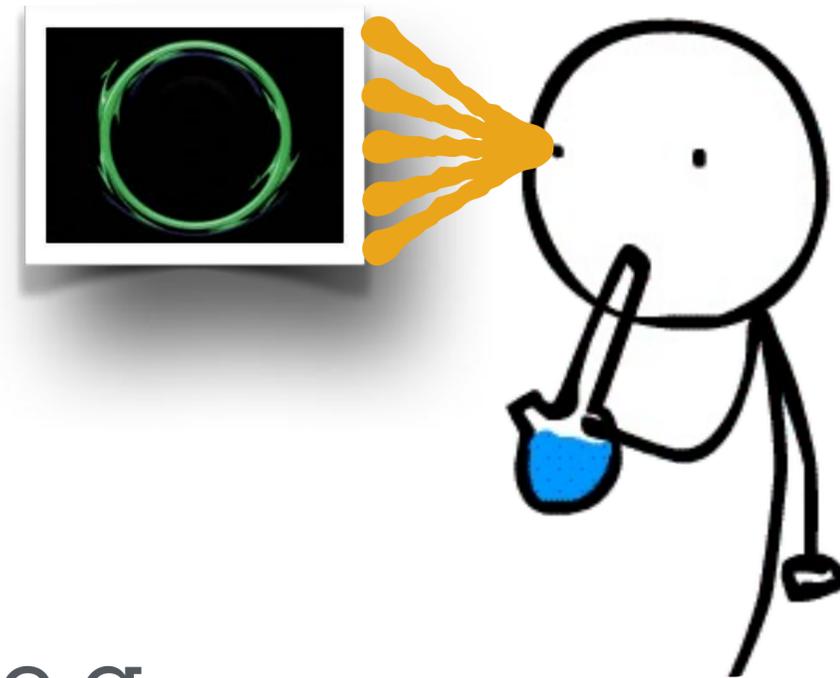








This is the view in the
tangent space at a point



We want to expose a
piece of film!

LIGHT



DINOSAUR

BLACK HOLE



FILM



