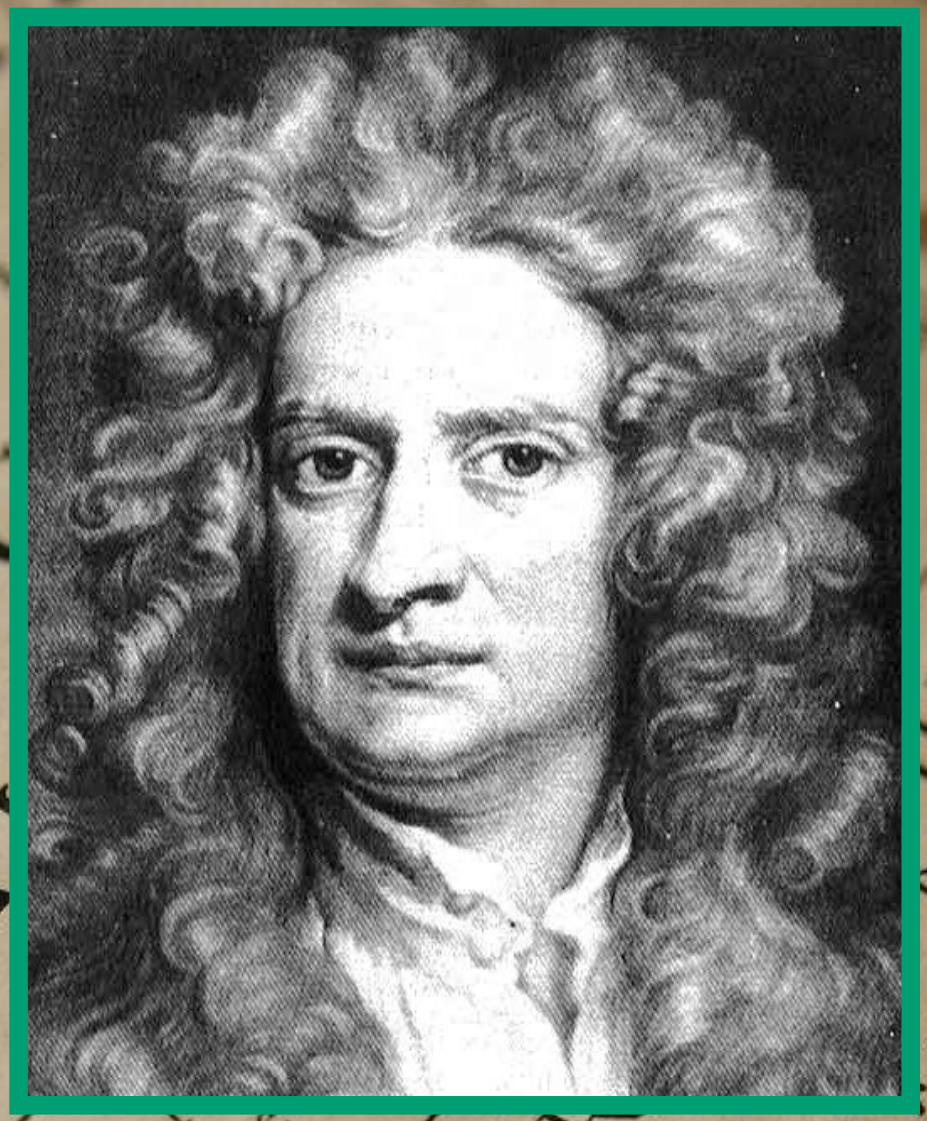
Einstein's greatest idea

Christopher Berry • @cplberry

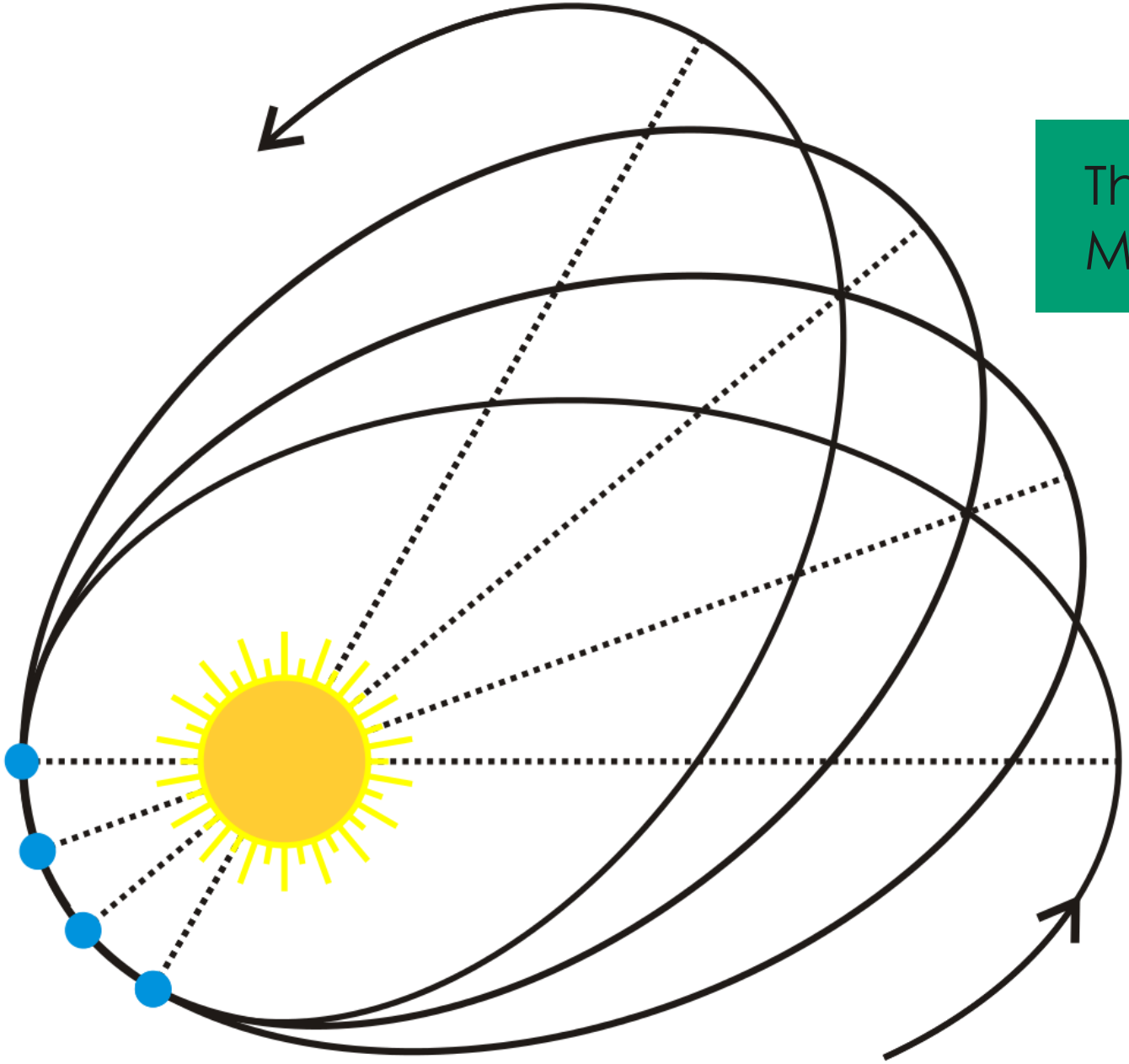
Image:
Daniel Berehulak/
Getty Images



Gravitation is universal.

Objects move in straight lines.

The puzzle of Mercury's orbit



Relativity

Space and time are linked.

Nothing can travel faster than the speed of light.

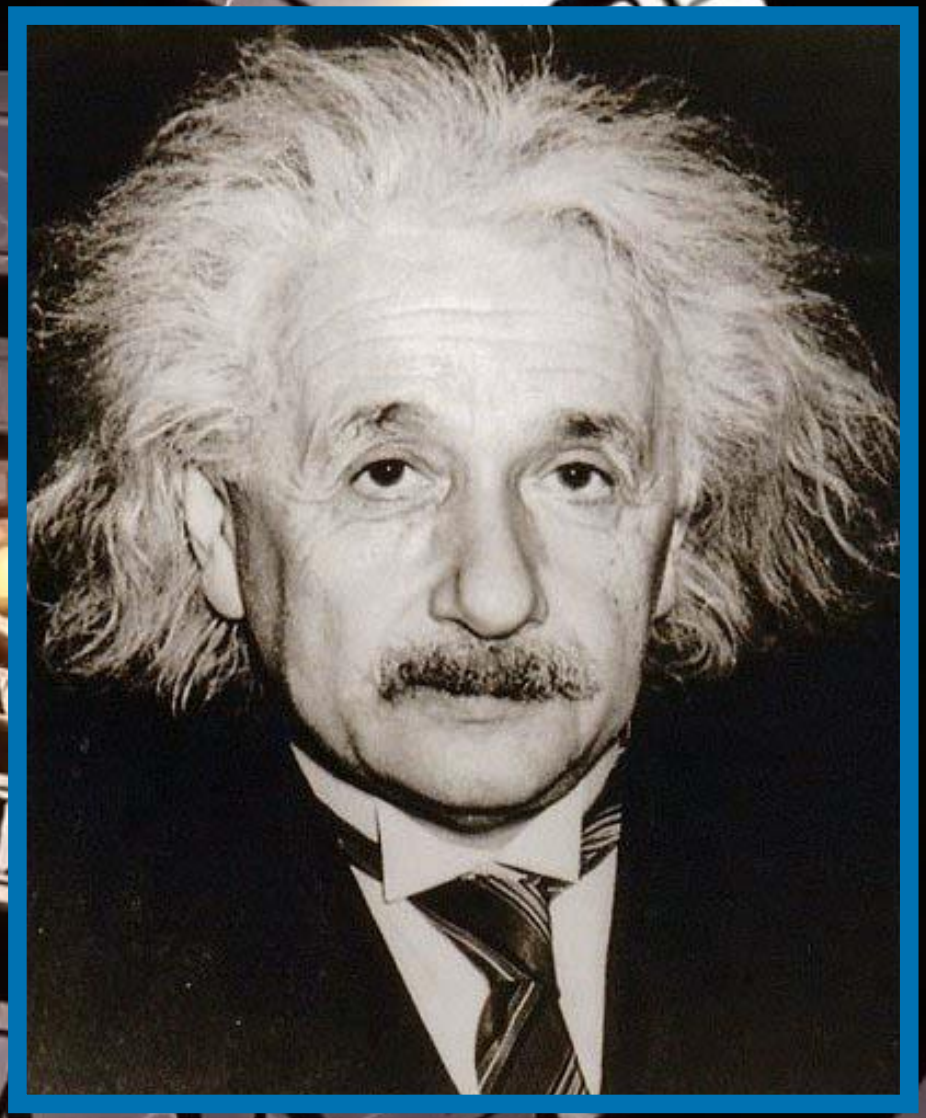


Image: BBC

Space-time

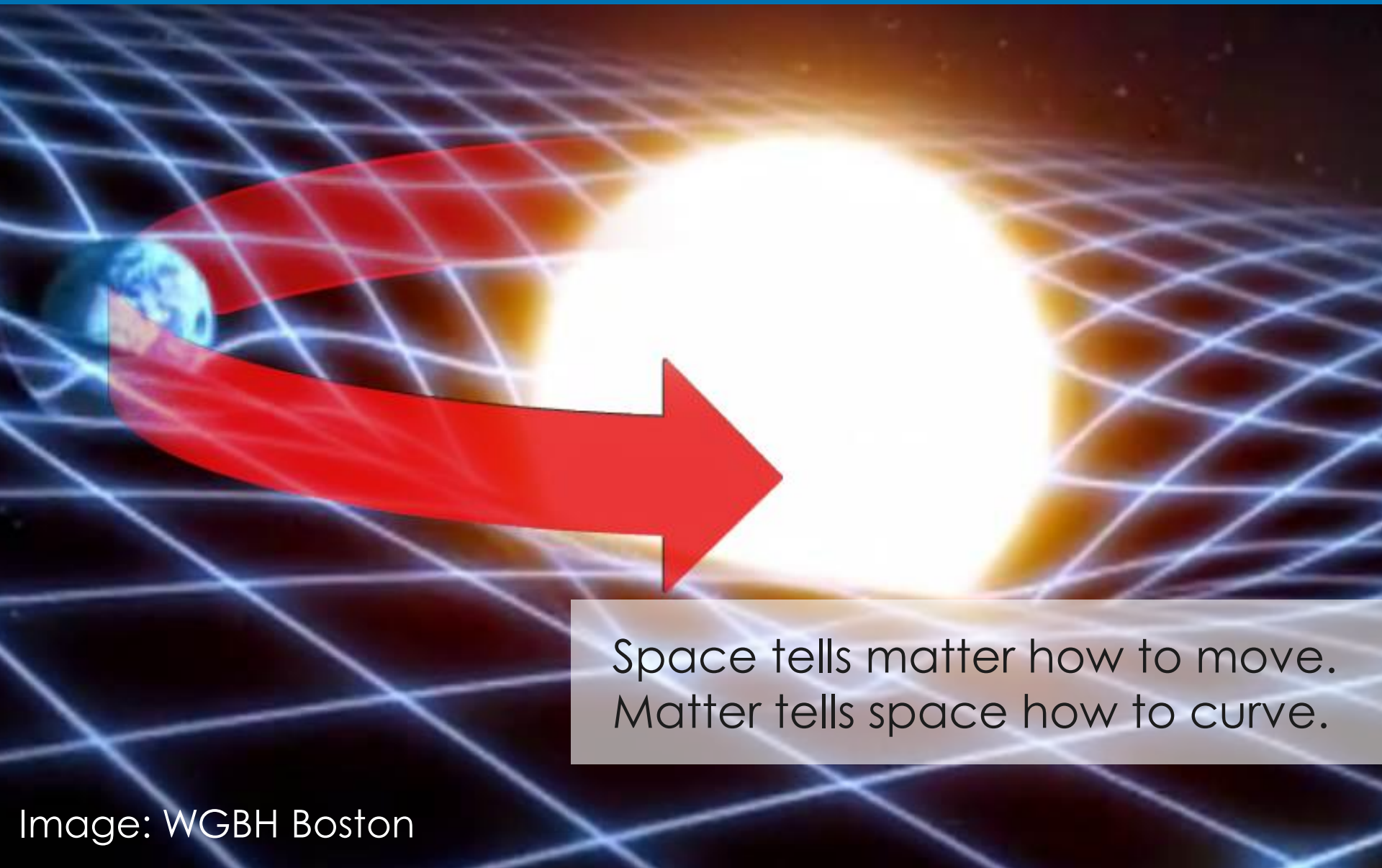


Image: WGBH Boston

General relativity

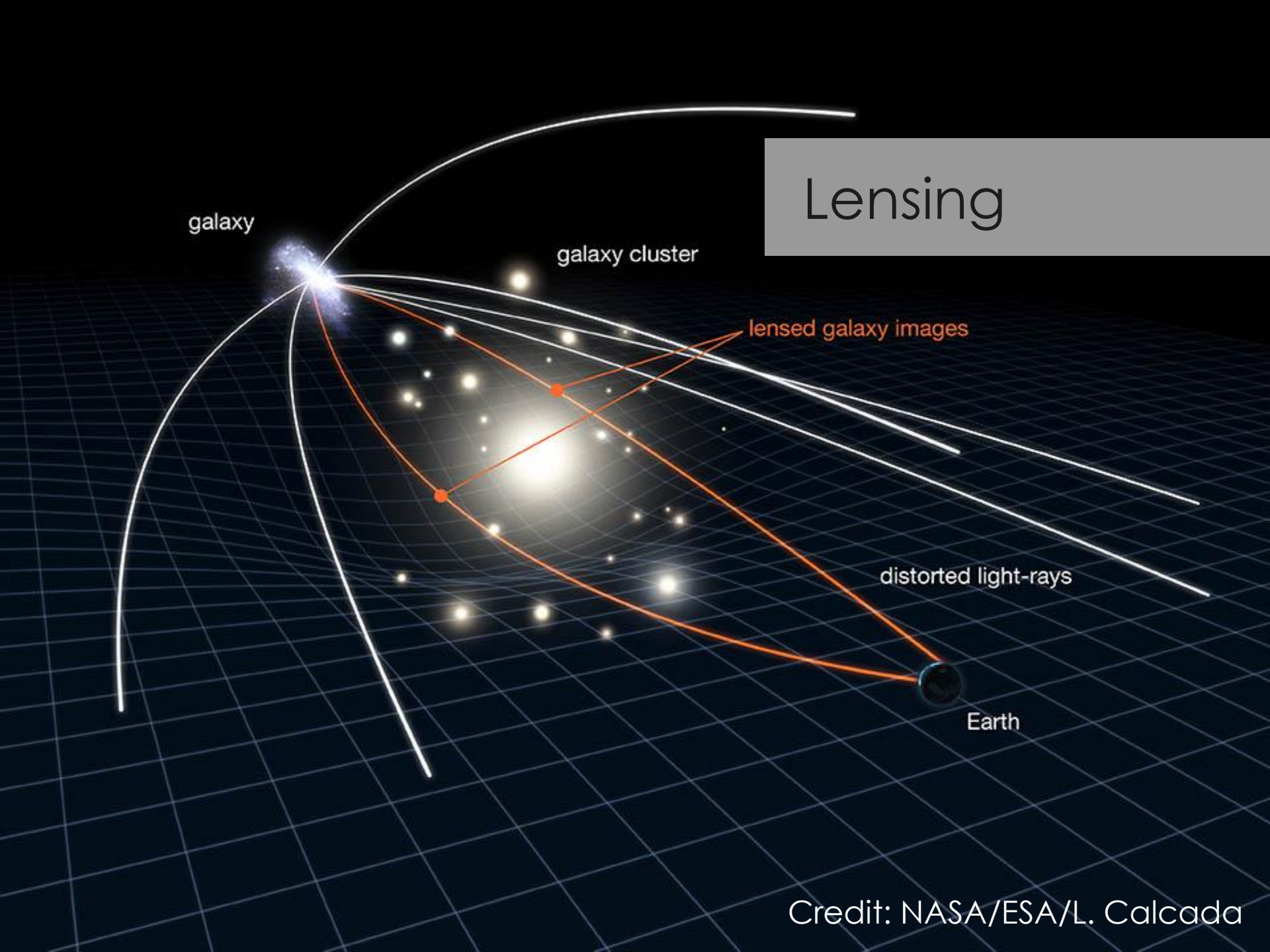
$$G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Curvature

Mass


What does general relativity tell us?
Image: NASA, ESO

Lensing



Credit: NASA/ESA/L. Calcada

LIGHTS ALL ASKEW IN THE HEAVENS

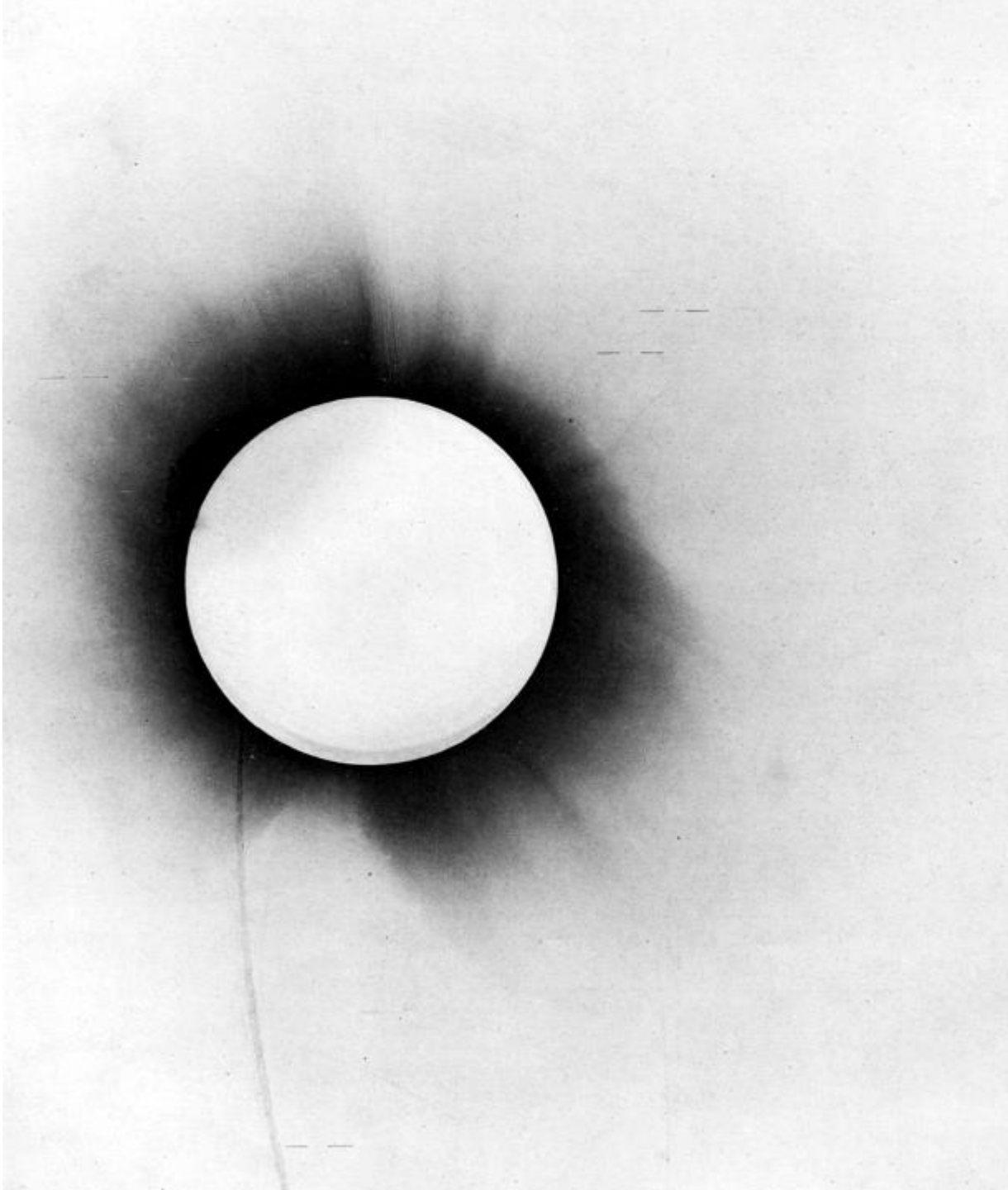
Men of Science More or Less Agog Over Results of Eclipse Observations.

EINSTEIN THEORY TRIUMPHS

Stars Not Where They Seemed or Were Calculated to be, but Nobody Need Worry.

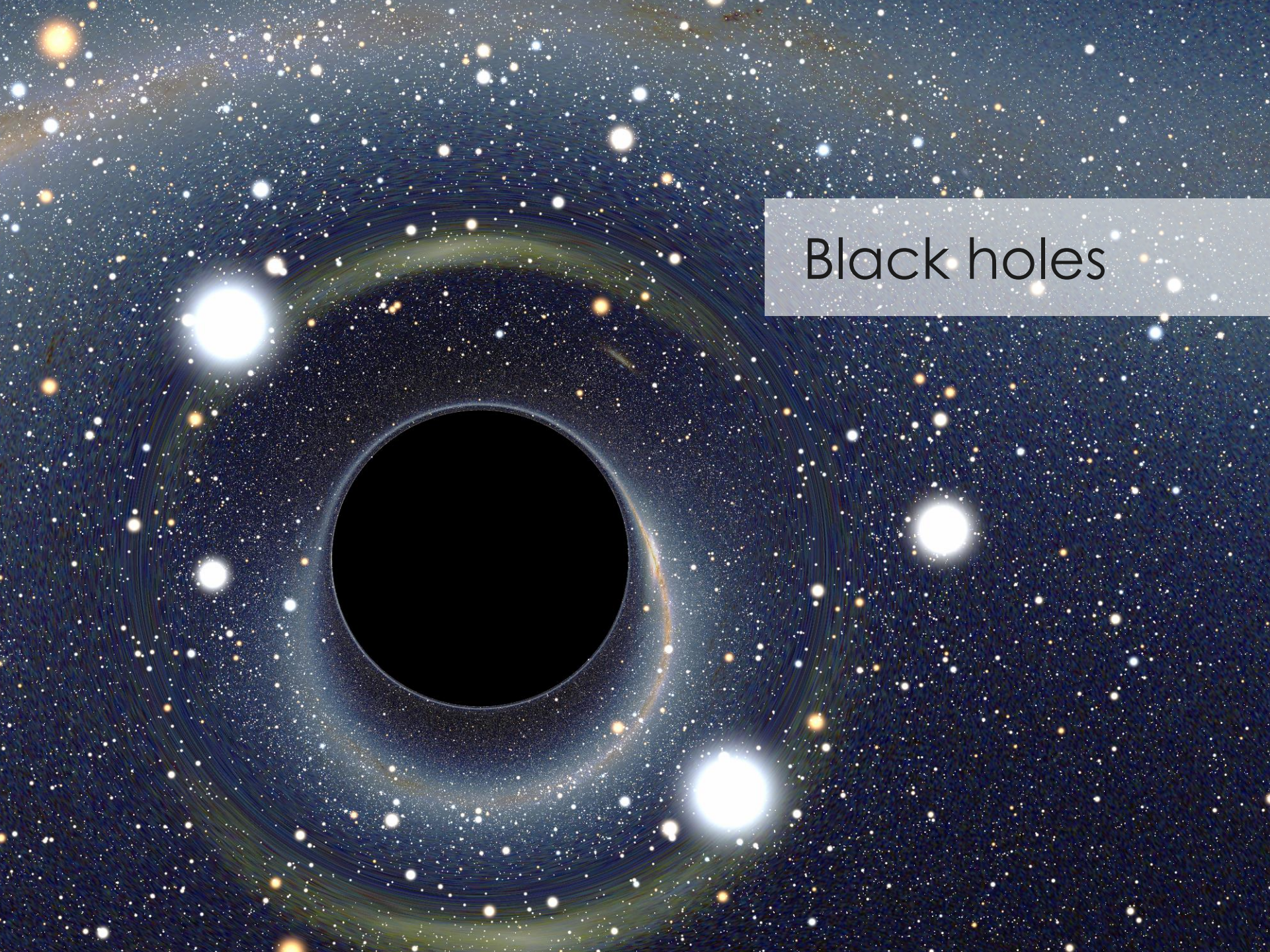
A BOOK FOR 12 WISE MEN

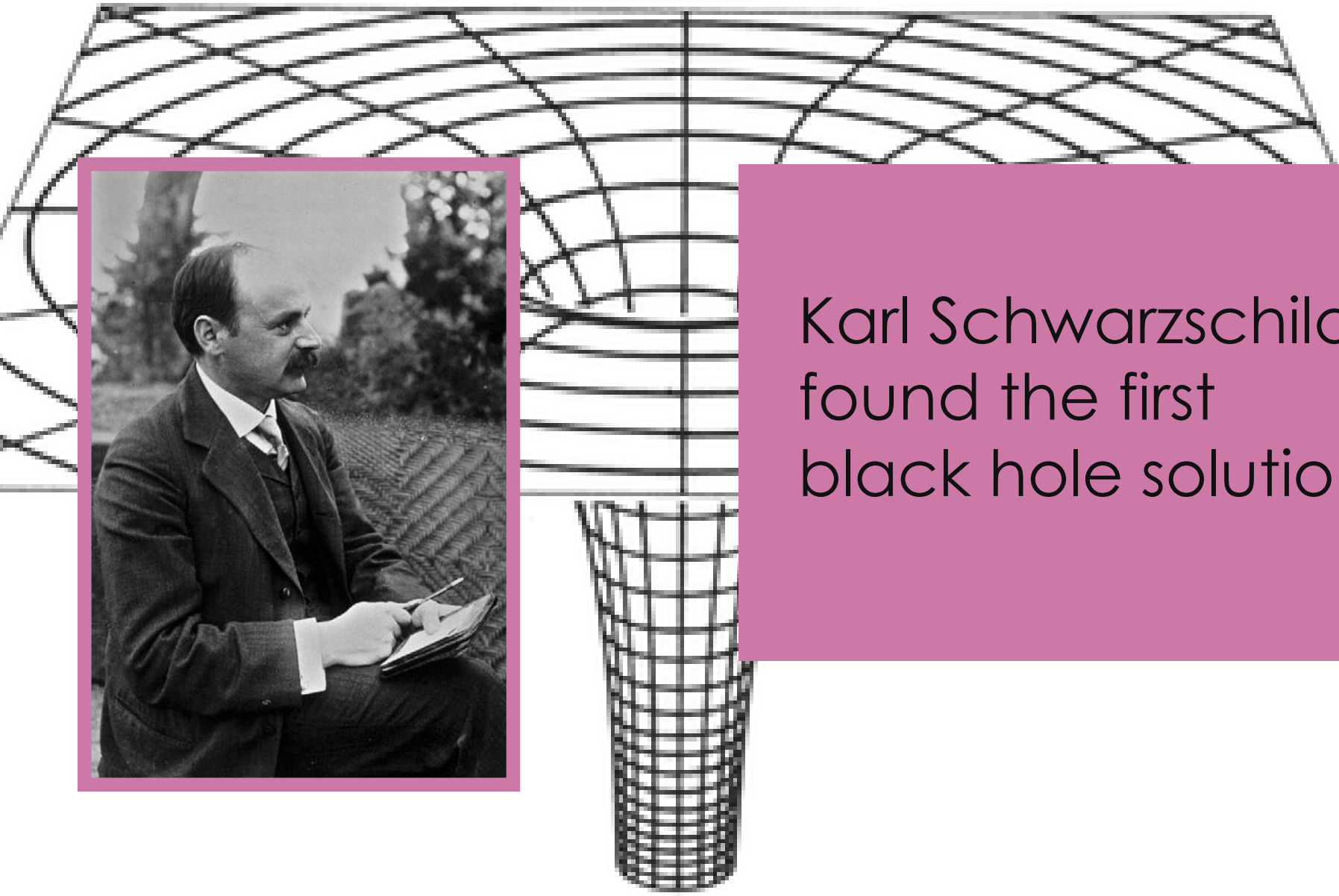
No More in All the World Could Comprehend It, Said Einstein When His Daring Publishers Accepted It.



Credit: New York Times


Image: NASA/ESA/HST


Black holes



Karl Schwarzschild found the first black hole solution

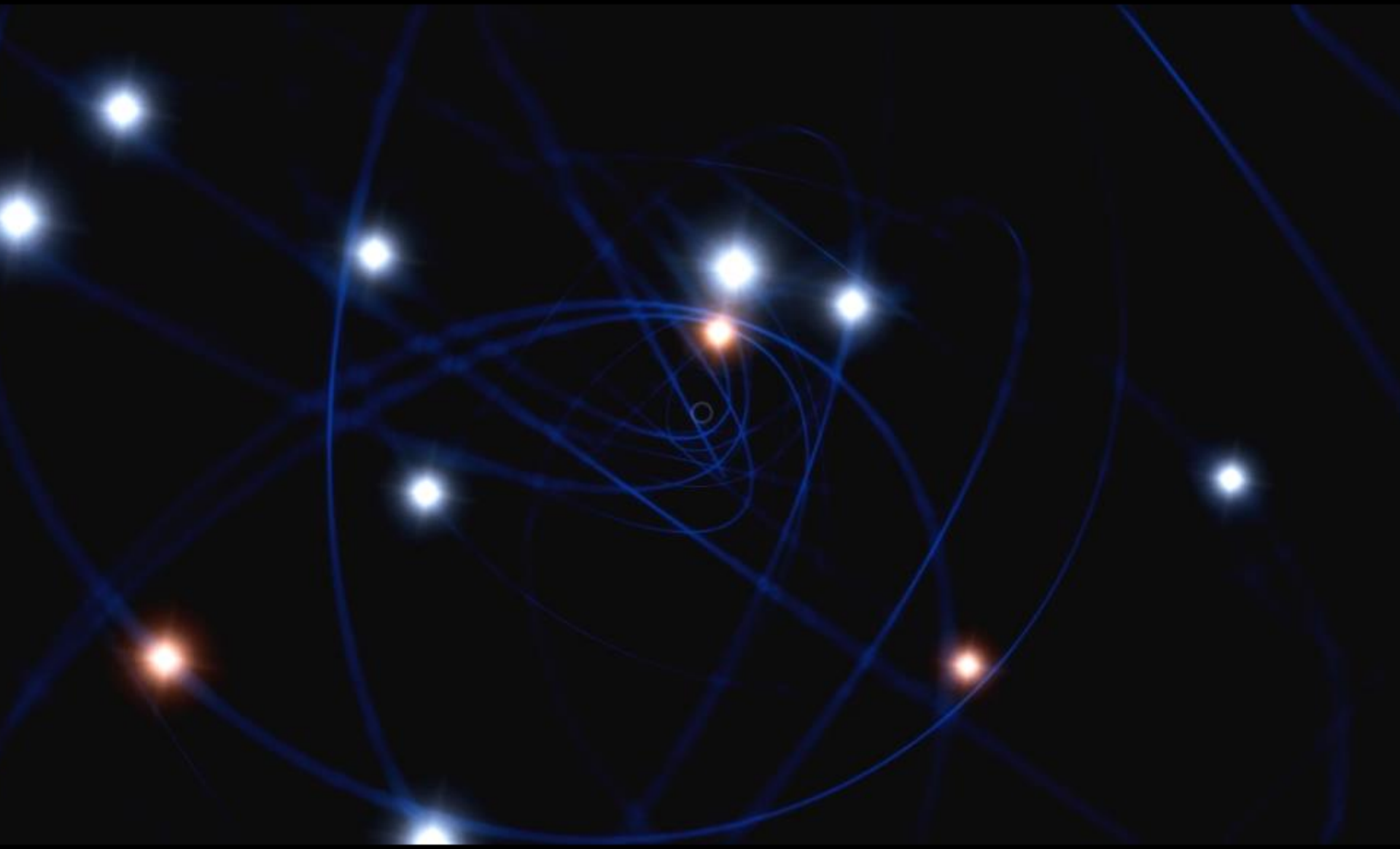
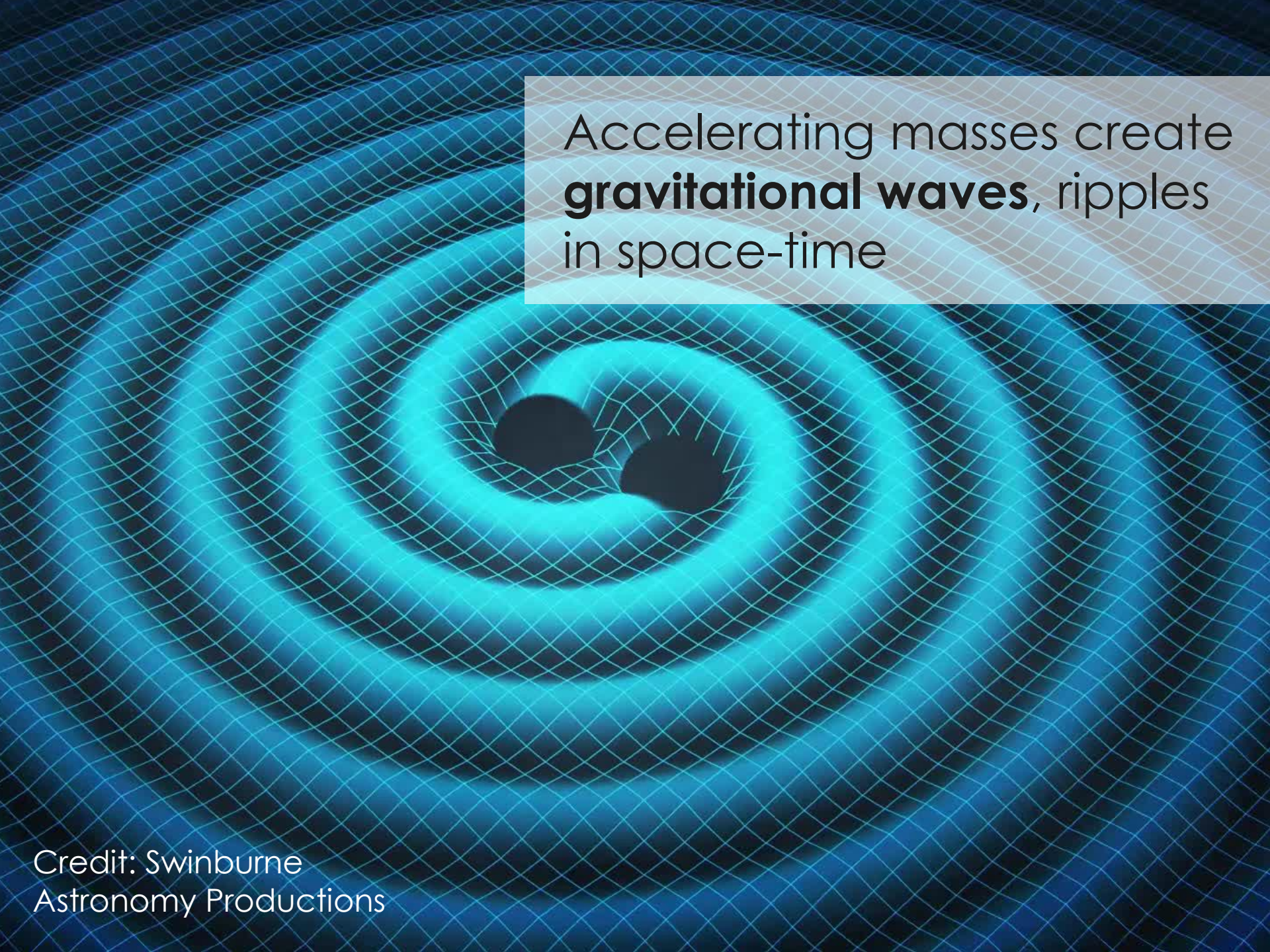
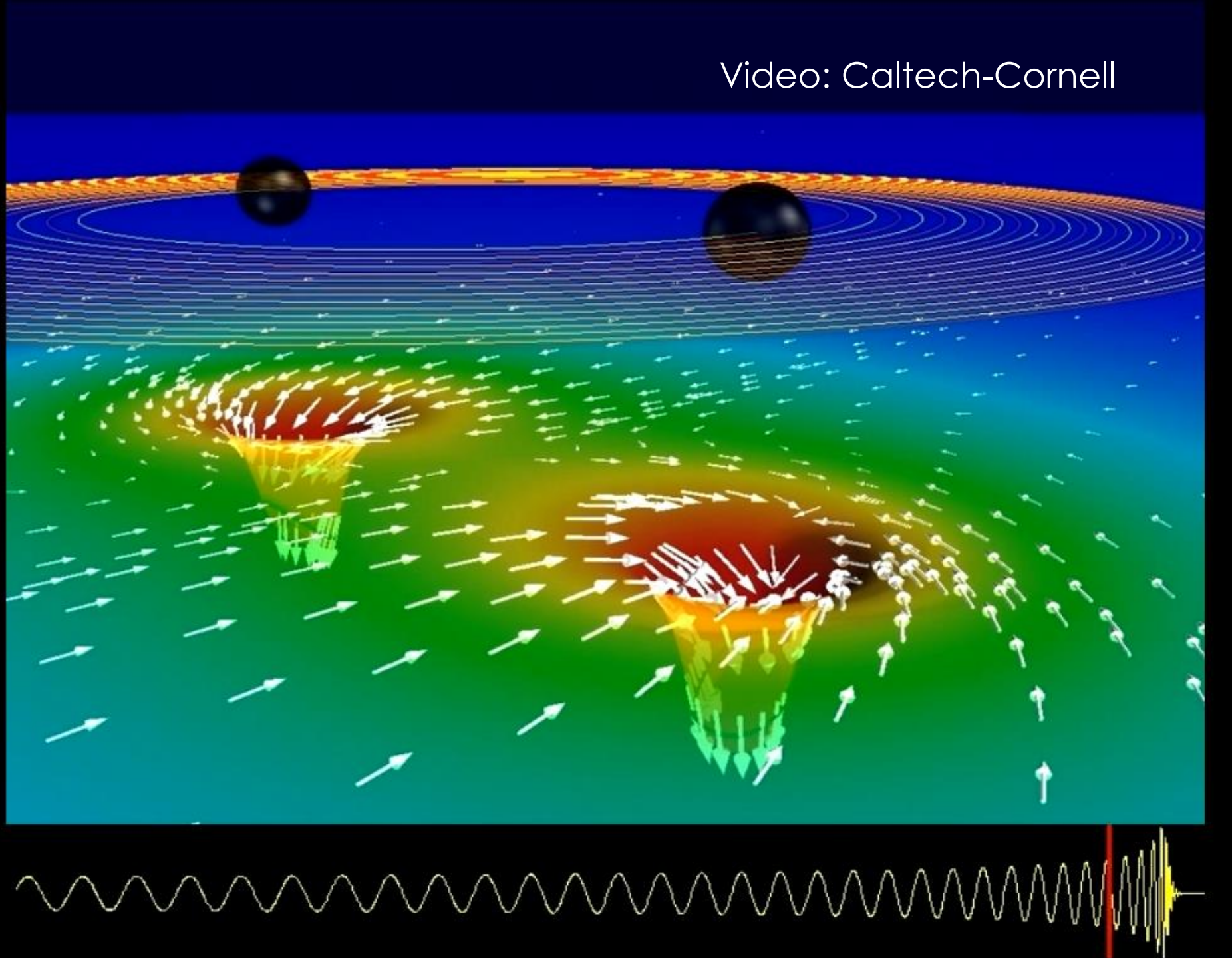


Image: ESO


Accelerating masses create **gravitational waves**, ripples in space-time
Credit: Swinburne Astronomy Productions

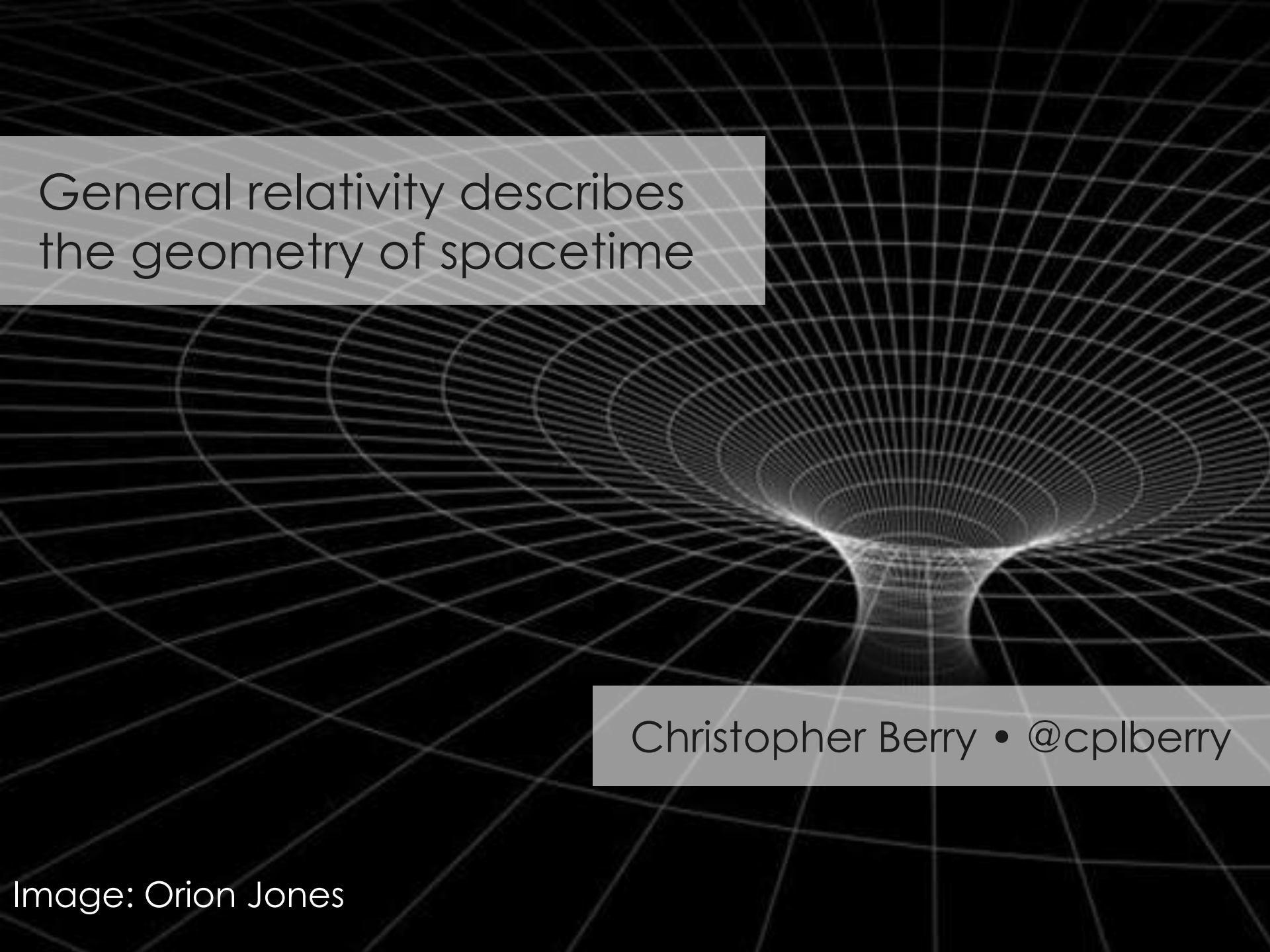

Video: Caltech-Cornell

Gravity is a universal force, the dominant force in astrophysics

It is described by the curvature of spacetime in **general relativity**

Gravitational lensing lets us weigh objects and learn about gravity

Black holes are the regions of strongest gravity


General relativity describes
the geometry of spacetime
Christopher Berry • @cplberry
Image: Orion Jones