

# Einstein's greatest idea

Christopher Berry • @cplberry

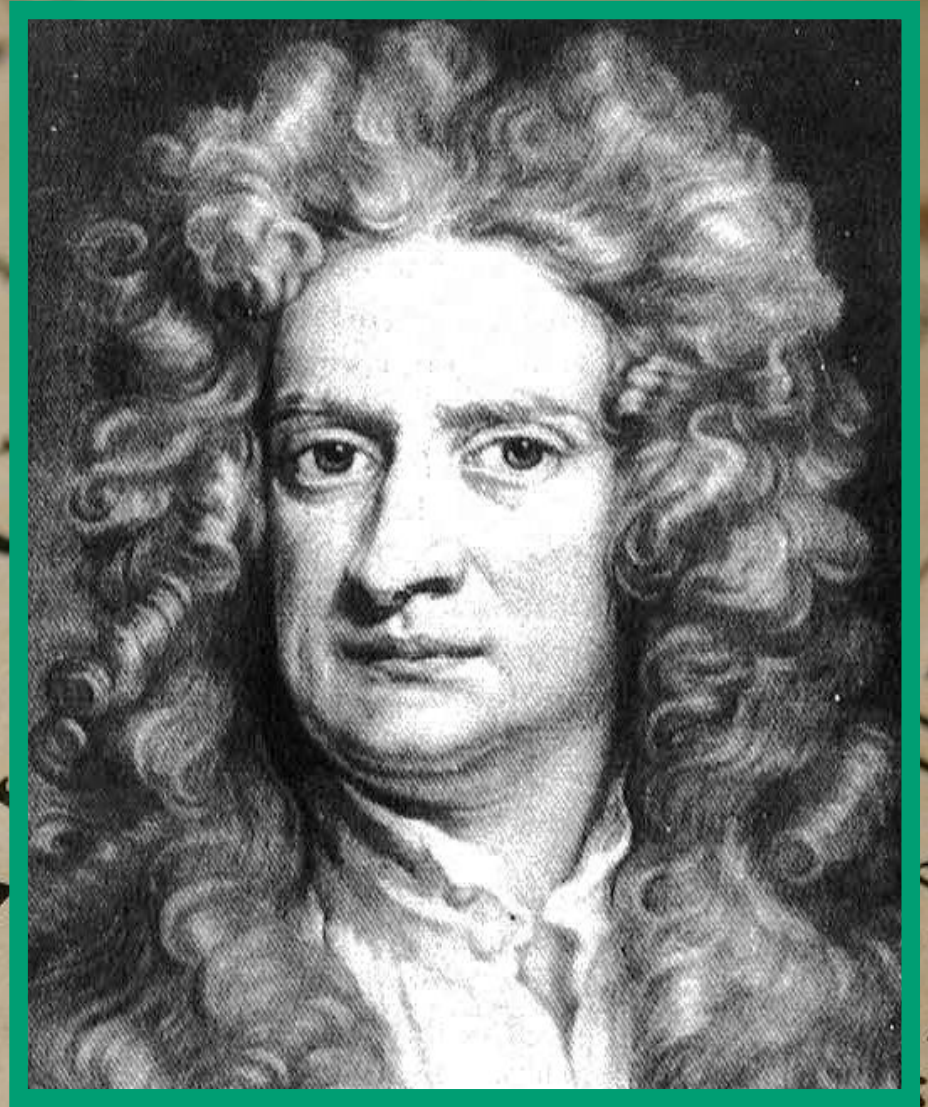


Image: Double Negative

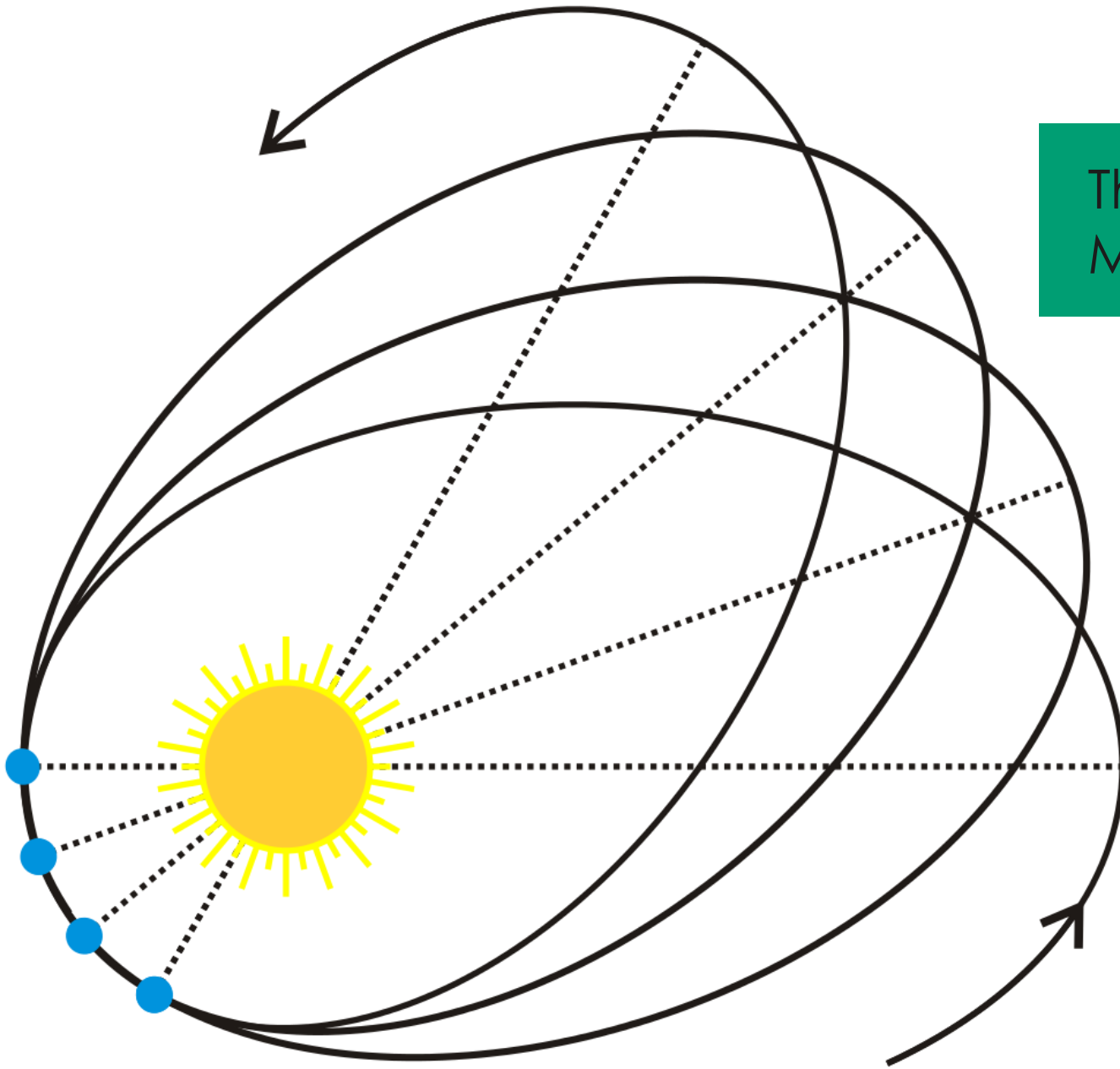
Image:  
Daniel Berehulak/  
Getty Images

Gravitation is universal.

Objects move in  
straight lines.



The puzzle of  
Mercury's orbit

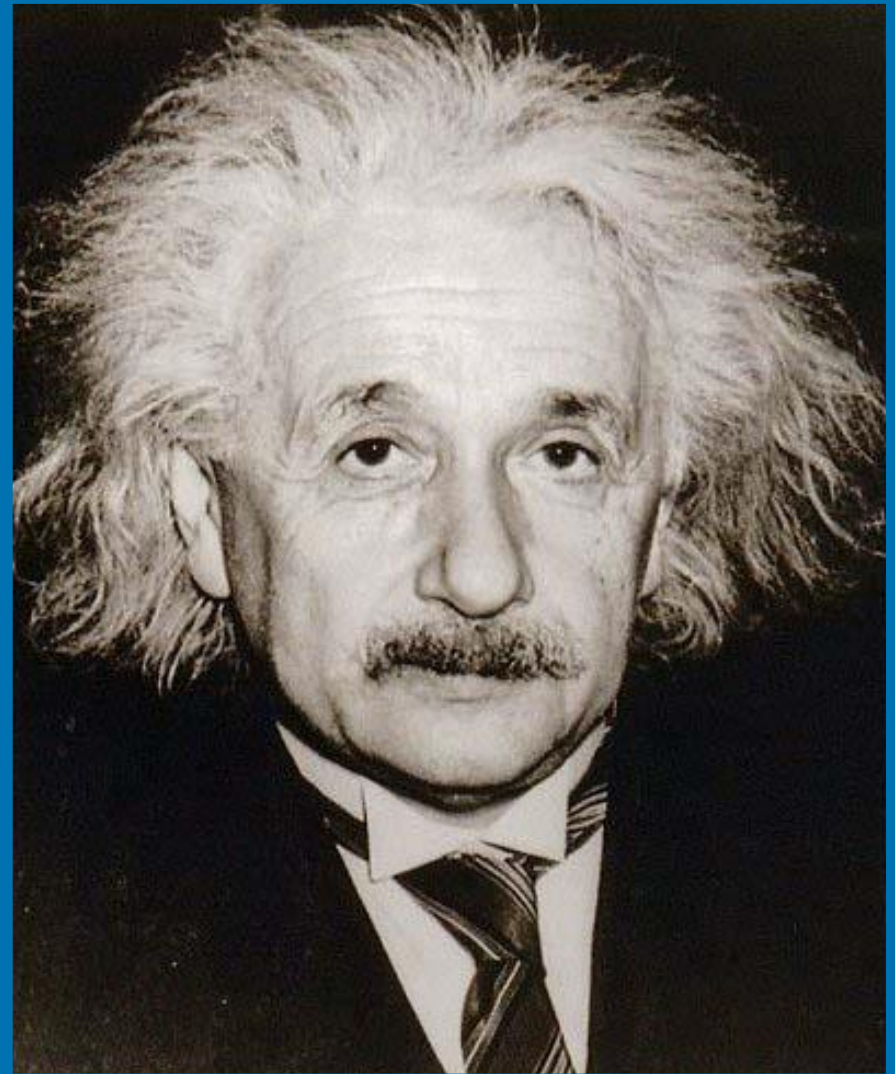




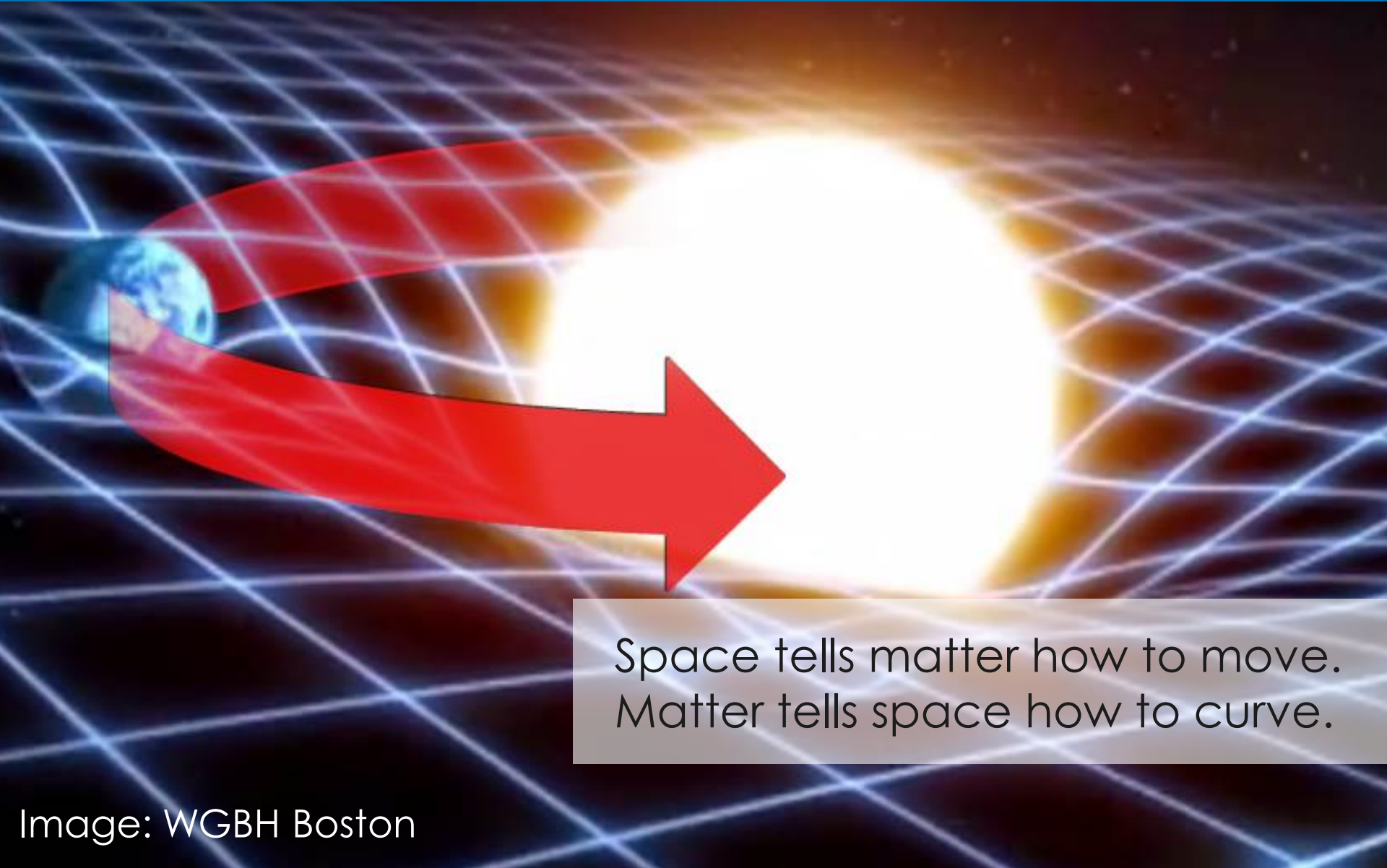
# Relativity

Space and time are linked.

Nothing can travel faster than the speed of light.



# Space-time



Space tells matter how to move.  
Matter tells space how to curve.

# General relativity

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

Curvature

Mass

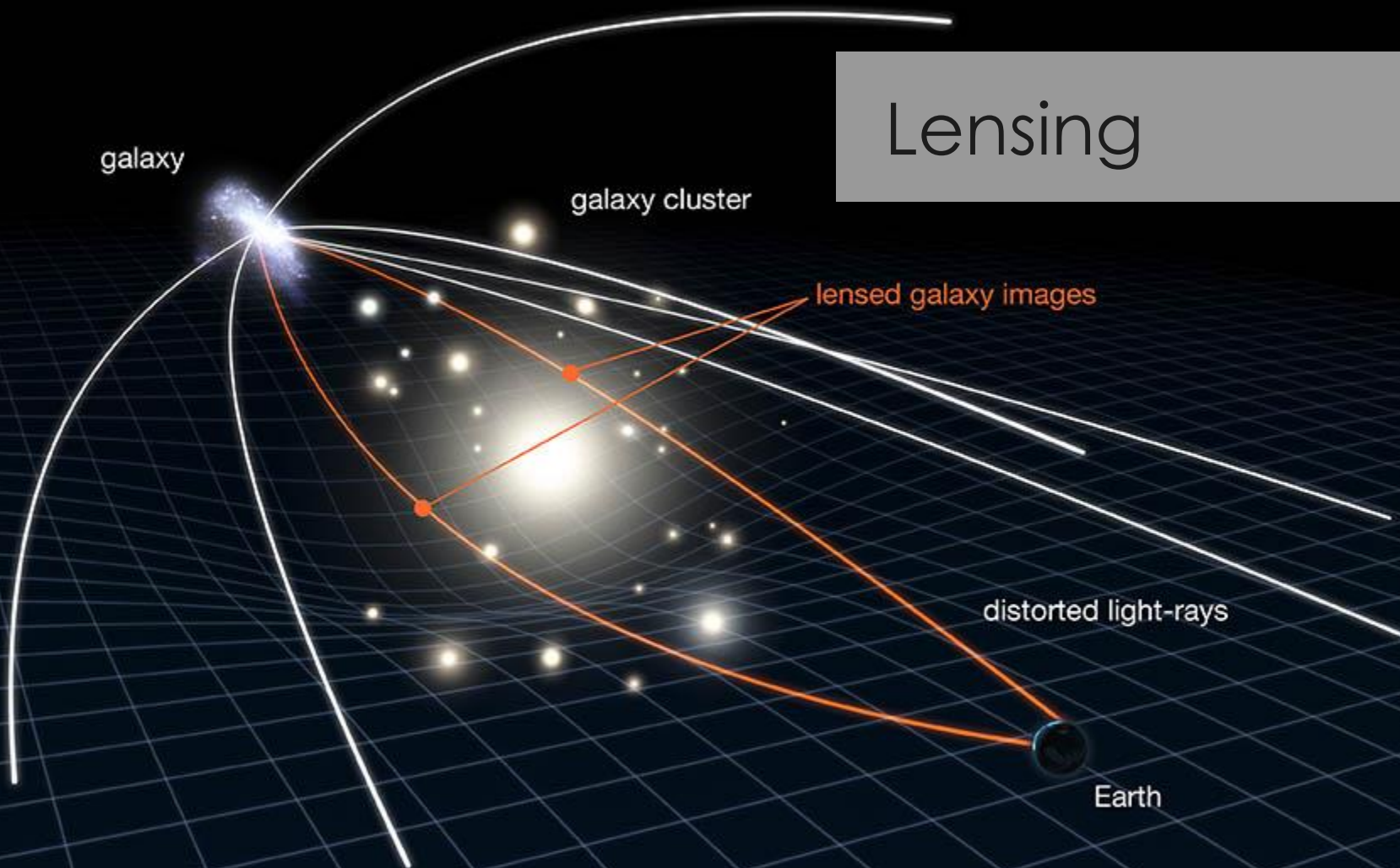




What does general relativity tell us?

Image: NASA, ESO

# Lensing





# LIGHTS ALL ASKEW IN THE HEAVENS

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

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## **EINSTEIN THEORY TRIUMPHS**

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

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## **A BOOK FOR 12 WISE MEN**

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

Credit: New York Times

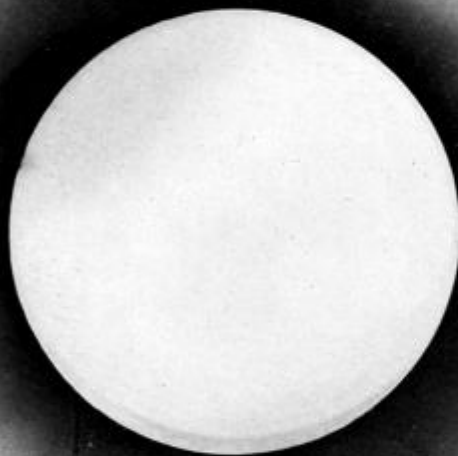


Image: NASA/ESA/HST

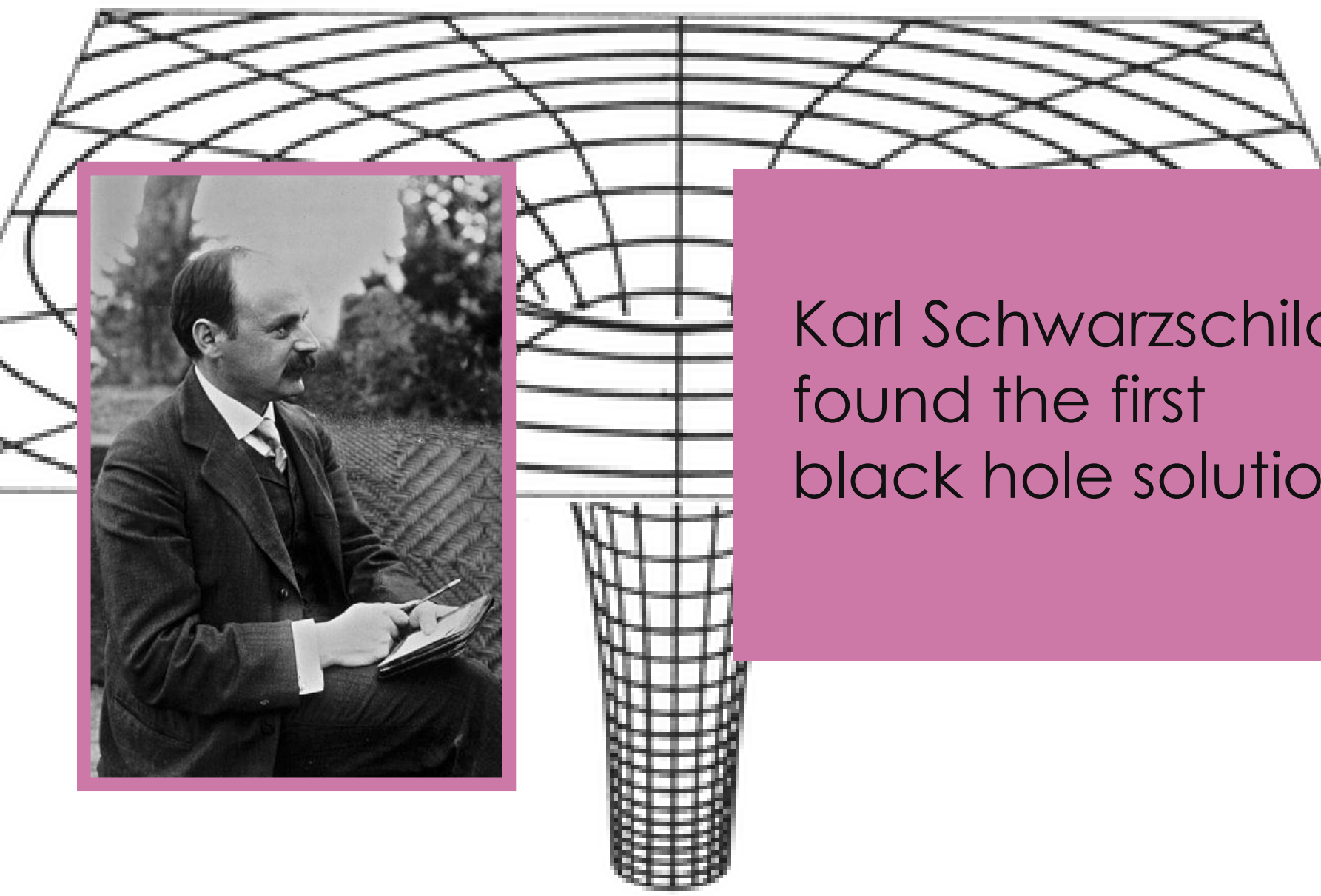




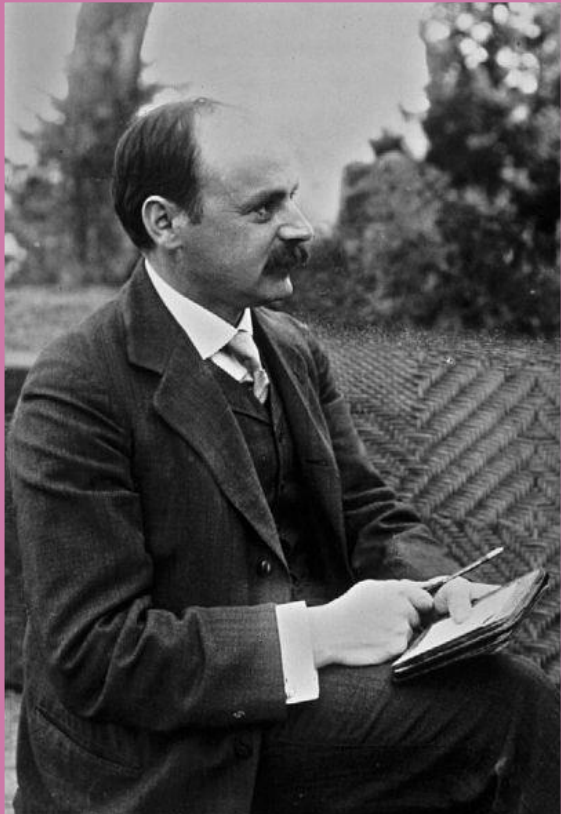
A central black hole is depicted as a dark, circular void. It is surrounded by a glowing accretion disk that exhibits a color gradient from blue and green to yellow and orange. The background is a dense field of stars of various colors, including white, yellow, and blue. The overall scene is set against a dark, starry space.

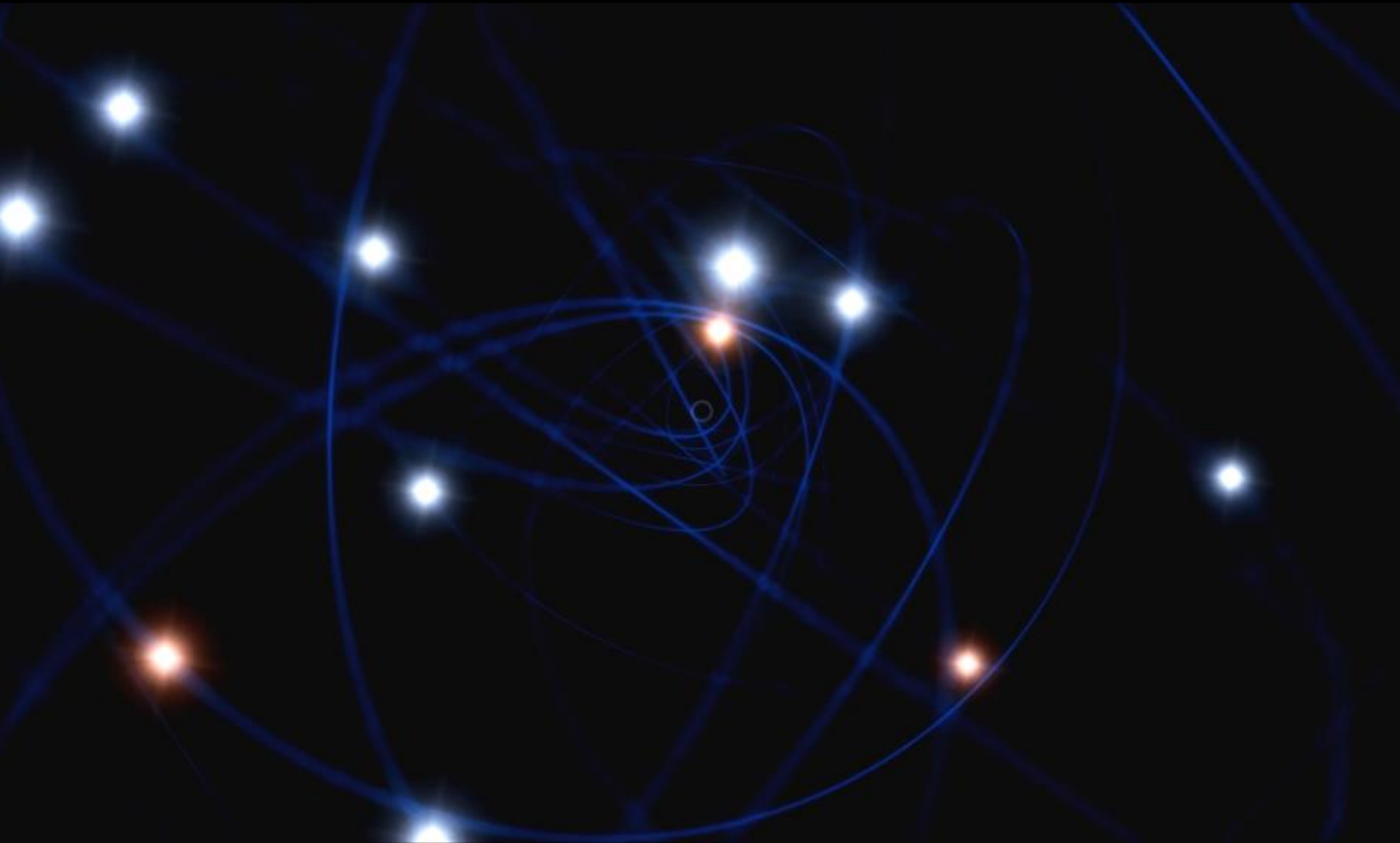
# Black holes



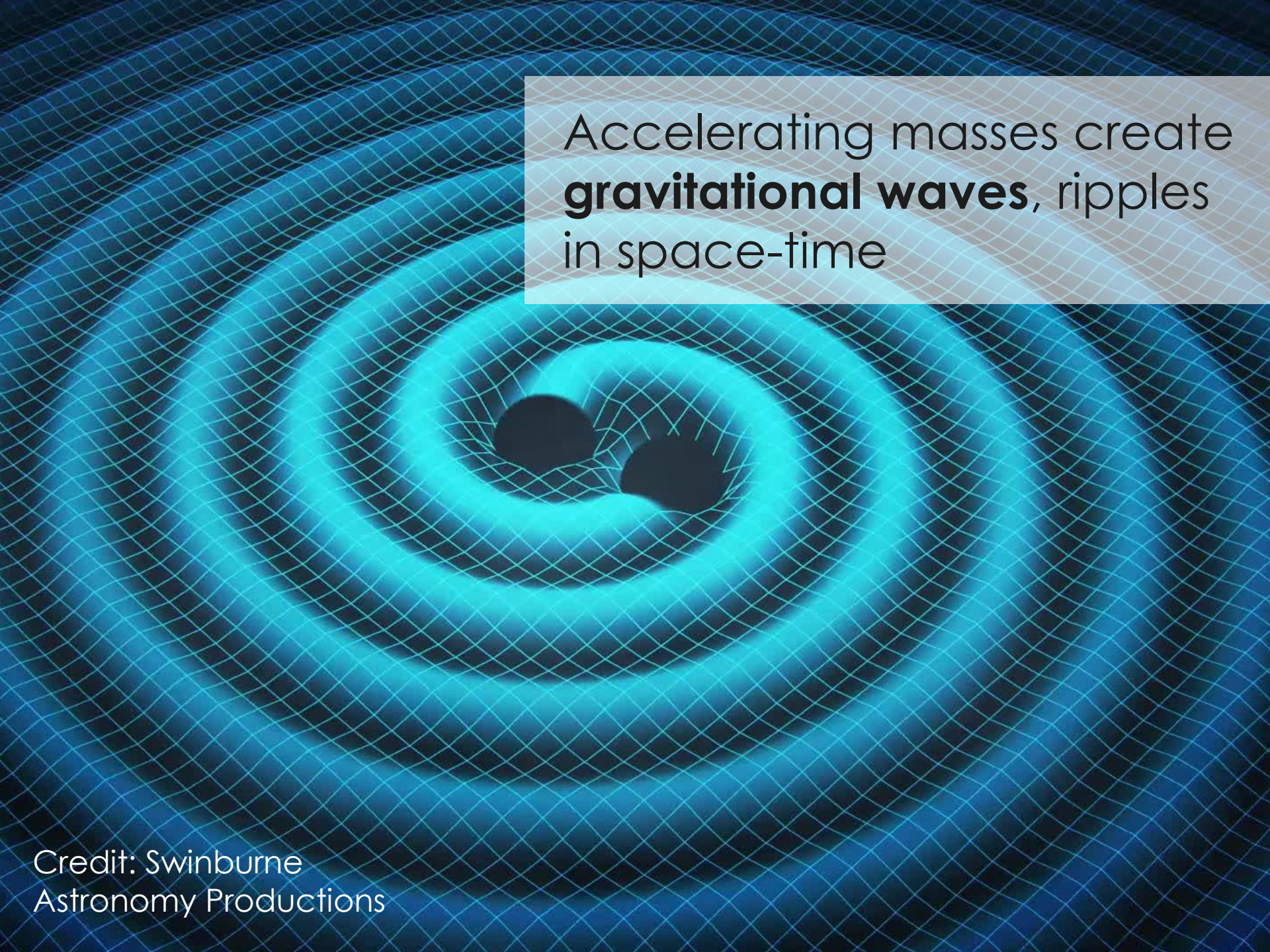


Karl Schwarzschild  
found the first  
black hole solution







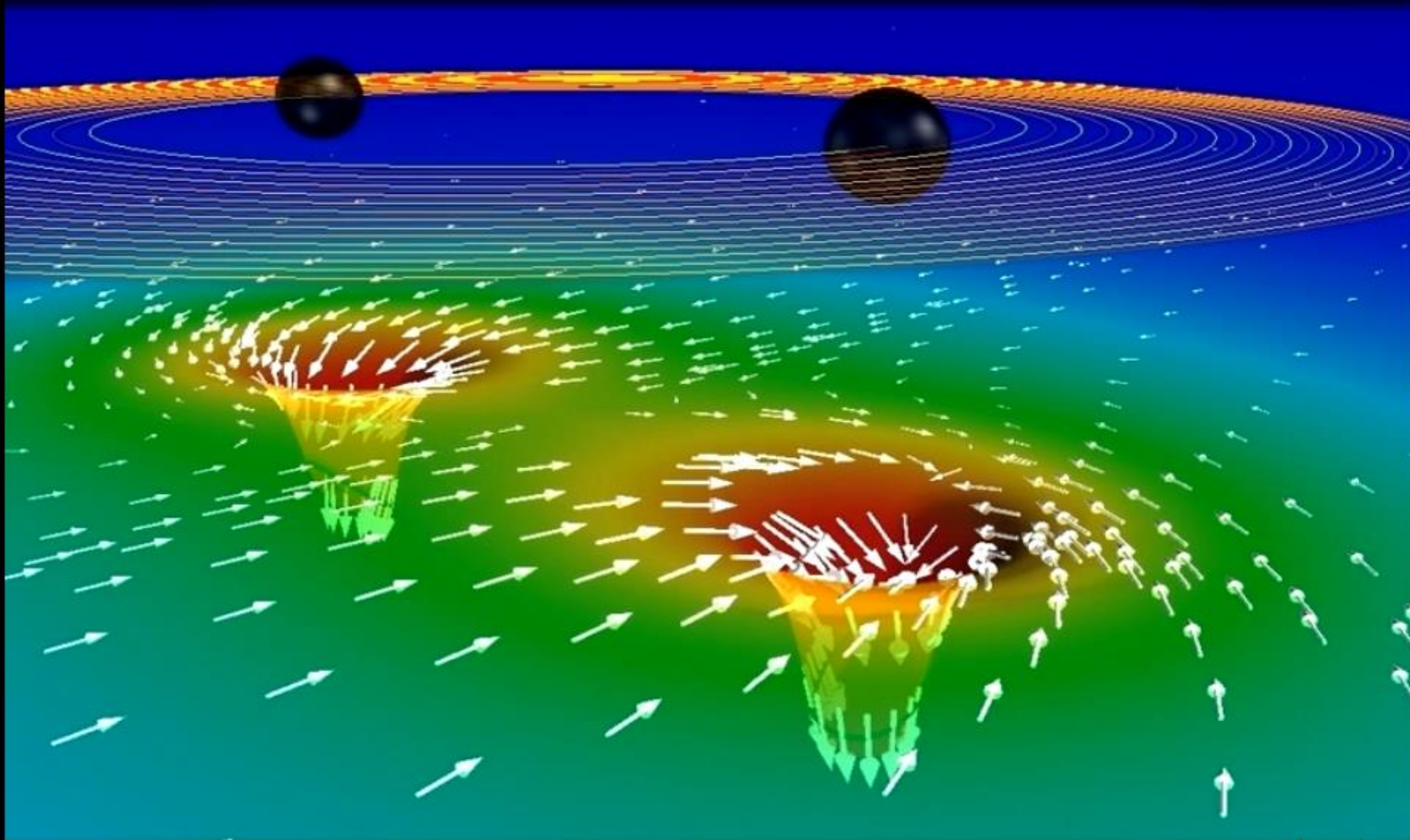


Accelerating masses create **gravitational waves**, ripples in space-time

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

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Image: Orion Jones