

WHY SOCIETY NEEDS ASTRONOMY AND COSMOLOGY

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&

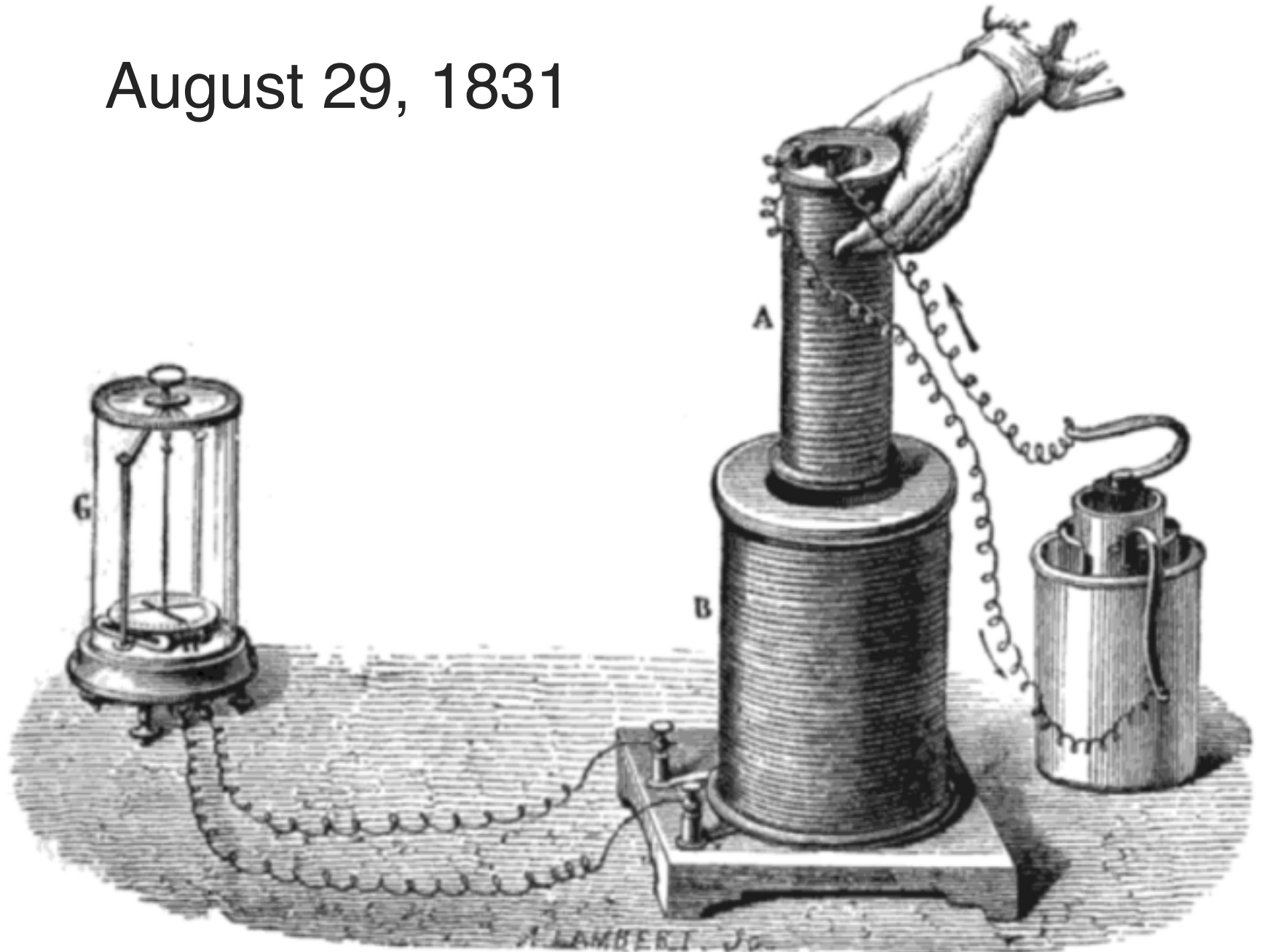
STFC PUBLIC ENGAGEMENT FELLOW



@R_TROTTA

WWW.ROBERTOTROTTA.COM

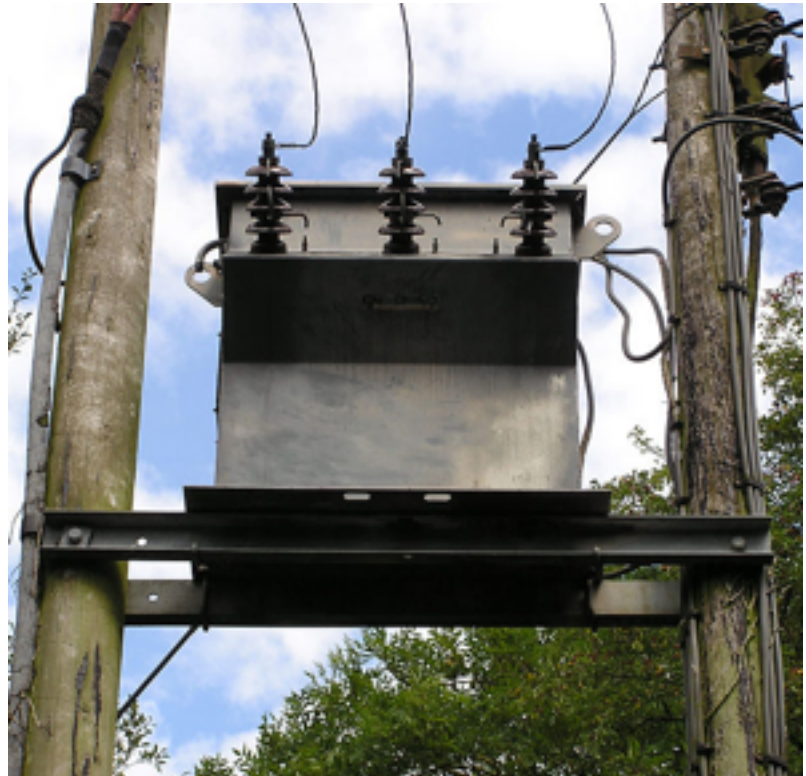
August 29, 1831

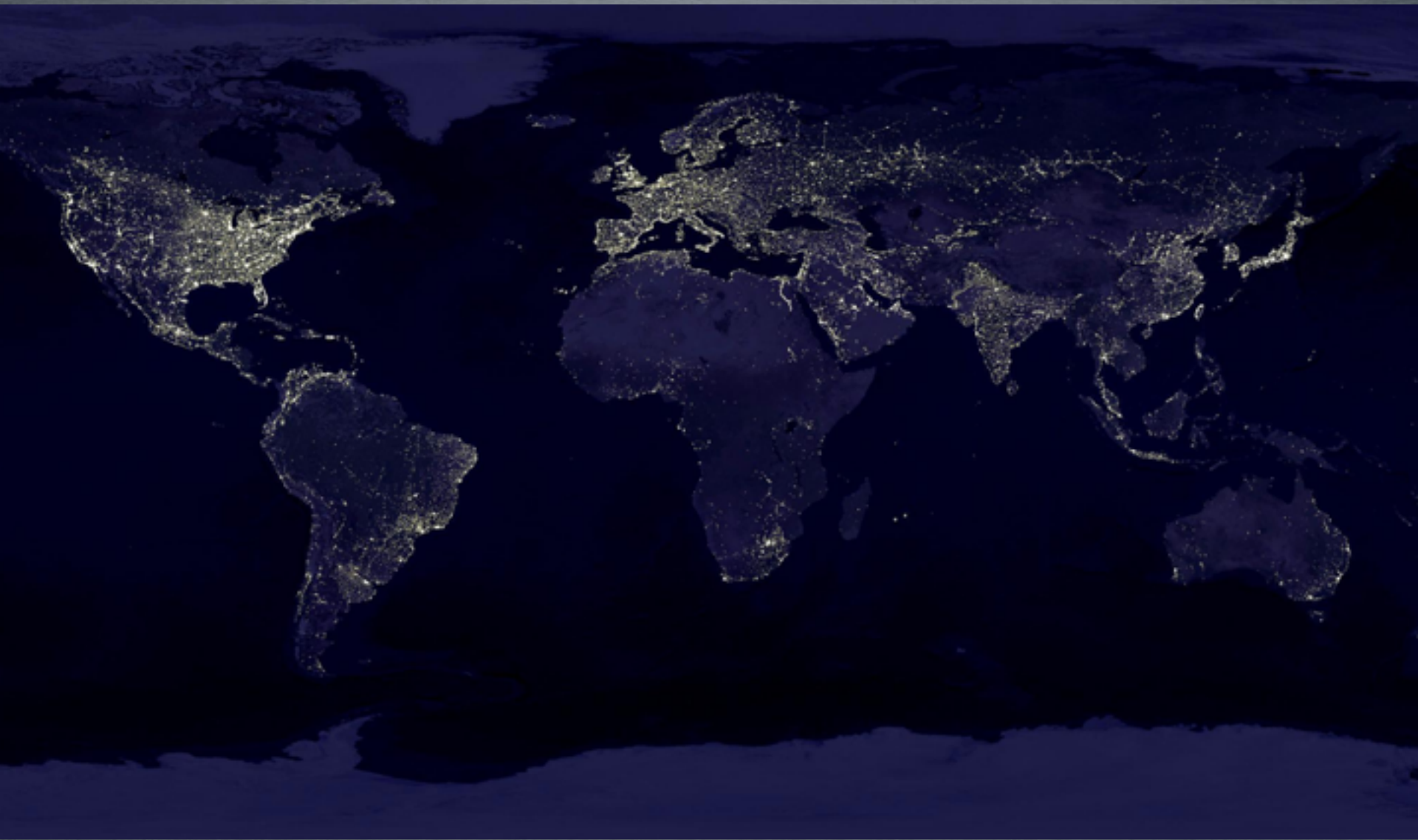


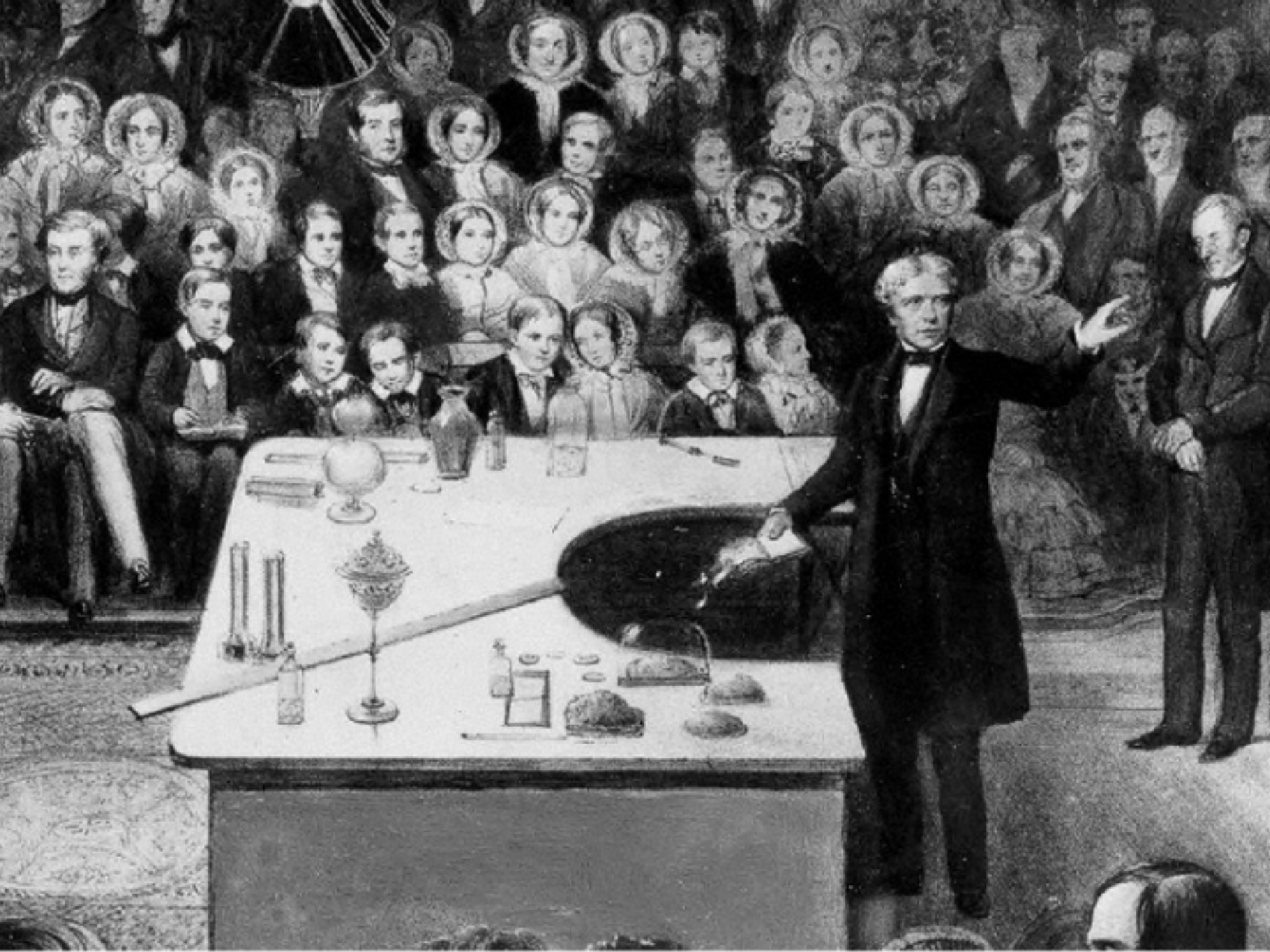
$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$



$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$







£20

£20

Bank of England

I PROMISE TO PAY THE BEARER ON DEMAND THE SUM OF

Y53 264879

TWENTY

Pounds

Y53 264879

London

For the Gov. and Comrs.
of the BANK OF ENGLAND

G. B. A. Koutfield

Chief Cashier



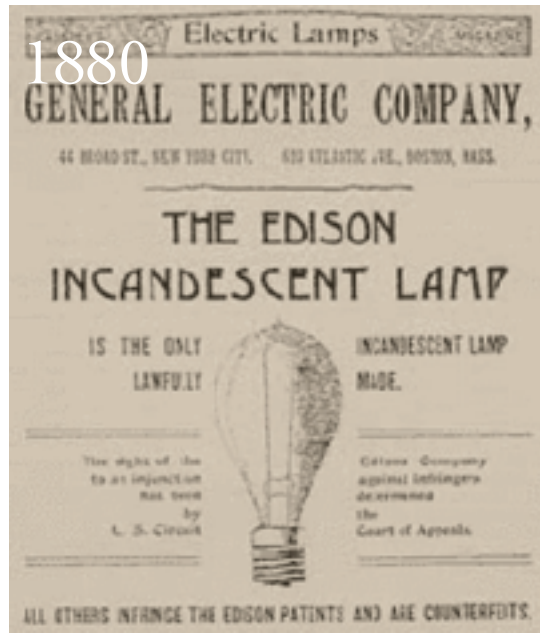
© THE GOVERNOR AND COMPANY OF THE BANK OF ENGLAND 1993

1876

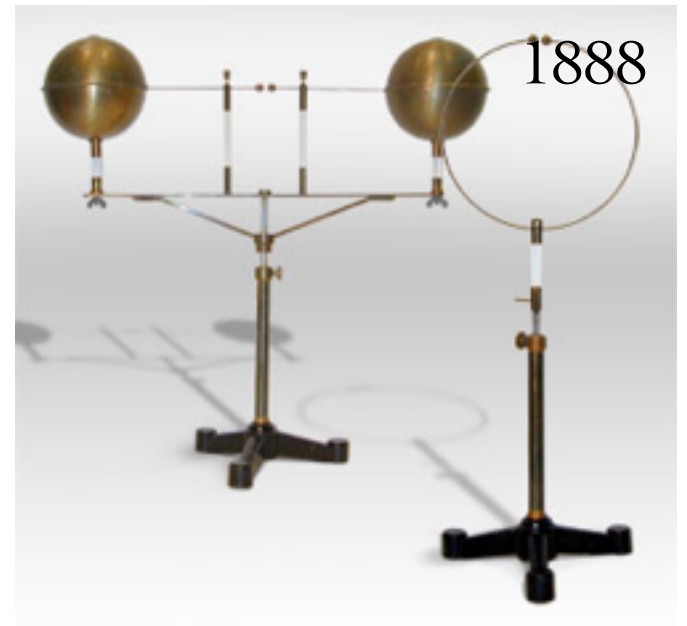


Getty Images

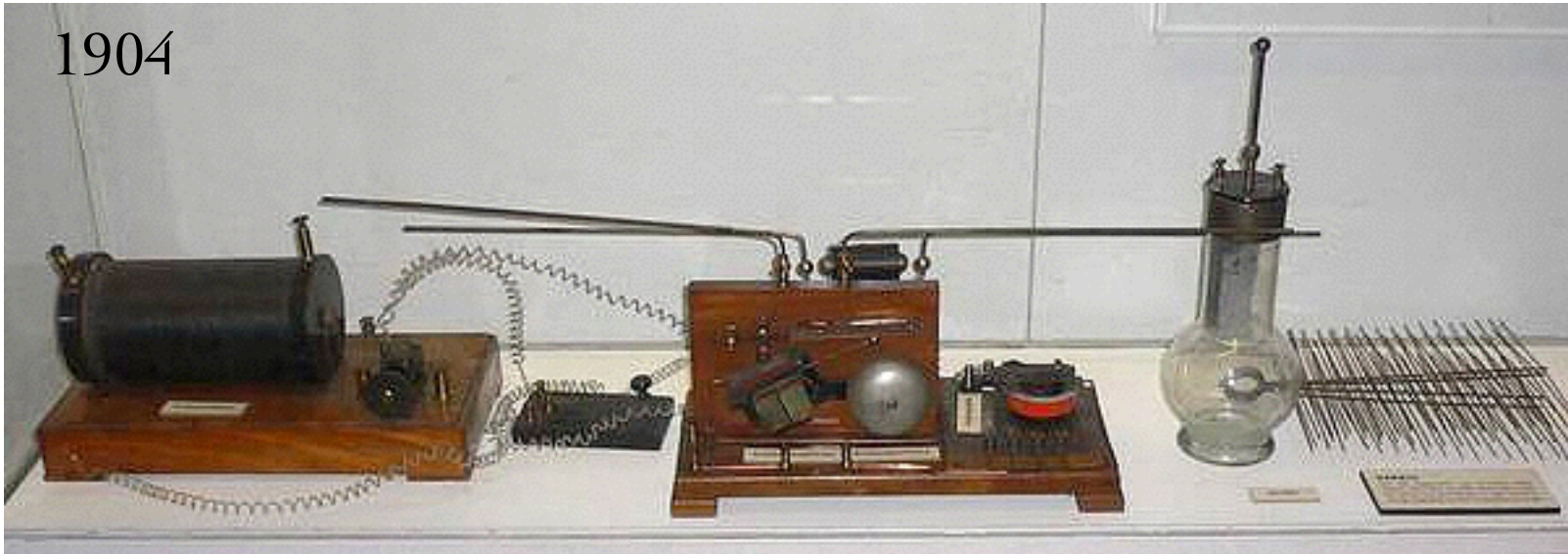
1880

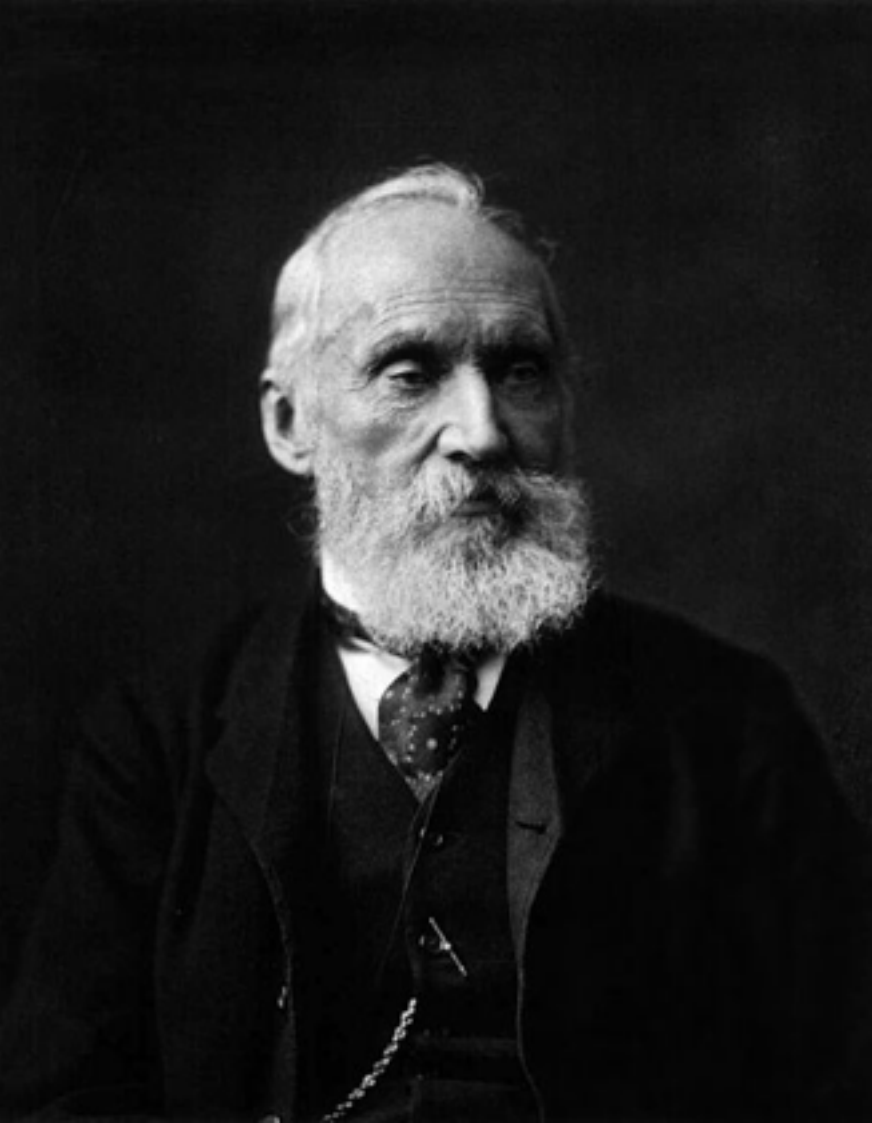


1888



1904

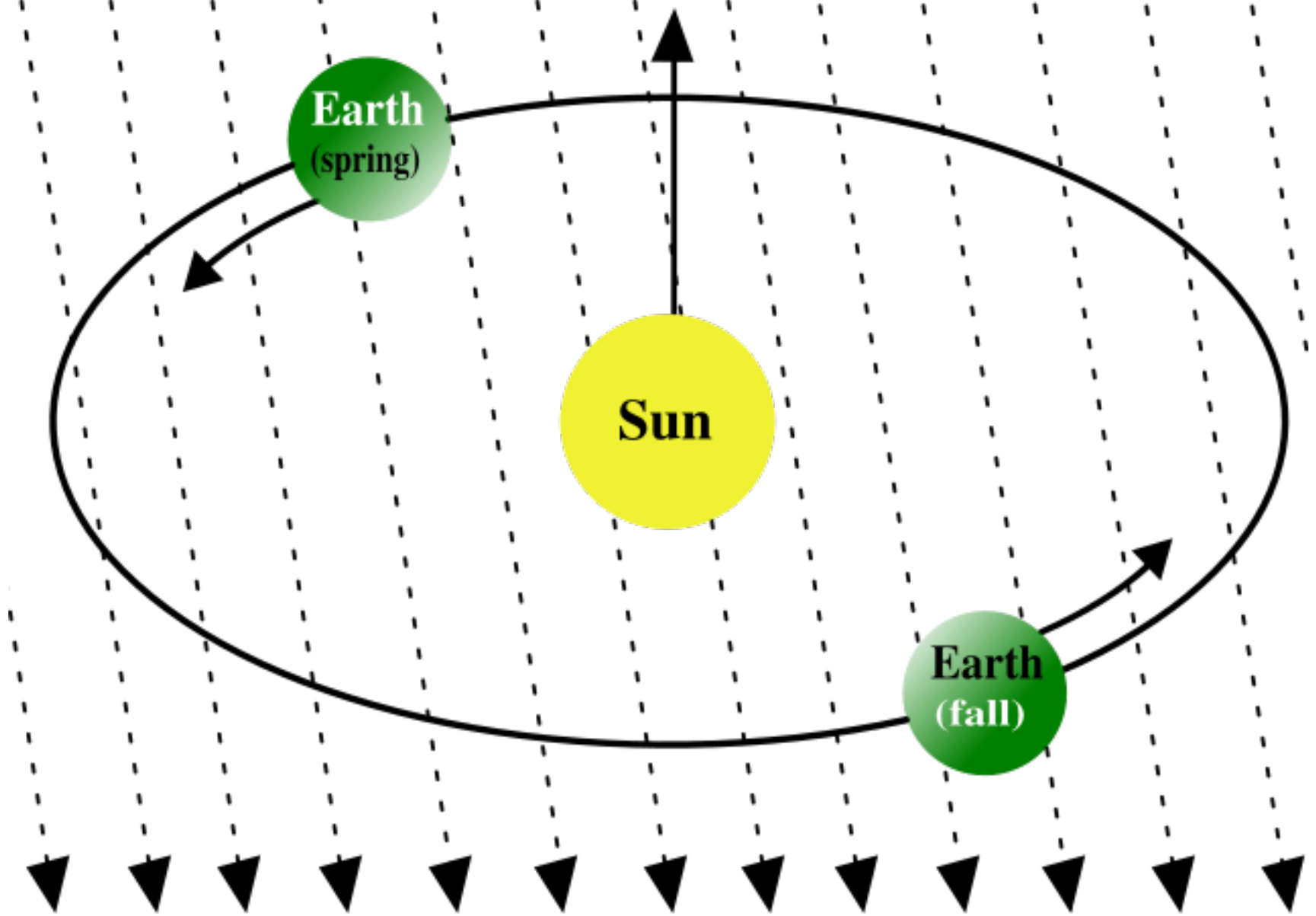




‘There is nothing new to be discovered in physics now. All that remains is more and more precise measurement.’

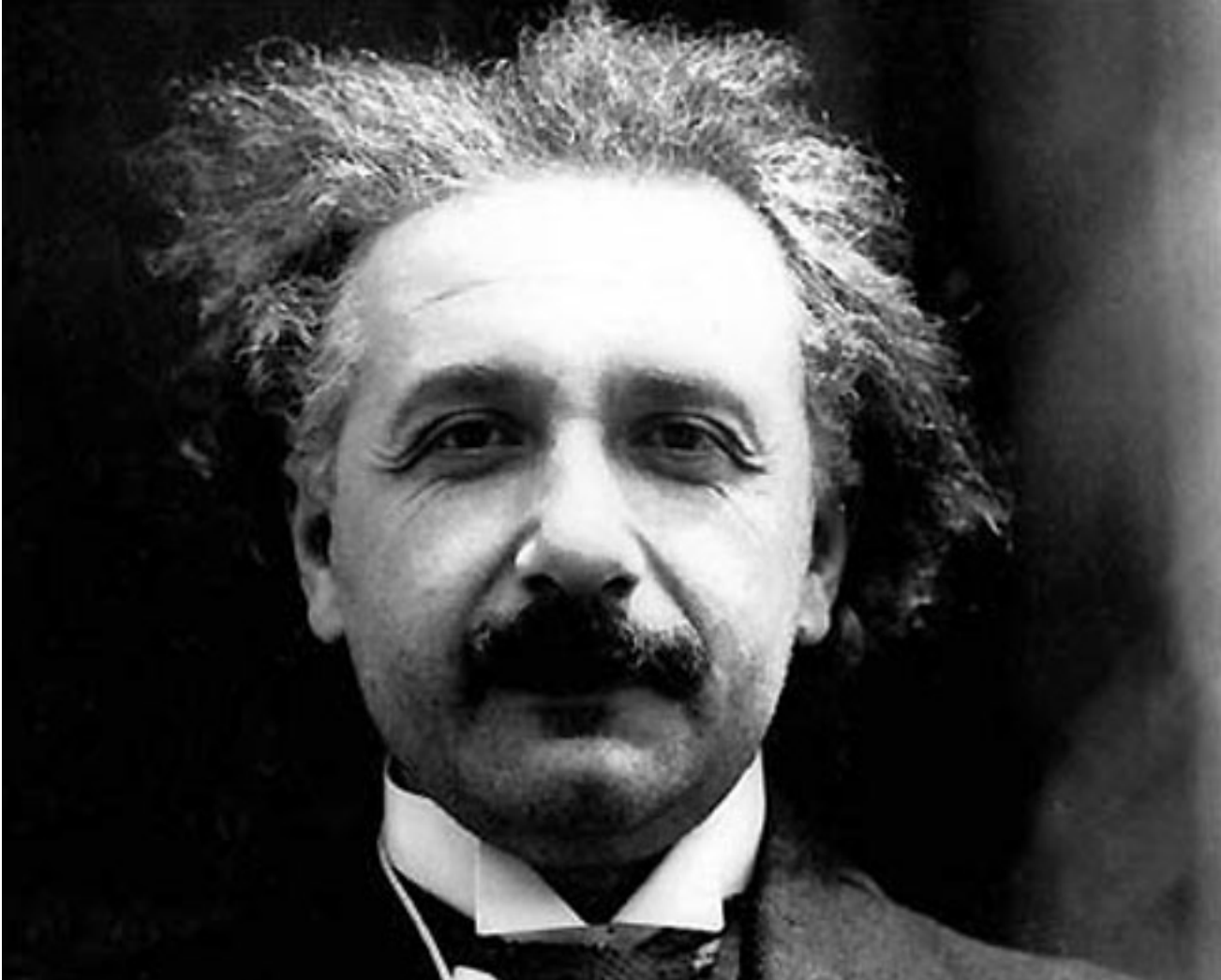
Attributed to Lord Kelvin, ca 1900

Luminiferous Ether



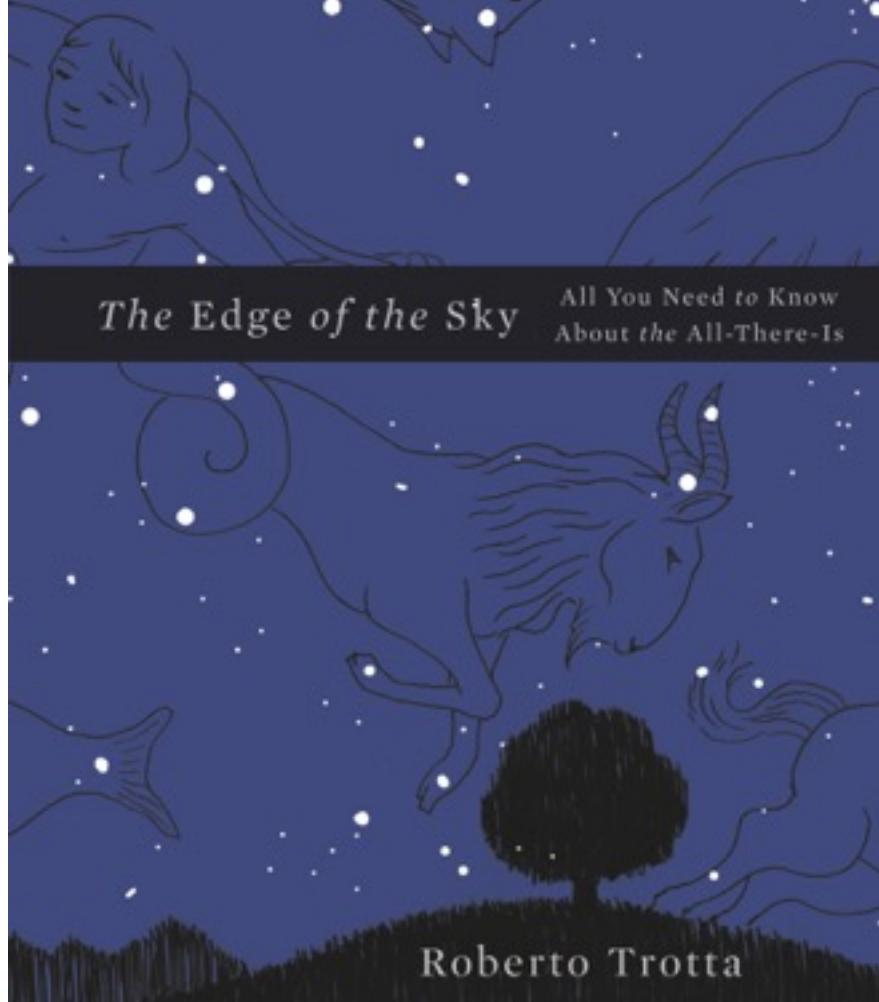
1905

The Special Theory of Relativity

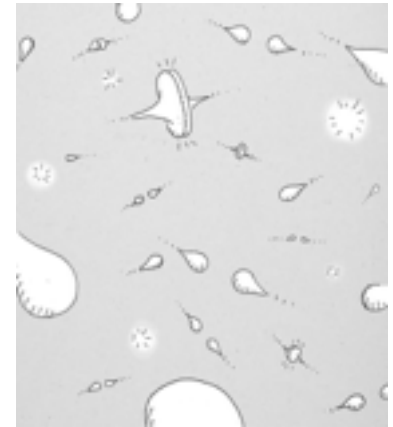


The Universe ("All-There-Is") explained with the most common 1,000 words in English!

Best Science Books 2014



www.edge-of-the-sky.com





Words I didn't have...

 @R_Trotta

#TheEdgeOfTheSky

telescope

planet

Universe

cosmos

energy

gravity

Earth

Big Bang

particle

galaxy

scientist

Moon

... and some I came up with

 @R_Trotta

#TheEdgeOfTheSky

Big Seer

crazy-star

All-There-Is

Big Flash

Home-World

star-crowd

drop

student-
person

Sun's Sister

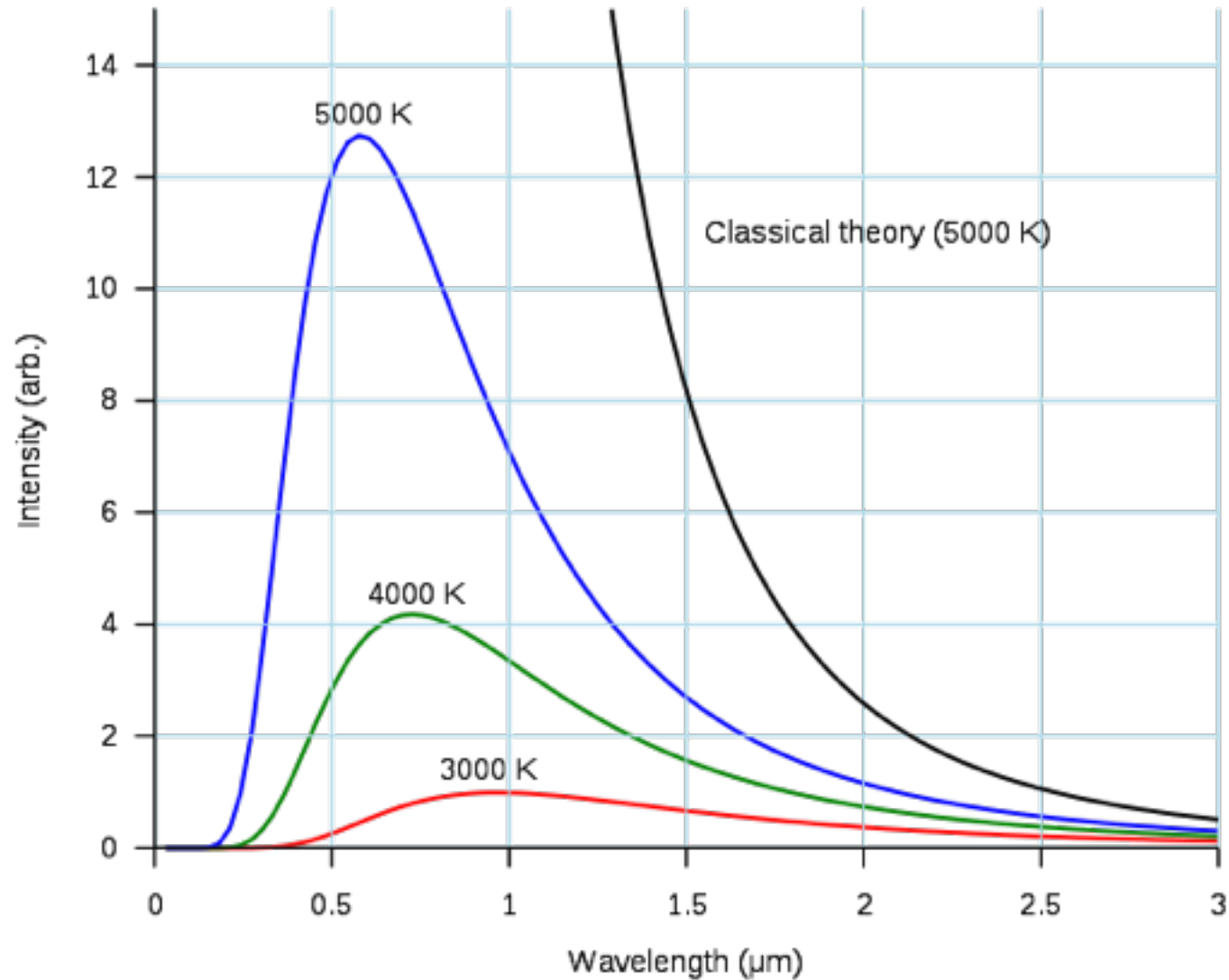


The Edge of the Sky

All You Need to Know
About *the All-There-Is*

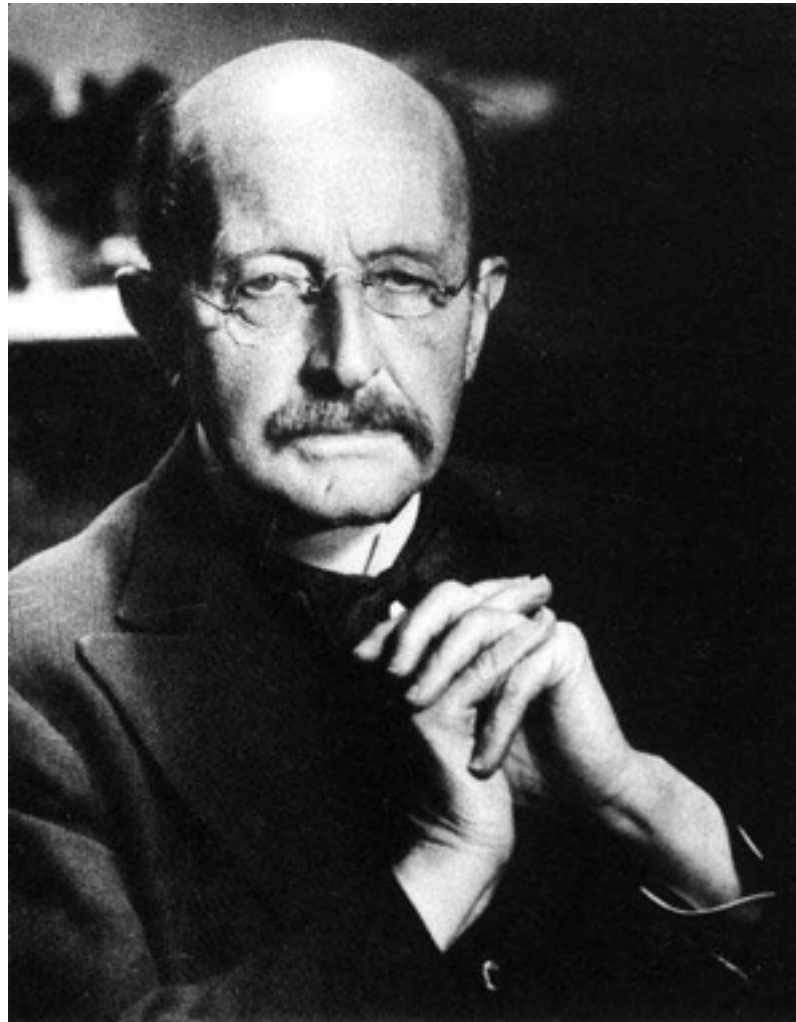


The black-body spectrum



1901

Planck's Law opens the door
to Quantum Mechanics



1899

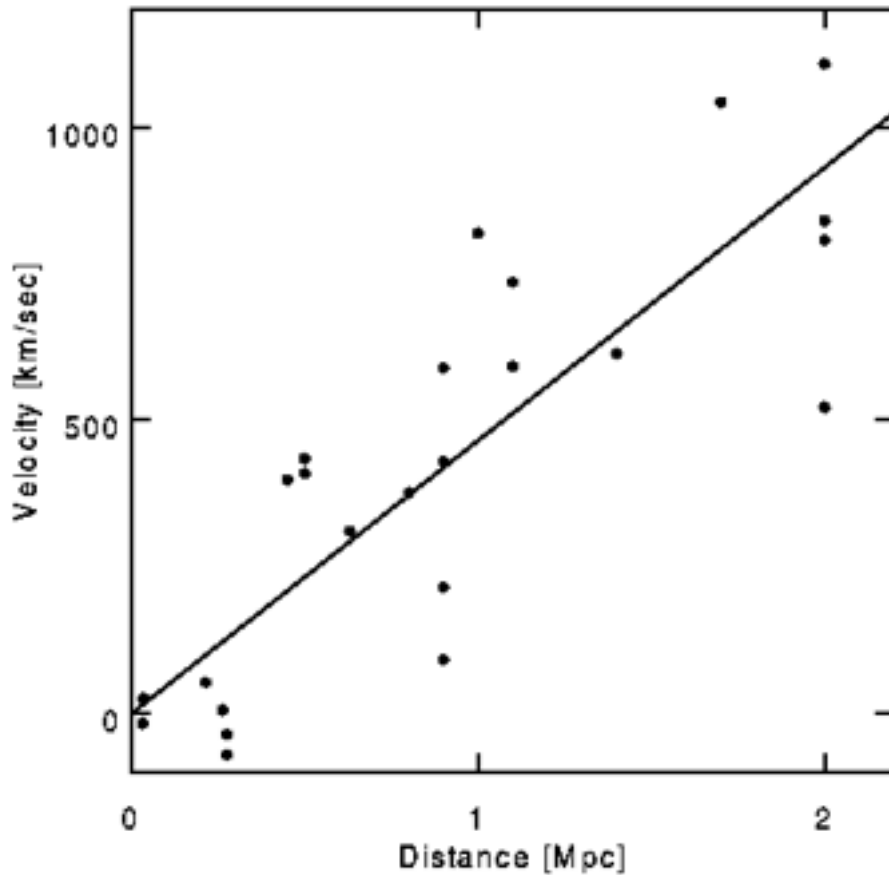
The Great Andromeda Nebula
An “Island Universe”?



1927

Hubble's Law

The Universe is expanding



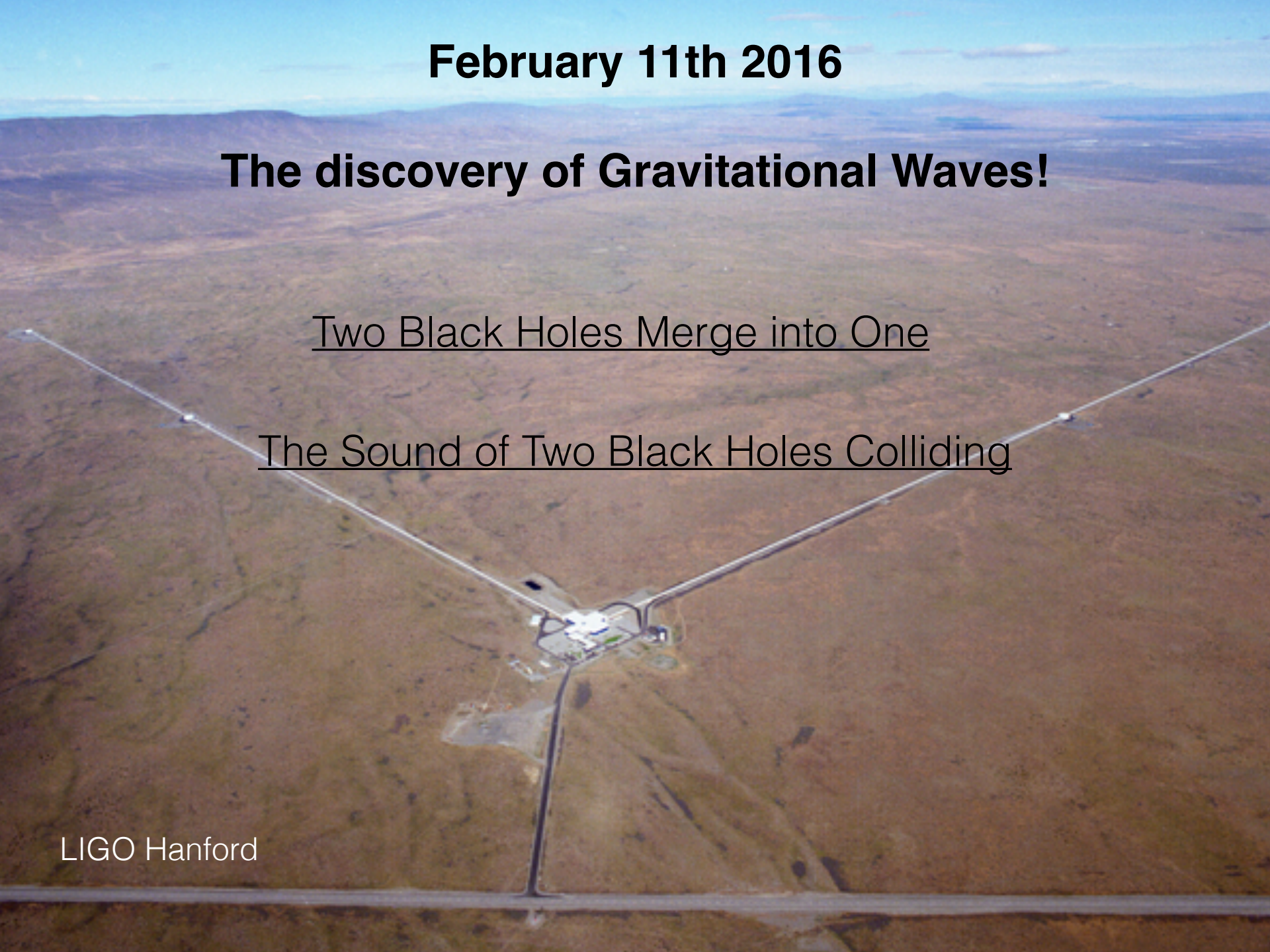
February 11th 2016

The discovery of Gravitational Waves!

Two Black Holes Merge into One

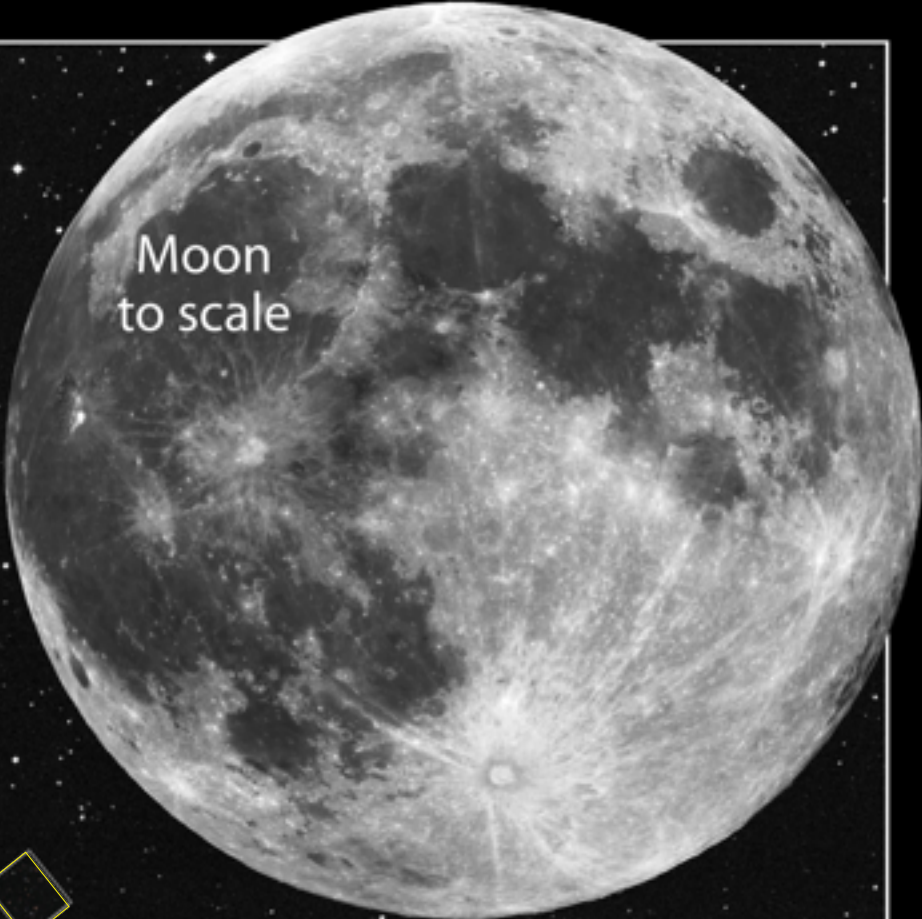
The Sound of Two Black Holes Colliding

LIGO Hanford



What did Einstein ever do for me?



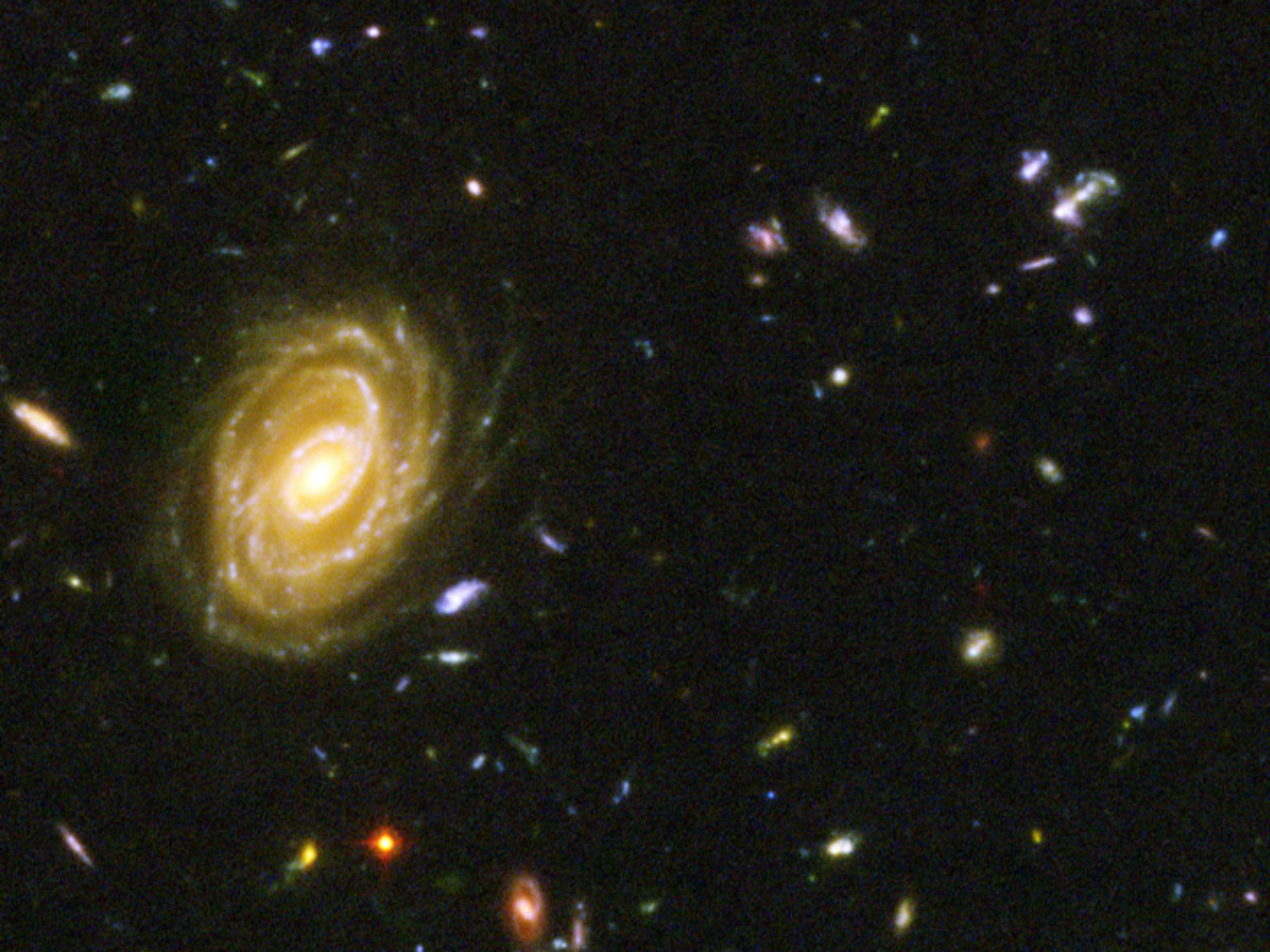


Moon
to scale

XDF







BREAKING NEWS!

96%

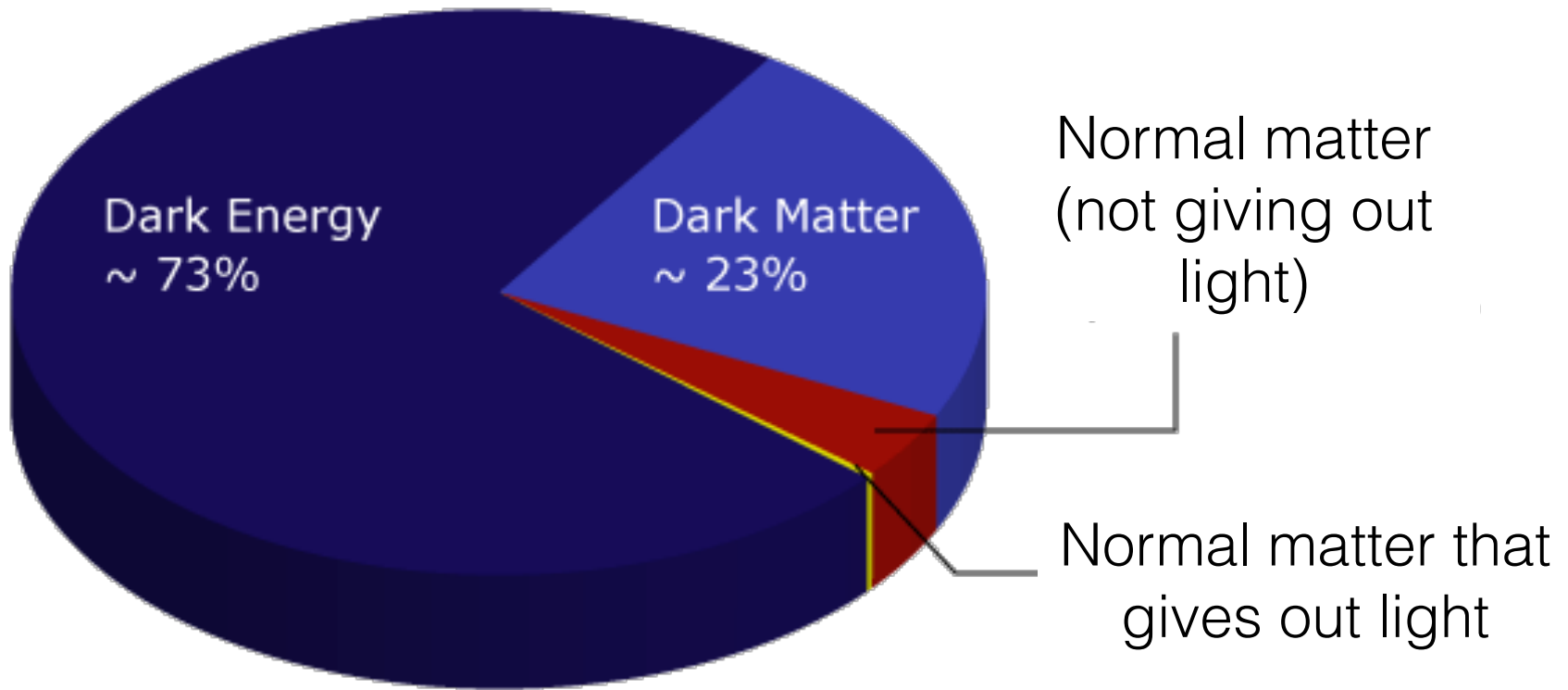
UNIVERSE

MISSING





What the Universe is made of (standard lore):



95% of the Universe is dark!

$z = 48.4$

$T = 0.05 \text{ Gyr}$

The Aquarius Simulation

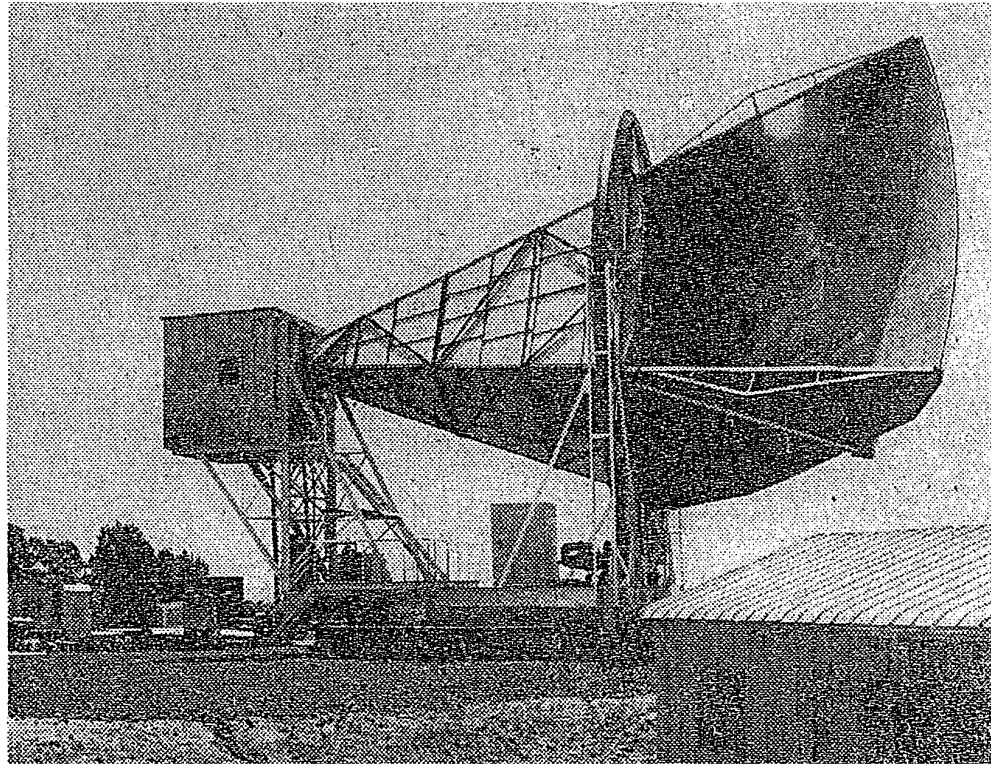
The Dark Matter Universe

500 kpc

Signals Imply a 'Big Bang' Universe

The left-over "heat"
from the Big Bang:

-270.425 °C



Horn antenna, used in space exploration, at the Bell Laboratories in Holmdel, N. J.

By WALTER SULLIVAN

Scientists at the Bell Telephone Laboratories have observed what a group at Princeton University believes may be remnants of an explosion that gave birth to the universe.

These remnants are thought to have originated in the burst of light from that cataclysmic event.

Such a primordial explosion is embodied in the "big bang" theory of the universe. It seeks to explain the observa-

tion that virtually all distant galaxies are flying away from the earth. Their motion implies that they all originated at a single point 10 or 15 billion years ago.

The Bell observations, made by Drs. Arno A. Penzias and Robert W. Wilson from a hilltop in Holmdel, N. J., were of radio waves that appear to be flying in all directions through the universe. Since radio waves and light waves are identical, except for their wavelength, these are thought

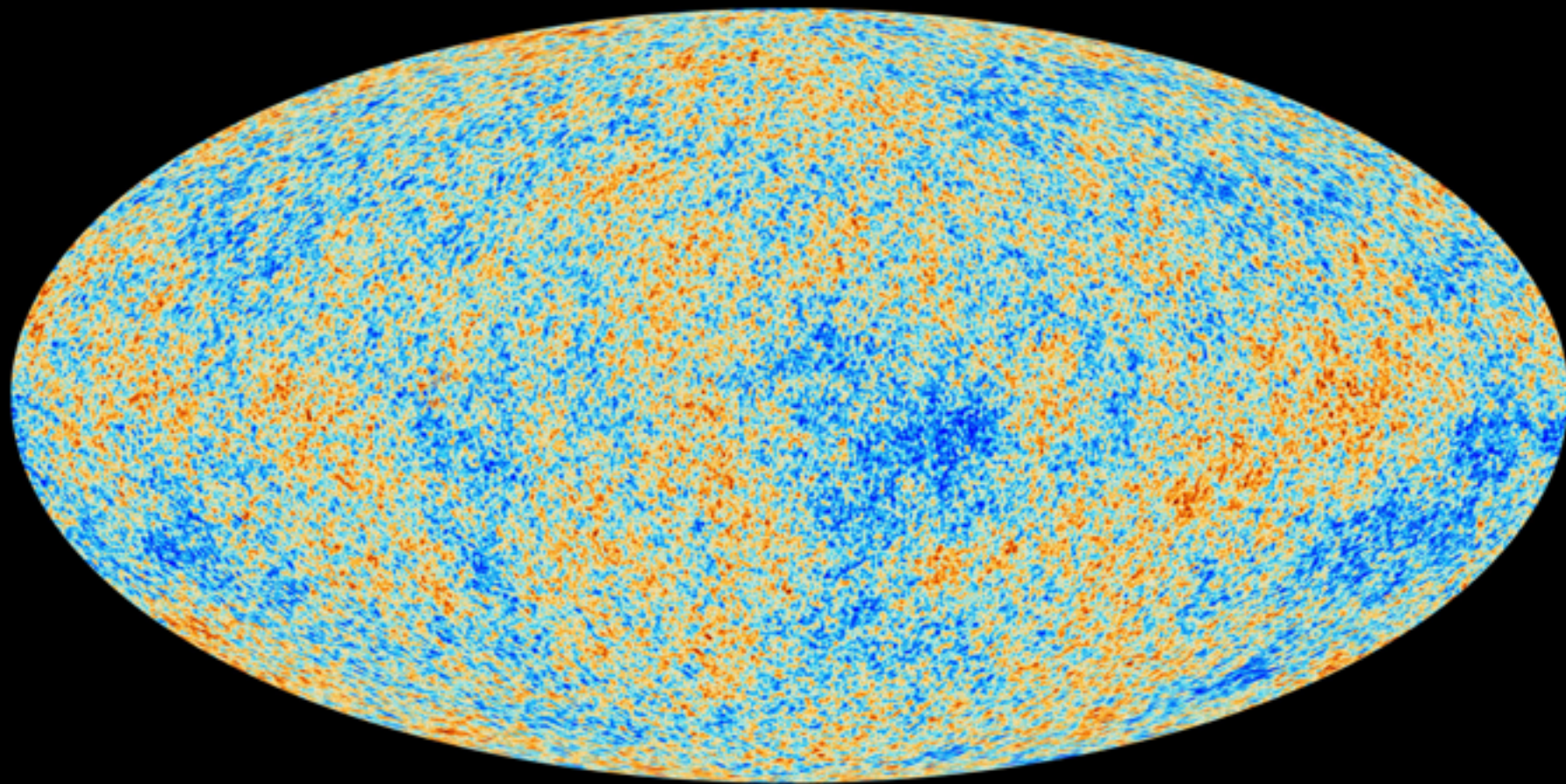
to be remnants of light waves from the primordial flash.

The waves were stretched into radio waves by the vast expansion of the universe that has occurred since the explosion and release of the waves from the expanding gas cloud born of the fireball.

In what may prove to be one of the most remarkable coincidences in scientific history, the existence of such waves was predicted at

Continued on Page 18, Column 1

THE END OF THE ALL-THERE-IS (THAT WE CAN SEE)

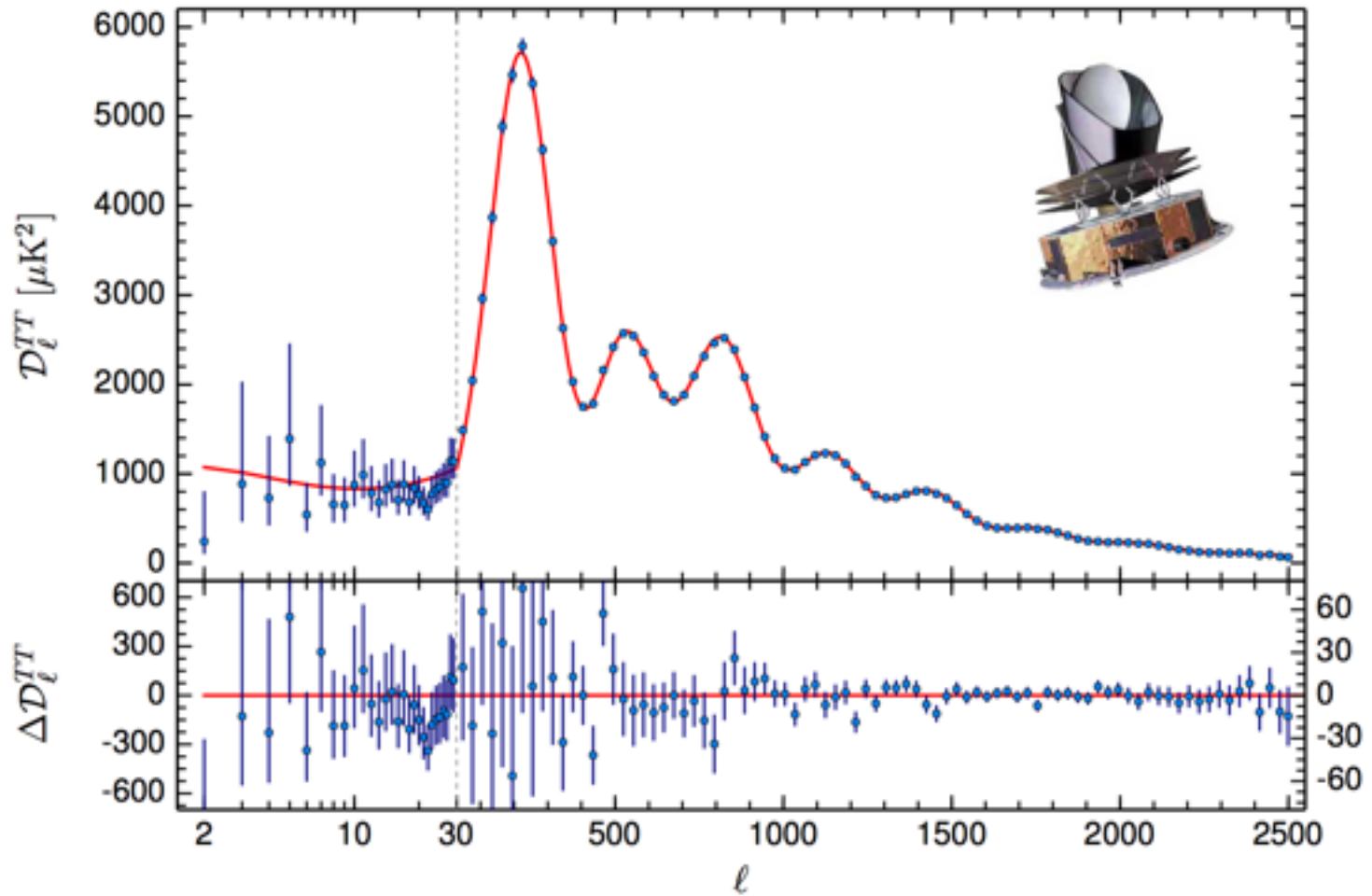


(BEFORE THIS TIME, LIGHT COULD NOT TRAVEL STRAIGHT)

Cosmic harmony

 @R_Trotta

#TheEdgeOfTheSky



Planck Team, 2015

Inspiration



Vera Rubin, 1970's



Fermi LAT Collaboration



Jocelyn Bell, 1968



(Some of the) LSST Team



What's the bang for my bucks?



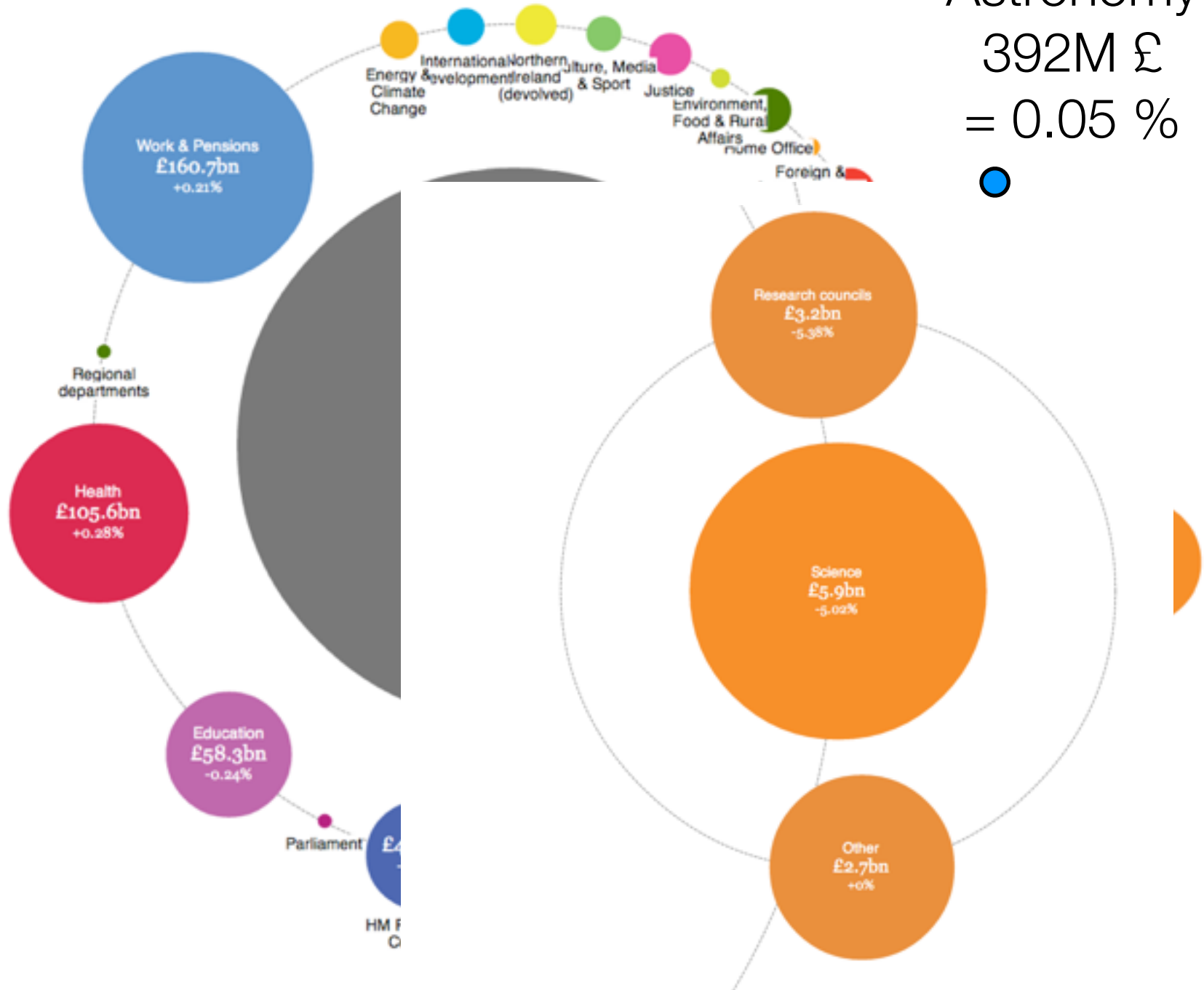
Cosmology is cheap!



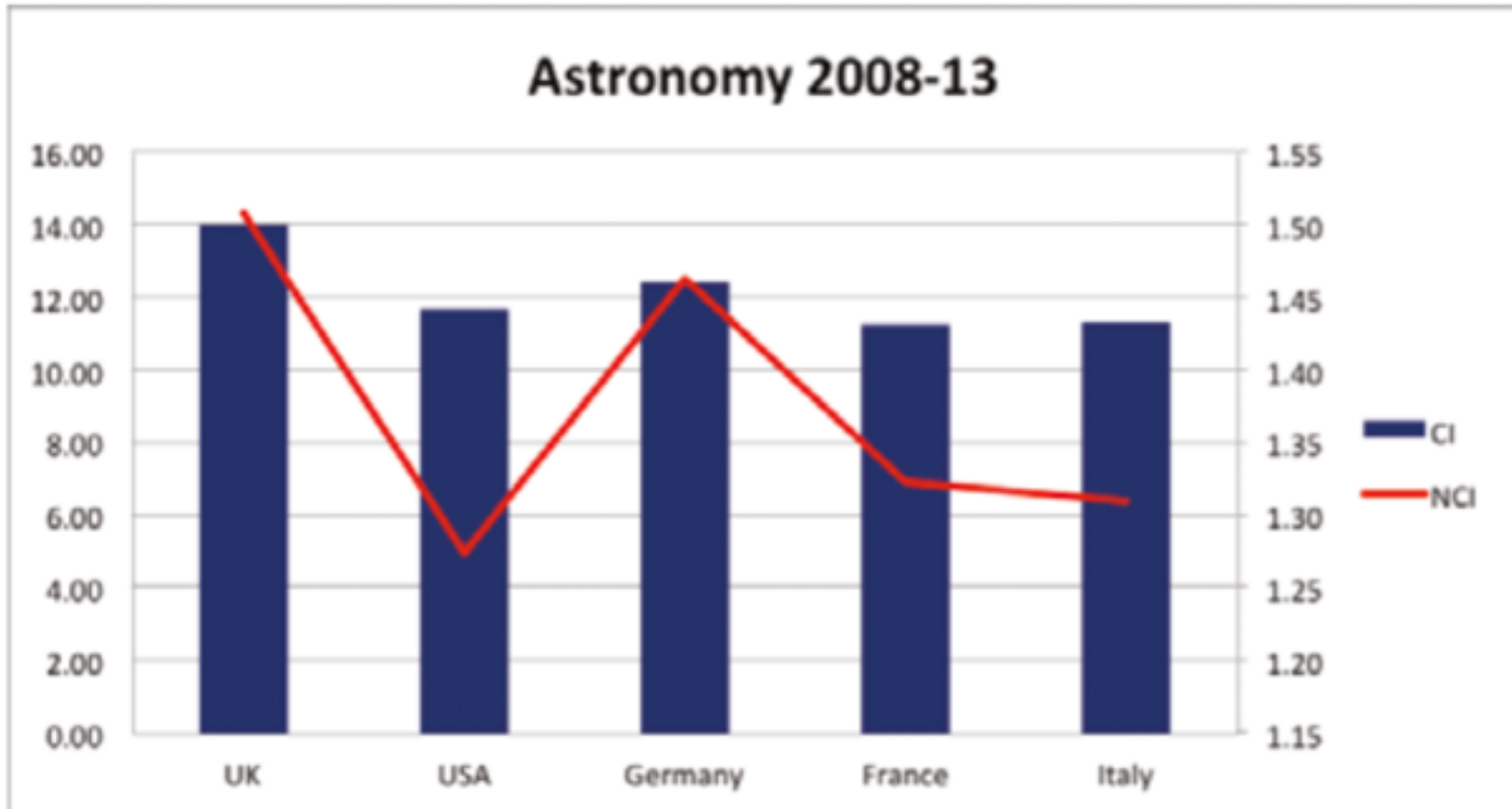
Astronomy

392M £

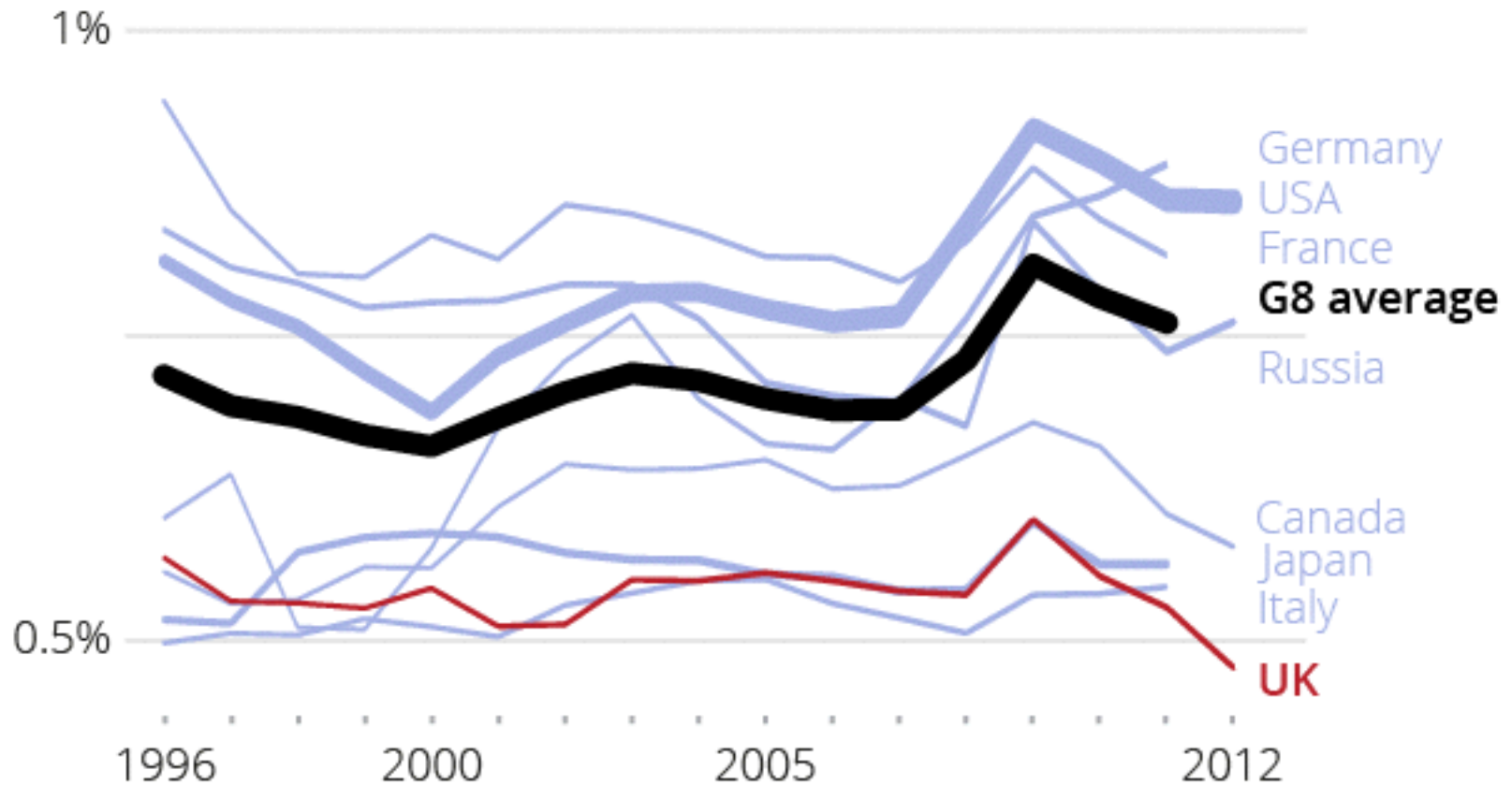
= 0.05 %



UK astronomy is world-leading



... despite below-average investment



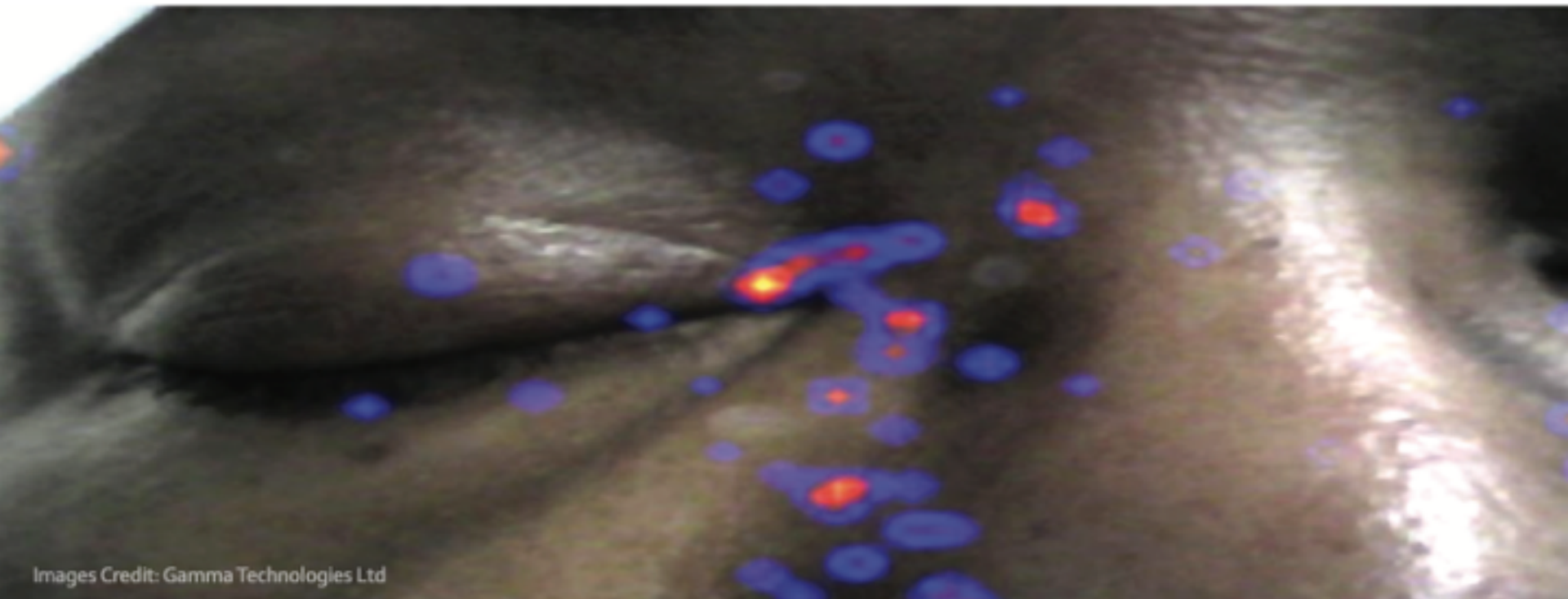
Public funding of scientific research as a percentage of GDP in the G8, from 1996 to 2012

Data: GERD financed by government, UNESCO Institute for Statistics

scienceogram.org

The unexpected applications

Mini Hybrid Camera Improves Tumour Diagnosis



The unexpected applications

Code optimisation for
aero-engine innovation



Hartree Centre
Science & Technology Facilities Council



The unexpected applications

**Technology for
research saves lives**

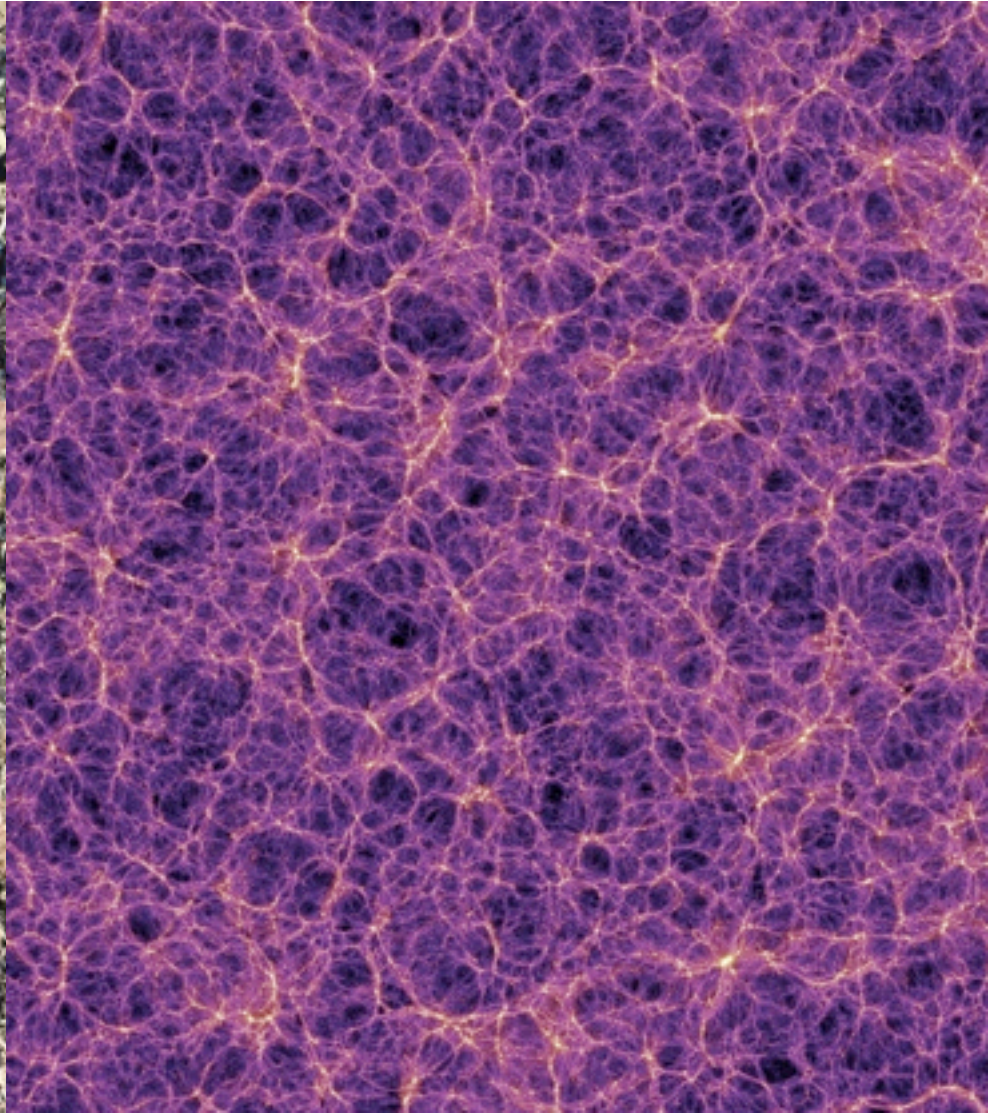


Science & Technology
Facilities Council

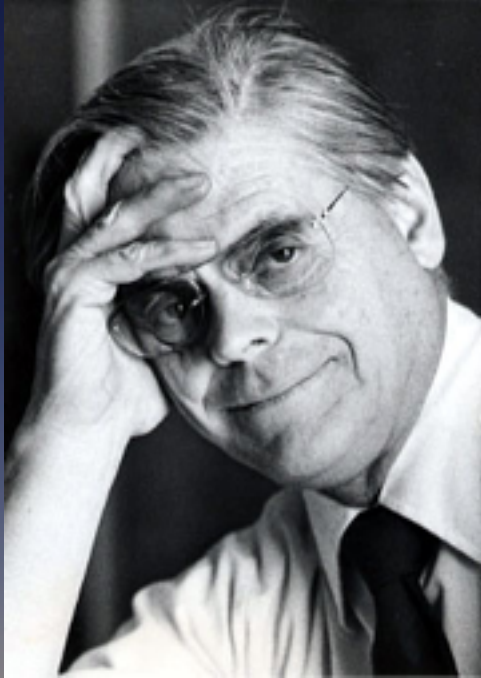


Image credit: Dreamstime

Cosmos is Culture



1969, Congress hearing into FermiLab funding





"One day, Sir, you may tax it!"



The Edge of the Sky

All You Need to Know
About *the* All-There-Is

THANK
YOU!



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