



/// synergies between
technique and fundamental
physics led to important
discoveries + developments

As it's true for many other fields of physics, it is hard to find a genuine start for radio astronomy. But as it's true in other fields as well, technical developments and fundamental science are tightly connected and the synergies between technique and fundamental physics have led to some of the most important discoveries and development.

Notes

Summary



0m 05s



Just to mention one, the invention of the Wi-Fi is a by-product of radio astronomy as efficient Wi-Fi connections were needed to synchronize the multiple antenna of radio arrays.

Notes

Summary



0m 27s

most of our electronic devices are “connected”

Nowadays, most of our electronic devices are connected in a large part, thanks to the pioneering work of the few astronomers who started to study the sky at radio wavelength.

Notes

Summary



fundamental equations
describe the propagation
of electromagnetic waves

Of course, radio astronomy finds its foundation in the work of James Maxwell who established in the middle of the 19th century his famous fundamental equations that describe the propagation of electromagnetic waves including radio waves.

Notes

Summary



0m 53s



Credit: Wikipedia

Based on Maxwell's theoretical work, Heinrich Hertz produced radio waves and studied their reflection.

Notes

Summary



1m 10s

He proved that radio waves propagate at the speed of light

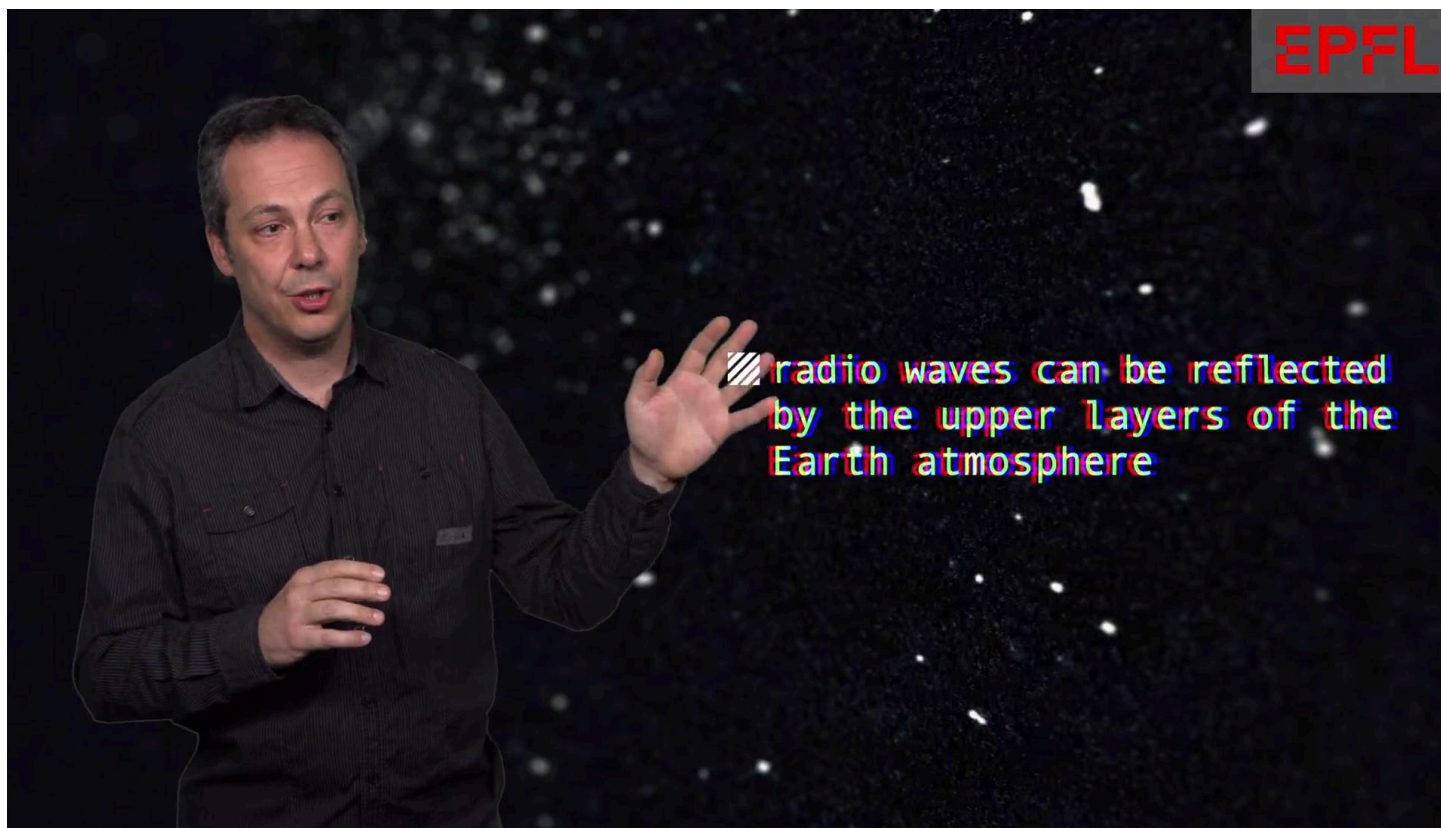
He even produced standing waves as in an instrument as in a music instrument, hence showing that radio waves were able to produce interference and he proved that radio waves were propagating at the speed of light.

Notes

Summary



1m 17s



But one of the first to explore propagation of radio waves around the Earth was Edward Appleton, a British radio physicist from Bradford college who showed in 1924 that radio waves can be reflected by the upper layers of the atmosphere of the Earth known as the ionosphere.

Notes

Summary



1m 32s

- Notes

[illegible]

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Appleton won the 1947 Nobel
prize in Physics & led
important work in the invention
of the radar

This work won Appleton the Nobel prize in physics in 1947 and he also led important work behind the invention of the radar.

Notes

Summary



2m 02s

/// In 1932 Karl Jansky carried out first radio observations of the sky

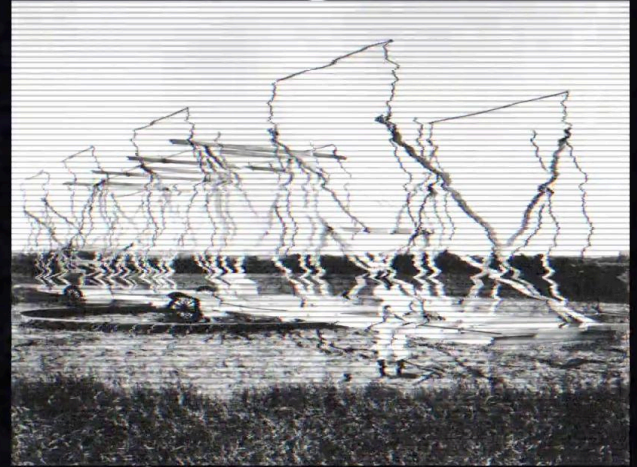
While Appleton observations were limited to the Earth's atmosphere, Karl Jansky carried out what is probably the very first radio observations of the sky back in 1932.

Notes

Summary



2m 11s



Credit: Wikipedia

Using this very simple telescope, Jansky noticed a radio signal appearing to be periodic with a period with a very specific period of 23 hours and 56 minutes.

Notes

Summary



/// Sidereal period of the Earth

This happens to be the sidereal period of the Earth so the time it takes between two consecutive observations of the same object at the same position on the plane of the sky.

Notes

Summary



2m 36s

▨ Jansky concluded that the source emitting the radio waves had to be very distant

If the object he was observing was in the solar system this period would be instead 24 hours. So Jansky concluded that the source emitting the radio waves was very distant.

Notes

Summary



2m 47s

/// He made the first radio detection of the Milky Way & birthed a new window in astronomy: the radio domain

Jansky made the first radio observations of the Milky Way, and hence, gave birth to a new window in astronomy: the radio domain.

Notes

Summary



3m 01s

“Jansky” is also the flux unit still in use nowadays in radio observations

And Jansky's name is not only famous for that specific discovery. The "Jansky" is also the flux unit still in use nowadays in radio observations.

Notes

Summary



3m 09s

/// Jansky's antenna design
doesn't efficiently focus
radio light

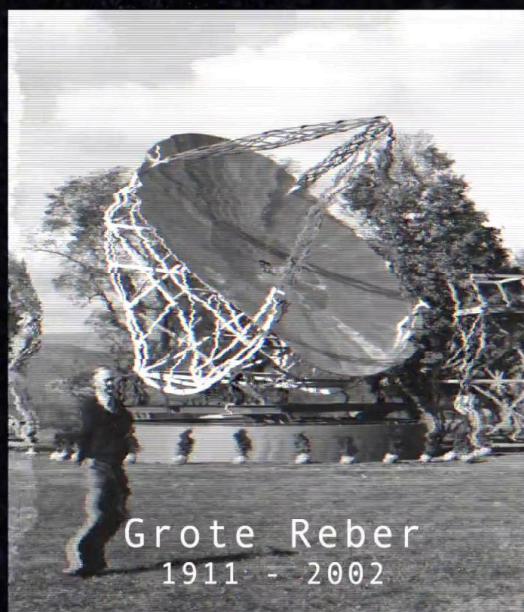
The design of Jansky's antenna does not allow to focus very well radio photons and observe very faint radio fluxes from objects outside the Milky Way.

Notes

Summary



3m 19s



Credit: Jodrell Bank Centre for Astrophysics
The University of Manchester

It is the American physicist, Grote Reber who actually designed the first radio dish actually focusing radio photons and allowing for much better observations than with Jansky's antenna.

Notes

Summary



3m 31s

Reber confirmed Jansky's observations of the Milky Way in 1938

With this dish, Reber confirmed Jansky's observations of the Milky Way in 1938.

Notes

Summary



3m 44s

/// Attempted the first radio observations of other galaxies & started the first radio survey of the sky

He also attempted the first radio observations of other galaxies like the Andromeda galaxy M31 and started what is known as the first radio survey of the sky.

Notes

Summary



3m 51s

/// Brown and Hazard successfully unveiled spatially extended radio emission in 1950

Reber's attempt to observe M31 remained unsuccessful as, in fact, many others in the late 40s but by scanning across the sky towards the Andromeda galaxy with their fixed 72 meter dish in diameter, Brown and Hazard successfully unveiled spatially emission across the Andromeda galaxy in 1950 as is seen here in this figure in their Nature paper.

Notes

Summary



4m 04s

/// This paved the way to what is now known as extragalactic radio astronomy.

The first detection of a radio source outside the Milky Way was made paving the way to what is now known as extragalactic radio astronomy.

Notes

Summary

