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Airy's Failure

The experiment called **Airy's Failure** was a test conducted by Astronomer Royal Sir George Biddell Airy in 1871, in which Airy failed to detect the motion of the earth. The experiment showed that the stars move relative to a fixed Earth. By first filling a telescope with water to slow down the speed of light inside, then calculating the tilt necessary to get the starlight directly down the tube, Airy unintentionally demonstrated that the earth was fixed horizontally since the starlight came in at the correct angle without needing to change the tilt of the telescope.

Malcolm Bowden

Malcom Bowden gives an overview of Airy's Failure. Runtime: 6m

Video Description: “ "Airey's failure" (Reference - Proc. Roy. Soc. London v 20 p 35). Telescopes have to be very slightly tilted to get the starlight going down the axis of the tube because of the earth's "speed around the sun". Airey filled a telescope with water that greatly slowed down the speed of the light inside the telescope and found that he did not have to change the angle of the telescope. This showed that the starlight was already coming in at the correct angle so that no change was needed. This demonstrated that it was the stars moving relative to a stationary earth and not the fast orbiting earth moving relative to the comparatively stationary stars. If it was the telescope moving he would have had to change the angle. ”

(Archive)

Neville Jones

Reality Reviewed: Airy's experiment
By Neville Thomas Jones, Ph.D. (bio)
Full Text Link

“ Many think it proven long ago that the World orbits the Sun. However, the results of two simple experiments, both performed in the nineteenth century, showed that it is the stars which move, and not the World.

An experiment with a water-filled telescope was performed by the then Astronomer Royal, George Airy (after whom the Airy disc of diffraction theory is named), in 1871, which can be considered to be a variation of an earlier investigation by François Arago, performed with a moving slab of glass in 1810.

Arago showed that either light itself or the luminiferous aether is dragged along by a moving piece of glass. Fresnel explained the effect by assuming it was the light-carrying medium (this is called Fresnel drag). George Stokes explained it via compression of the aether, but the important point is whether we can tell which one is doing the moving - the light source or the transparent material. When Arago investigated this effect with starlight, he concluded that the World (with respect to which the glass plate was stationary in this instance) was at rest and that it was the stars that were moving.

The experiment subsequently performed by Airy was first proposed by Ruggiero Boscovich for testing James Bradley's heliocentric aberration idea of 1728. This, in turn, was thought up to explain the elliptical motion of the star Gamma Draconis, as observed by James Bradley and Samuel Molyneux, over a fairly long time period commencing in 1725.

What was the result of Airy's experiment? Exactly the opposite outcome to that predicted in the rotating-World scenario. (Note that the experiment is usually referred to as 'Airy's failure' for this reason.)

Just like Arago before him, George Airy proved that the World was stationary and the stars are moving. It does not matter whether there exists a luminiferous aether or not, because the dragging of starlight, as demonstrated initially by Arago, is real, irrespective of how we try to explain it. Both Arago and Airy showed that it is the stars, and not the World, which move (although Airy did not actually go so far as to admit this). In addition, we can say that Michelson-Morley, Trouton-Noble and many, many others have consistently demonstrated no motion of the World around the Sun. ”

François Arago

In 1810 physicist François Arago performed an experiment designed to collect the light of stars near the ecliptic at different times of the year, as the Earth would be moving at different velocities either towards or away from the stars in its orbit around the Sun. On p.9 of The Optics and Electrodynamics of Moving Bodies (Archive) from the Max Planck Institute for the History of Science we read about Argo's experiment:

“ The problem of refraction in moving bodies became an issue in the wave theory of light because of an experiment performed in 1810 by François Arago (1786–1853) in the context of the particle theory. He wanted to determine whether light particles entering a prism would be refracted differently depending on their velocity with respect to the prism. To this end, he considered the refraction of light from the same star over the course of a year. Changes in the velocity of the earth with respect to the star would presumably produce changes in the relative velocity of the earth and the light particles emitted by the star. Arago observed no such effect on the refraction of the star’s light. ”

Following Arago's results various theories were put forth to explain it. From The Ten Most Beautiful Experiments (Archive) by George Johnson we read about the explanation given by French physicist Augustin-Jean Fresnel:

“ A French scientist, Francis Arago, ..had tried to measure the velocity of starlight colliding with the Earth. Arago assumed, naturally enough, that the speed would vary depending on whether the orbiting planet was approaching or retreating from the light source. He mounted a prism on the end of a telescope, predicting that faster light beams would be bent more abruptly than slower ones. He was surprised to find that whatever the season the angles were the same.

Arago concluded that our eyes must be sensitive to only a small range of velocities, that the faster and slower rays were invisible. But his colleague Augustin-Jean Fresnel came up with a different explanation: while aether flows effortlessly through matter's molecular cracks, a tiny bit had become stuck in Arago's prism, carried along for the ride. That, he explained, would negate the effect Arago was seeking. When the Earth was approaching a star, its light would indeed strike the prism at a higher speed. But then it would be slowed a compensating amount by the aether trapped inside the glass. The effect would be true for any transparent medium, Fresnel proposed, and would depend on its index of refraction—a measurement of how much it slows and bends light. ”

Resources

- Airy's paper
- Airy's Telescope Specifications
- Arago’s experiments on the speed of light
- François Arago: A 19th Century French Humanist and Pioneer in Astrophysics

Further Reading

- Airy's Failure Reconsidered (Archive) by Astronomer Walter van der Kamp
- FECORE seeks to repeat Sir George Biddell Airy’s experiment

See Also

Related Topics

- **Aether**

Flat Earth Topics on Rotation and Revolution

- **Michelson-Morley Experiment** - Light velocity experiment which suggests a lack of Earth's motion around the Sun
- **Sagnac Experiment** - Experiments which show that light's velocity is indeed affected by detector motion
- **Airy's Failure** - An experiment which suggests that the stars are in motion, rather than the Earth
- **Time Dilation by Latitude** - The predicted time dilation caused by Earth's rotation does not occur
- **Aviation** - Mechanical air flight assumes a flat, non-rotating Earth

Round Earth Topics on Rotation

- **Foucault Pendulum** - Pendulum device which is alleged to detect the rotation of Earth
- **Coriolis Effect** - Eastwards deflection of bodies caused by Earth's rotation
- **Coriolis Effect (Weather)** - Hurricanes and other effects due to Earth's rotation
- **Ring Laser Gyroscope** - Ring laser experiment alleged to observe the rotation of Earth

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