

## Scientist and Politician François Arago



François Arago (1786 – 1853)

On February 26, 1786, French mathematician, physicist, and astronomer **François Arago** was born. Arago discovered the principle of the production of magnetism by rotation of a nonmagnetic conductor. He also devised an experiment that proved the wave theory of light and engaged with others in research that led to the discovery of the laws of light polarization.

*“Connaître, découvrir, communiquer—telle est, au fond, notre honorable destinée.  
To get to know, to discover, to publish—this is the destiny of a scientist.”*  
— François Arago, (1855) as quoted in [14]

## **Francois Arago – Early Years**

Dominique-François-Jean Arago was born in Estagel, Roussillon, France. François Arago's father was François Bonaventure Raymond Arago (1754-1814), the mayor of Estagel, a small town about 18 km northwest of Perpignan, and his mother was Marie Anne Agathe Roig (1755-1845). The Arago family came from the eastern Pyrenees. François Arago's parents had eleven children, six boys and five girls.. He was educated at the Municipal College of Perpignan where he became interested in mathematics. Later, he was admitted to the École Polytechnique in Paris. There, he he succeeded Gaspard Monge in the chair of analytic geometry at the age of only 23.[3] Subsequently, Arago also was director of the Paris Observatory and permanent secretary of the Academy of Sciences. He was also active as a republican in French politics. As minister of war and marine in the provisional government formed after the Revolution of 1848, he introduced many reforms.

## **Electromagnetic Phenomena**

Around 1820, Arago demonstrated that the passage of an electric current through a cylindrical spiral of copper wire caused it to attract iron filings as if it were a magnet and that the filings fell off when the current ceased. This work is based on the scientific research by H.C. Ørsted of Denmark [9]. Shortly after, Aragon managed to show that a rotating copper disk produced rotation in a magnetic needle suspended above it. It was later Michael Faraday who proved these to be induction phenomena.[4] Arago called this phenomenon rotational magnetism. It was also the first experiment that could prove the eddy current.

## **The Stranger Properties of Light**

In Paris, Alexander von Humboldt met François Arago in 1809, with whom he soon cultivated a special friendship, both humanly and scientifically. Both were interested in the phenomenon of geomagnetism. Alexis Thérèse Petit (1791-1820) married a sister of Arago's and the two of them jointly carried out experiments on the refraction of light and the influence of temperature on the refractive index in gases. In 1816, together with the latter, he found the law according to which two rays polarized in a plane can interfere with each other, but rays polarized perpendicular to each other cannot. In 1818, a competition was announced by the French Académie des sciences, whose jury was chaired by Arago. The 30-year-old Augustin-Jean Fresnel entered with a novel paper on wave optics. After Siméon Denis Poisson had challenged the predictions of the theory with his seemingly far-fetched thought experiment on the formation of Poisson spots, Arago was able to demonstrate this effect experimentally. In the English-language literature, the spot is therefore also referred to as the Arago spot. François Arago is known to have been a great supporter of Augustin-Jean Fresnel's wave theory of light.[10] The theory states that light should be retarded as it passes from a rarer to a denser medium. Laplace, Biot, and Poisson however favored the emission theory, which means that light should rather be accelerated. Before Arago's death, the retardation of light in denser media was demonstrated by Fizeau and Léon Foucault, who used Arago's method with improvements in detail.[5]

## **A New Planet**

*“On certain occasions, the eyes of the mind can supply the want of the most powerful telescopes, and lead to astronomical discoveries of the highest importance.”*

— François Arago, (1859) as quoted in [15]

From 1830 Arago was director of the Paris Observatory, where he used all modern possibilities of astronomy and physics. He was the first to attribute the scintillation of stars to interference in the Earth's atmosphere caused by air turbulence. Arago took part in the dispute between Urbain Le Verrier, who was his protégé, and the English astronomer John C. Adams over priority in discovering the planet Neptune and over the naming of the planet. In 1845, Arago suggested that Le Verrier investigate anomalies in the motion of Uranus. When the investigation resulted in Le Verrier's discovery of Neptune, Arago proposed that the newly found planet be named for *Le Verrier*.<sup>[7]</sup>

### **An Advocat for Photography**

On August 19, 1839, Arago officially presented the invention of photography by Louis Daguerre and Joseph Nicéphore Niépce to the French Academy of Science and the public.<sup>[11, 12]</sup> Earlier, the Chamber of Deputies and the House of Pairs had approved a law whereby the rights to the invention were purchased by the French state and made available to the world as a gift. Daguerre received a life-long monthly pension of 6,000 francs and Isidore Niépce, the son of Joseph Nicéphore Niépce, received such a pension of 4,000 francs.

### **Later Years**

After the July Revolution of 1830, Arago became involved in politics. As a republican deputy for the “Pyrénées-Orientales” region, he spoke in the Chamber of Deputies during the July Monarchy, particularly on issues of navigation, canal construction and railroads. After the 1848 Revolution, Alphonse de Lamartine brought him into the provisional government as Minister of War and the Navy. Together with his undersecretary Victor Schoelcher, he played a decisive role in the final abolition of slavery in France. For a month and a half, he was chairman of the Republic's Executive Commission before the Assembly placed General Louis-Eugène Cavaignac at the helm of power. Arago remained a consistent republican to the end, and after the coup d'état of 1852, though suffering first from diabetes, then from Bright's disease, complicated by dropsy, he resigned his post as astronomer rather than take the oath of allegiance. Napoleon III gave directions that the old man should be in no way disturbed, and should be left free to say and do what he liked. In the summer of 1853 Arago was advised by his physicians to try the effect of his native air, and he accordingly set out to the eastern Pyrenees, but this was ineffective and he died in Paris. His final resting place was at Père Lachaise Cemetery in Paris (Division 4).

### **References and Further Reading:**

- [1] Detailed [Biography of Francois Arago](#) at MacTutor History
- [2] [Francois Arago at Britannica](#)
- [3] [Caspar Monge and the Geometry](#), SciHi Blog
- [4] [A Life of Discoveries – the great Michael Faraday](#)
- [5] [Hippolyte Fizeau and the Speed of Light](#), SciHi Blog
- [6] [Fizeau, Foucault and Astronomical Photography](#), SciHi Blog
- [7] [Neptune, Oceanos, or ‘Le Verrier’ – How to name a new planet?](#), SciHi Blog
- [8] [Francois Arago at Wikidata](#)

- [9] [Hans Christian Ørsted connecting Electricity and Magnetism](#), SciHi Blog
- [10] [Augustin-Jean Fresnel and the Wave Theory of Light](#), SciHi Blog
- [11] [Making Photography Really Operational – Louis Daguerre](#), SciHi Blog
- [12] [Nicéphore Niépce and the World's First Photograph](#), SciHi Blog
- [13] [H. SADOON – Du ciel à l'hémicycle. La vie de François Arago](#), in Les multiples facettes d'Arago (1786-1853) – 5 à 7 de l'Académie des sciences @ youtube
- [14] François Arago, '*De L'Utilité des Pensions*', *Œuvres complètes de François Arago* (1855), Vol. 3, 621
- [15] François Arago, trans. by William Henry Smyth, Baden Powell and Robert Grant, '*Laplace*', *Biographies of Distinguished Scientific Men* (1859), Vol. 1, 347.
- [16] [Timeline for François Arago](#), via Wikidata