**A Brief History of Fluorescence**

**The 19th Century: Discovery of a Celestial Light**

When John Frederick William Herschel (1792-1871) observed a mysterious blue light through a glass of quinine solution, he likely never imaged that this observation would lead to imaging live cells.

**1897** to describe a chemical group associated with a particular wavelength of light. The term was later used by spectroscopist and chemist, John F.W. Herschel, in his 1852 presentation at the University of Edinburgh. It referred to the property of atoms and molecules to absorb light at a particular wavelength and then re-emit light at a different wavelength.

**George G. Stokes** coined the term fluorescence in 1852, and introduced the concept of the quantum yield of light, an experimentally verifiable quantity that describes the efficiency of the fluorescence process.

**The Early 1900s: An Amalgamation of Minds**

Herschel’s findings were met with skepticism, but his colleague, the Zeiss firm and the Reichert firm produced their fluorescence microscopes concurrently. Oskar Heimstädt at Carl Reichert Optische Werke AG in Vienna versioned Woods’ light source to produce a prototype bright-field fluorescence microscope. In 1903, Robert W. Woods at Johns Hopkins University invented a reliable light source of light within the specimen itself. These can toggle more than once between a fluorescent and a non-fluorescent state, making them valuable tools for studying cellular processes.

**A New Era: Fluorescent Stains, Probes, and Proteins**

In the late 1980s, scientists began developing fluorescent probes that could be used to label specific proteins in cells. This led to the development of fluorescent antibodies, which became the first commercially available probe for live-cell imaging. These probes, called immunofluorescent probes, are still widely used today, especially in live-cell pulse-chase experiments.

**Fluorescent Timers**

These change emission wavelengths upon irradiation with light at specific wavelengths. Photoactivatable FPs enable specific probing, with fluorescence emission being uniquely controllable by light irradiation at specific wavelengths. Photoconvertible FPs are useful in applications where the behavior of proteins in living cells with changing fluorescence properties is necessary. Photoconvertible FPs are particularly useful for live-cell imaging, as they allow for the reversibility of the fluorescence process.

**Microscopy**

Epifluorescence microscopes are a central tool in biology labs today, aided by immunofluorescent probes introduced by Albert Coons, professor in the Department of Bacteriology and Immunology at Harvard Medical School, in the 1940s. These probes enabled researchers to visualize a wide range of cellular structures and processes.

**ILLUMINATING LIFE**

**Fluorescence Microscopy**

A try-year journey of discovery revealed fluorescent microscopes into powerful biological tools. Fluorescence microscopy has been instrumental in understanding the behavior of proteins in living cells with changing fluorescence properties. These change emission wavelengths upon irradiation with light at specific wavelengths. This has led to the development of fluorescent probes that can be modified and engineered, enabling researchers to observe the dynamics of cellular processes in real time.