Detecting Elements Impossible to See with the Naked Eye

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Abstract

Examining the history of famous discoveries that brought together the scientific field known as spectroscopy helps us appreciate and understand the hard work that may seem irrelevant at times. Spectroscopy is the science that tells us what elements lie in planets and stars that are currently impossible to reach. From Newton discovering the spectra, Herschel discovering infrared waves, to Ritter finding Ultraviolet waves, and Kirchhoff weaving the previous findings together, we can now understand waves and what they mean.

For centuries, people all over the world had wondered what the shimmering sky lights in the dark night were. It wasn't until the early 16th century that telescopes were created and quickly popularized, that caused famous thinkers to brainstorm further into the possibilities of our celestial surroundings. One of the lingering questions was: What are the objects in space made of?

A few decades after the invention of the telescope, Sir Isaac Newton proved that the light being emitted from the sun could be separated into different types of waves. "Newton introduced the word "spectrum" to describe this phenomenon. His instrument employed a small aperture to define a beam of light, a lens to collimate it, a glass prism to disperse it, and a screen to display the resulting spectrum." (The Era of…,n.d) The tool to distinguish these waves was the closer than ever to being made with Newton's findings. Not too long after Newton's discovery of the light's spectrum, other waves were observed that would be impossible to detect through the use of the naked eye.

In MIT's article, titled: *The Era of Classical Spectroscopy*, two other famous contributors are accredited to helping figure out a way to measure particular elements that lie millions and billions of miles away. One of them, is a famous Astronomer named William Herschel. In the year 1800, Herschel accidentally discovered infrared particles dispersed from sunlight as he was running tests on his telescope. Herschel initially called these "heat rays." The following year in 1801, J.W Ritter heard of the news and believed that the opposite should be true, as in a cooling wavelength that comes from the sunlight. Once again, another set of waves were discovered. Unbeknownst to Ritter, he was able to see what is now known as Ultraviolet rays.

A few years prior, a man named Joseph Fraunhofer invented the first spectroscope. “He re-discovered the dark lines in the spectra.., 574 lines were described by him, to the stronger [lines,] he assigned the letters A to Z, which are still used today.” (Plicht, n.d). These lines he discovered are now known as Fraunhofer lines. Unfortunately, the men known for kick-starting the practical use of these discoveries did not know much of what they had discovered. They understood it existed, but not why. Now, the “why” is the answer to the question in the first paragraph.

In 1859, the most important piece that joined all the discoveries together into a practical science was a man named Gustav Kirchhoff. Kirchhoff explained “that the emitted power and absorbed power of light at a given wavelength are the same for all bodies at the same temperature. It follows that a gas, which radiates a line spectrum must, at the same temperature, absorb the spectral lines it radiates.” Meaning that the “Fraunhofer lines in the sun's spectrum were due to absorption of the continuous spectrum emitted from the hot interior of the sun by elements at the cooler surface. Analysis of the sun's atmosphere thus became possible.” (The Era of…, n.d)

Gustav Kirchhoff and his colleague Robert Bunsen understood that each atom and molecule had a specific set of defining characteristics through the spectra. As they verified through terrestrial studies and discoveries, they began what is now known as spectroscopy, a scientific field that ranges from practical uses to unimaginable possibilities, such as discovering what a celestial body or object is made of, as the science and laws go unchanged in any place or situation.

In conclusion, the scientific community is one of the largest and most diverse communities that can bring people together to discover and understand what is difficult to understand. Without all the contributing parties involved in detecting the rays emitted from the sun, the spectrometer would have been made much later, rather than the mid-19th century. Even the most unexpected or “useless” findings can map out and bring us a great leap into new discoveries and possibilities. The science of spectroscopy now ranges through many practical, everyday uses to furthering our wealth of knowledge in the scientific community. We are still using this science to understand new planets and its contents. Without the discovery, it is impossible to imagine what we would be able to understand or what facts and theories would be questions and myths.

References

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