1993 Noble Prize Winner Russell A. Hulse

By: Ryan Saunders

Hulse was born in New York City and attended the Bronx High School of Science. He then moved to the University of Massachusetts. He was born on November 28, 1950 from his parents Alan and Betty Joan Hulse, his parents supported him throughout his lifetime and he grants much of his success to the way he was brought up. Hulse went on to pass his P. HD; this is where he decided to write his thesis on radio astronomy. After completing his Ph.D. in 1975, he had a post-doctoral appointment at the National Radio Astronomy Observatory from 1975 to 1977. He soon became aware of the lack of long-term careers in astronomy. He later became part of a plasma modeling group in the organization known as the Princeton University Plasma Physics Laboratory, or PPPL for short. His first task was to model the behavior of impurity ions in the high temperature plasmas of a controlled thermonuclear fusion device. He also has hobbies outside of science such as nature photography, bird-watching, and target shooting. Hulse often expresses how his drive in science is not for a career, but rather his want to know “how the world works.”

Russell A. Hulse with a man named Joseph Taylor were awarded the noble prize in 1993 for discovering a new type of pulsar, which opened up many new possibilities to improve study of gravitation. This was significant because the men concluded that the behavior of a beacon signal could be deduced by an approximately equal heavy companion at a distance only a few times the distance from the moon to the earth. This

astronomical system strays from what can be calculated using Newton's Theory. Due to the weakness of the gravitational force, it has always been a tough subject to study within physics. In a sense, that is why the binary pulsar is such an extravagant discovery. The pulse period of the new pulsar, 0.05903, so far, has been extremely stable. The pulse period seems to increase less than 5% over a long duration of time (1 million years). This lack of deviation from the original pulse makes the invention primarily useful as a clock that has a very precise output, compared only to the best atomic clocks. Variations in the pulse period may lead to answers about the pulsar's speed in not only its orbit, but in other important featured as well. It is also believed that the orbit is periodical, meaning it is necessary to have a companion.

The first binary pulsar was discovered in 1974, which was called the PSR 1913 +16. These had small astronomical bodies, with a radius of about 10 km, but a mass that may be compared to the sun. The orbital speed of the binary pulsar is greater than that of Mercury. One orbit of the pulsar can take 8 hours; this is compared to the moon taking one month to orbit the earth. It was later found after the discovery of the pulsar that the two bodies rotate faster and faster around each other in a tight orbit that is consistently increasing. Thought it requires sufficient time, it is still fully measureable in which the change occurs. Originally it was thought that the change occurred because the system emitted energy in gravitational waves; this theory, of course, being founded by Einstein was often popular amongst those in the scientific community. The latest data shows the theoretically calculated data, with regards to the theory of relativity, agrees only approximately ½% with value being observed. This was studied thoroughly following four years of the discovery of the binary pulsar.

The good agreement may be used as indirect proof of the existence of gravitational waves. Multiple projects have already been put into place to study direct observation in regard to gravitational waves. For now, the radiation from the binary pulsar is too weak to be able to study as an observation of Earth. However, the closeness of the two astronomical bodies may eventually enhance the ability to measure gravitational waves. The binary pulsar truly revolutionized idealism in astronomy; the common ideal was based on physical phenomena, first applied during a terrestrial connection.

Hulse was able to make these findings with the extraordinary help of computer modeling, with which he utilized multiple times in his life. He was able to write an electron transport code which modeled experimentally observed density profile evolutions. He also in the past pushed his former associates in developing advanced computer modeling environments. His goal was to make it easier to apply and develop multiple models to an extended range of areas such as industry, research, and education. This constant drive of Hulse and his prowess in using computer modeling truly set the conditions to be right for him to help to discover something such as the binary pulsar. He was a man that was truly thankful to his parents, and employers support for a lengthy time, and were proud to discover something that would further revolutionize studies in astronomy. Along with Joseph Taylor, Russell Hulse was able to do the unthinkable and help scientists take another step closer to continuous experimentation of gravitational waves.

Sources

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