The Cosmic Handshake

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ALL of you might have watched Steven Spielberg's *ET* or *Extra Terrestrial* and enjoyed it. Have you ever wondered if it was for real? That is, if aliens really exist. Celebrated science fiction writer Arthur C Clarke once remarked, "Two possibilities exist; either we are alone in the universe or we are not. Both are equally terrifying" Scientists Carl Sagan and Stephen Hawking said, "It would be improbable for life not to exist somewhere other than Earth".

In the early 1960s, the mission SETI (Search for Extraterrestrial Intelligence) was launched to find evidence of other civilisations in the universe and extract information from extraterrestrial signals. For this purpose, astronomers resort to active and passive communication. In active communication, messages are sent, like in 1974, astronomers transmitted a 218-byte message from the Arecibo Observatory in Puerto Rico in the hope of signalling civilisation in the star cluster M13. In passive communication, astronomers rely on listening to transmissions sent by alien civilisations. This method uses a radio telescope, which can detect longer wavelength energy signals compared to optical telescopes. So, a giant radio telescopic dish is pointed to the sky and tuned to the microwave region of the electromagnetic spectrum. The microwave frequency band is 1000 MHz to 3000 MHz, as this band has less noise. So far, 5500 stars have been sampled, and 82 million candidate signals have been detected. In 1977, researchers at Ohio State University picked up an intriguing signal — "Wow". But this transmission was not repeated.

In 1961, astrophysicist Frank Drake developed an equation to estimate the number of advanced civilizations likely to exist in the Milky Way galaxy---

$$N = R_x\ f_p\ n_e\ f_e\ f_e\ f_i\ f_c\ L \qquad \ldots (1)$$

N = technologically advanced civilisations in the Milky Way galaxy.

R_x = rate of star formation in the galaxy.

f_p = fraction of those stars with planetary systems.

n_e = number of planets per solar system with an environment suitable for life.

f_e = fraction of suitable planets on which life actually appears.

f_i = fraction of life-bearing planets on which intelligent life emerges.

F_c = fraction of civilisations that develop a technology which releases a detectable sign of their existence.

L = length of time, such as civilisations that release detectable signals into space.

Drake predicted that there might be 10,000 detectable civilisations in the Milky Way. While Carl Sagan suggested that one million civilisations might exist in the galaxy!

In new research, Adam Frank and Woodruff Sullivan offered a new equation that asks what the number of advanced civilisations is likely to have developed over the observed history of the universe. The difference between Drake's and Frank's equations is the elimination of parameter L.

$$A = N_{ast}\ f_{bst} \qquad \ldots (2)$$

A = number of technologically advanced species that have formed over the history of the observed universe.

N_{ast} = number of habitable planets in a given volume of the universe.

f_{bst} = likelihood of a technologically advanced species arising on one of the planets.

The astronomers are searching for planets similar to Earth and our solar system in order to find signs of life (called exoplanets). The exoplanets discovered in the past have filled a few terms in Drake's equation, but most of the other terms remain blank!

Alone in the universe

Radio dish antenna

Imagination of alien