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LITTLE GREEN MEN

Ken Tapping, 26th June, 2018

In 1967, Cambridge graduate student Jocelyn Bell was investigating how the solar wind makes distant radio sources twinkle. These observations can tell us how fast the wind is blowing, and the size and density of irregularities in it. However, the output of the custom-built radio telescope was showing something else; at one time of day there were groups of little, regularly-spaced spikes.

Southern Britain is densely populated, and with the higher population density come more cars, electric motors, power line interference and all the other unwanted radio transmissions that people make. It is maybe not surprising that radio interference turned up. These spikes, which Bell referred to as "scruff", turned up at the same time every day, which generated the idea that it came from a farmer's vehicle when he returned home in the evening. Firstly, he was an unusually punctual farmer. However, as time passed, something happened that turned that idea upside down. The scruff turned up four minutes earlier each day.

Our measurement of time is based on the apparent motions of the Sun. One complete orbit around the Sun is called a year, and the time interval between two consecutive noons is called a day, and is divided into 24 hours. However, as we go around the Sun, the direction in which the Sun lies at noon changes by about a degree a day. So between two consecutive noons the Earth turns a little bit more than one revolution. If you note the time a star passes due south, and when it is due south the next night, you'll see the time difference is 23 hours and 56 minutes. This is because the stars lie so far away they always lie in the same direction, and would appear in the south after exactly one complete revolution of the Earth, not a revolution and a bit. The scruff was originating somewhere far out in interstellar space.

The pulses making up the scruff were exactly 1.33 seconds apart, stable, like a clock. To rule out the possibility it was some sort of technical quirk, the observation was checked using a different radio

telescope. It too picked up the object; it was real and it was cosmic. On Earth, regularly pulsed radio transmissions are generally produced by us. This got imaginations going. Were those pulses produced by alien civilizations, maybe as "cosmic lighthouses" for interstellar voyagers? Somewhat humorously, the object became known as LGM-1, with LGM standing for "Little Green Men". Then more of these mysterious pulsing radio sources were discovered. Perhaps fortunately, a non-alien theory for these objects was already available.

In 1934 astronomers Walter Baade and Fritz Zwicky postulated that when an ageing, giant star dies in a huge explosion, known as a supernova, the core region of the star can be compressed so hard that the atoms making it up completely collapse. The electrons are forced into the nuclei of the atoms, forming neutrons. Something the size of a star would be compressed into a ball of neutrons maybe 10 km in diameter. A large fraction of the star's magnetic field is also jammed into this neutron ball. The reduction in the size of the star accelerates its rotation from once a month or so to seconds or even fractions of a second. The magnetic field and the fast rotation cause two beams of radio emission to be produced, and each time the beam sweeps across our direction, we get a pulse, just like the flash we see from a lighthouse. The light is on all the time, but we see a flash when it points our way. Now many of these objects, now known as "pulsars" have been found, some of them sitting obviously in the middle of the remains of exploded stars. I rather liked the idea of Little Green Men and their cosmic lighthouses.

After sunset, Venus shines brightly in the west; Jupiter lies in the south and Saturn in the Southeast. Mars, getting brighter every night as it gets nearer to its closest to us on the 26th, rises around 1am. The Moon will be Full on the 27th.

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