THE WOW! SIGNAL. AN ALTERNATIVE HYPOTHESIS AND SEARCH STRATEGY FOR THE WOW! ORIGIN. W. A. Bains, Rufus Scientific Ltd, Melbourn, SG8 6ED, UK, *and* EAPS, MIT, Cambridge, MA 02139, USA. william@rufus-scientific.com

Introduction. The "Wow! Signal" was a strong narrowband radio signal detected by a SETI programme being run at the Big Ear radio telescope in Delaware, Ohio on 15th August 1977, and apparently originating from a sky location in Sagitarius. The signal bore characteristics expected of an artificial signal. Several subsequent attempts to detect a signal from the same spot in the sky again failed to detect anything, suggesting that the original signal was an artefact, i.e. either an instrument error or a miss-identified terrestrial transient. However a range of studies of possible artefactual sources for the signal also failed to explain it. I suggest a third reason for the origin and subsequent non-repetition of the Wow Signal.

Analysis.

Hypothesis

Let us assume, for the sake of argument, that the Wow Signal was genuinely of non-human in origin (*a priori* the least probable but most interesting assumption). There are three reasons why we might intercept such a signal. It may be a broadcast signal, in which case we could detect it if we are in range. It may be a directional signal beamed at us, and again we detect it if we are in range. Or it may be a directed signal beamed at someone else, and we happen to get in the way. In the first two cases the apparent origin of the signal is non-human civilization, either radiating into space as a side-effect of local communication (as we are) or deliberately seeking to communicate with us. In the third, however, there are two options: that the apparent source is the communicating civilization, or that the apparent source is attempting to communicate with an extraterrestrial civilization. For example, if a sufficiently powerful detector could intercept the signals from Voyager 2 on 1st Jan 2015, they might conclude that humans lived somewhere near Eta Ophiuchi. As Voyager is moving, they would never detect a signal from that region of the sky again, because both the Voyager spacecraft and the Earth – its transmission target – would have moved.

Counter-argument

The Wow Signal was detected at 1420.4556 MHz, i.e. within 10kHz of the neutral hydrogen line. If the signal was directed at us deliberately, then the source could both select this line and correct for Doppler shift between the source and the Earth. If we were an accidental recipient, the chances that their transmission frequency would be a signal of <10kHz width of this exact, astronomically significant frequency seems very small.

Sky location of target. I suggest that it is worth considering that the Wow Signal was a transmission from a moving object back towards its origin, and not a transmission from that origin to Earth. In this scenario, the civilization that is the source of the radiating object (the target of the signal, not its source) will be found in the sky roughly diametrically opposed to the source of the Wow Signal. The Wow Signal came from one of two ellipses RA 19h25m31s ± 10s or 19h28m22s ± 10s, DEC −26°57′ ± 20′ (2000 epoch) (ambiguity in the receiver means that it is not possible to determine which of two antennae received the signal). The opposite spot on the sky is RA 7h25m or 7h28m, DEC +26°57', in the constellation of Gemini.

I can find no nearby stars in the two ellipses corresponding to the antipodes of the original Wow Signal location, but this need not discourage us. It is unlikely that a moving object would chose to transmit to its target on a path that went directly through a planet. Rather, it is more likely that the object would transmit along a free path that (as far as was known to the transmitter) was free of obstructions, i. e. a path that was not directly through the Earth. In this scenario, our detection of a signal was detection of the edges of a focused transmission. The true target would therefore be offset from the apparent target, and the search zone is substantially larger than the actual error ellipses. In particular, I suggest the ecliptic near to δ Geminorum as a plausible source for the Wow Signal Object. To any observer in this zone, Earth is a transiting planet, and a hypothetical astronomer could deduce that our planet was 'Earth-like' (whatever that meant for them) and had an atmosphere rich in oxygen, which is one of the more robust signs of life, and hence that our Solar System is an interesting body for more direct study. The M dwarf HIP 36215 (distance 19.34 parsecs) and the K star component of the triple system δ-Geminorum (distance 18.5 parsecs) in particular might be interesting targets for exoplanet detection and targeted SETI searches.