TERRESTRIAL CONSTRAINTS ON EXTRA-TERRESTRIAL INTELLIGENCE. S.R.N. McIntyre[1] and C.H. Lineweaver[1], [1]Research School of Astronomy and Astrophysics, Australian National University, Canberra, Australia, (sarah.mcintyre@anu.edu.au and charley.lineweaver@anu.edu.au)

Introduction: To understand our place in the cosmos, one question rises above all others: "Are we alone in the universe?" Astronomical research on habitable planets has shown that there are billions of prospective Earth-like planets that could all potentially support complex life forms. de Duve has argued that the initial deterministic nature of proto-biochemistry makes life a "cosmic imperative" built into the chemistry of the universe, and we should therefore expect the presence of life to be common [1].

How likely is it that this life will develop intelligence? And if intelligent life is out there, why haven't our extra-terrestrial friends tried to contact us? It seems possible that at least some civilizations would be technologically advanced, seek out new resources in space, and colonize their own stellar system and, subsequently, surrounding stellar systems. [2]

A common explanation for the rarity of human-like intelligence is that "we are the first", but this argument assumes what we would like to evaluate.

It is often assumed that once life is present, even as a single-celled organism, an evolution towards human-like intelligence and subsequent technological development is inevitable. Lineweaver refers to this imagined selection pressure to occupy the "human-like intelligence" niche as the Planet of the Apes fallacy. [3-5]

If this convergent evolution hypothesis were to hold up in outer space, it should be applicable to the one planet that we know for certain harbours life – the Earth. Putting a terrestrial spin on Fermi's paradox, we can ask: If human-like intelligence is convergent, why are we the only species with human-like intelligence on Earth?

Since the breakup of Pangea around 180 million years ago continental drift has resulted in the prolonged isolation of ten landmasses. During their isolation, these continents and islands were equivalent to independent experiments in vertebrate evolution. [6] Therefore, these geographically isolated landmasses were laboratories where vertebrate evolution was simulated.

The elaboration of the homonid brain began less than 3 million years ago, and that of the cortex of Homo sapiens occurred about 300,000 years ago. [7-8]

Using continental drift data, we have ten simulated "planets", that were all habitable, have the ideal planetary composition, sufficient time for the development of human-like intelligence, and a wealth of continually evolving landlocked vertebrates. If evolution towards human-like intelligence were inevitable, and approximately 4 million years was a typical timescale for the selection of Sagan's "functionally equivalent humans", [9] one might expect these multiple, 40-to-100 million-year experiments to have produced some recognizable tendency towards human-like intelligence in at least one species.

We investigate if there is an intelligence niche towards which species on Earth evolve.

Development of the encephalization quotient (EQ) of vertebrates on each landmass over time was analysed to determine whether there was a significant increase in intelligence, or evolutionary tendency toward human-like intelligence. No significant increase is apparent but we are trying to quantify this more carefully.

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