

Humanity will out-communicate all life on Earth within 90 years, say researchers

September 7 2023, by Brian Koberlein



A male Japanese Bush Warbler singing. Credit: Wikipedia user Alpsdake (CC BY-SA 3.0)

Life on Earth is a glorious dance of data. From the songs of backyard birds to the chemical exchanges of forest trees, the exchange of information between living things is an essential part of its existence and

evolution. Humans, too, are a part of that dance, with friendship chats over morning coffee, bold headlines in newspapers, and TikTok videos of teenagers. Right now human data is just one part of Earth's living data exchange, but it could soon become the overwhelming dominant part. If the same is true for all advanced civilizations, it could impact our search for alien life.

Although it would be nearly impossible to get a precise measure of the rate of data exchanged between terrestrial organisms, you can estimate the rate as an order of magnitude. One way to do this is to look at the number of living cells and their [data exchange](#) since they constitute the bulk mass of life on Earth. Based on several studies, the total number of prokaryotes, such as bacteria, amounts to about 10^{29} cells. These cells exchange a single bit of information in about three hours, so very broadly the Earth's biosphere exchanges about 10^{24} bits of information each second.

In contrast, the technosphere, or the sum of digital information exchanged by humans, is a bit easier to estimate. Based on Internet data exchange, our bit rate is about 10^{15} bits/second, which is a billionth of the biosphere rate. But while the biosphere is relatively stable over time (barring the occasional mass extinction), our [digital data](#) is growing at an exponential rate. If our technosphere continues to expand at historical rates, it will outpace the biosphere in less than a century. This research is published in the journal *Life*.

So what does this have to do with alien civilizations?

Data is exchanged at the physical level. Whether through [chemical interactions](#), [optical fiber](#), or [electrical circuits](#), all data takes power to create and maintain. Currently, this energy is centered on biosphere data, but it could become dominated by technosphere data in the blink of a cosmic eye. If this trend is typical for advanced civilizations, the power

spectrum of a planet with [intelligent life](#) is more likely to be technological, not biological. We therefore might be able to distinguish the worlds of an alien civilization by looking for a distinctly synthetic thermal signature.

But even we we don't concern ourselves with aliens, the growing technosphere will have significant consequences for life on Earth. Humans already have a tremendous influence on Earth's biodiversity and global temperatures. If we continue our trend of exponential growth, we could significantly diminish the data resources for non-human life. Perhaps that's something we should talk about.

More information: Manasvi Lingam et al, Planetary Scale Information Transmission in the Biosphere and Technosphere: Limits and Evolution, *Life* (2023). [DOI: 10.3390/life13091850](https://doi.org/10.3390/life13091850)

Provided by Universe Today

Citation: Humanity will out-communicate all life on Earth within 90 years, say researchers (2023, September 7) retrieved 27 April 2024 from <https://phys.org/news/2023-09-humanity-out-communicate-life-earth-years.html>

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