

## Letter

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# Implication of our technological species being first and early: The anthropic selection effect of our technological youth

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## Abstract

In the previous paper (Whitmire 2017; hereafter Paper I) arguments were given which suggest that the *typical* technological species is short-lived and that their demise coincides with the extinction of their planetary biosphere. This conclusion is based on two observations and one primary assumption. The observations are: (1) Our own technological species is the first such species to evolve on Earth and (2) we are early in the potential evolution of a technological species. The primary assumption is that we are a typical member (in age) of the reference class of *all* extant technological species in the universe. In this Letter, I thoroughly discuss the anthropic selection effect that the predicted lifetime of the typical technological species would most likely first be made when a technological species is young, thus guaranteeing a predicted short lifetime, regardless of the actual typical lifetime. I argue here that this selection effect is equivalent to narrowly redefining the reference class to be *only* early technological species and, although true, it is a logical tautology, correct by definition and does not invalidate the application of the Principle of Mediocrity assumption to the expanded reference class of *all* technological species, as was done in Paper I. Several simple analogies are given to illustrate this point.

## The anthropic selection effect of our technological youth

As noted in Paper I, it is unlikely that the observations that we are the first technological species on Earth and that we are early in our technological evolution (and the corresponding inferences) could have been made much earlier than the present time, but would likely be made relatively soon after a modern technology is attained. Therefore, all young technological species could make the same short-lifetime inference as in Paper I, even if the typical such species survived for a very long time. A technological species destined to survive 100 yr or 1 Gyr would both conclude that their lifetime is short based on the application of the Principle of Mediocrity (POM) at this early technological time. This is a correct observation and in fact, it is consistent with the POM (*i.e.*, Why should we be atypical in making these arguments early in our technological evolution?). Subsequent to the publication of Paper I, this valid observation has been raised as an objection to the paper's conclusion regarding the predicted short lifetime of the typical technological species. Therefore, I address this selection effect more completely here. The selection effect does not apply to our status as the first technological species on Earth and the corresponding statistical inference.

To gain insight as to why this anthropic selection effect does not invalidate the short-lifetime argument, I note that the selection effect is equivalent to redefining the POM reference class as (only) *early* technological species. In Paper I, it was emphasized that defining the POM reference class too narrowly guarantees its validity, but at the expense of any useful or interesting results. On the other hand, expanding the definition of the reference class can lead to interesting results though at the expense of introducing some uncertainty. If we define the reference class as all early technological species having a mean age and standard deviation of  $\sim 100$  yr (*i.e.* us) then we are guaranteed to be typical in age of the reference class of all early technological species, *by definition*. On the other hand, we can (and did) expand the reference class to include not just young but all technological species. Applying the POM to this expanded reference class results in the two conclusions of Paper I, and in particular that the typical technological species has a short lifetime of a few centuries to 4,000 years, depending on the assumed age distribution (semi-normal or uniform, respectively). Since this conclusion is based on the application of the POM to an expanded reference class it is not guaranteed to be correct, but it is nonetheless our best *assumption* in the absence of any contrary evidence. (What meager evidence that does exist, such as the Fermi Paradox and negative SETI results, is supportive and not contrary.) If this expanded application of the POM is not correct it means that we are atypical of the reference class of all technological species, possibility at a level of  $10^{-7}$ , or less depending on the assumed distribution of ages (Paper I).

A similar consideration could be applied to the 'first' argument. In the narrow reference class of technological species that are first on their planet, we are guaranteed to be typical, the POM is certain to be correct by definition of the reference class. Though this is true, it is not interesting. If we expand the reference class to include all technological species without regard to rank, the implication is definitely interesting but at the expense of some uncertainty. The POM is now an assumption and not a certainty.

Below I give five analogies that illustrate how it is possible to be a member of a more narrowly defined reference class and an expanded reference class simultaneously. The last several illustrations are most closely related to the current problem of interest in that they involve the distribution of ages in narrow and expanded reference classes, with membership in the narrowly defined class guaranteed by definition.

### Analogies

- Suppose you live in a small town completely isolated from the rest of the world and with no knowledge of the outside world. Are you a typical person in the narrow reference class of people in the town you live in? Is your pulse rate, body temperature, height, weight, age, walking speed, blood type, blood pressure, etc. collectively within the middle 95th percentile? Very likely. Now consider the expanded reference class that includes all people in the world. Are you also a typical member of this expanded reference class? Very likely.
- In the reference class of stars that are the most likely candidates to harbour a technological species our sun is typical, being located near the peak in the mass/luminosity distribution (Whitmire and Matese 2009), as also expected from the proper application of the POM. In the expanded reference class of all main sequence stars, the sun is marginally typical at the 95 percentile level in the mass/luminosity distribution (Robles *et al.* 2008).
- Consider the narrow reference class of children. We define this reference class as people of age 0–16 years. By definition, if your age falls within this bracket you are a member of the narrow reference class of children. Are you also a member of the expanded reference class of all people? For simplicity assume that the population age distribution is flat from age 0 to 80 yr and zero after that. Then the middle 95th percentile of all ages lies between 2 and 78 yr. Therefore,  $14/16 = 87.5\%$  of the narrow reference class is also a member of the expanded reference class.
- According to the World Health Organization, the definition of adolescence is ages 10–19 years (<https://www.britannica.com/science/adolescence>). If a person falls within this age bracket

they are a member of the narrow reference class of adolescents, by definition. Are they also a member of the expanded reference class of people of all ages? Yes, this age group lies within the middle 95th percentile of the US population distribution (<https://upload.wikimedia.org/wikipedia/commons/a/a7/USpop2010.svg>).

- Suppose you learned about the POM in college (from a tenured professor no doubt) and immediately applied it to yourself. For the purpose of this analogy, we assume that all college students are 18–22 years old. Are you a typical age in the narrow reference class of all college students? Yes, *by definition*. Now consider the expanded reference class of all people, not just college students. Is your age also typical in this expanded reference class? Yes, your age falls within the middle 95th percentile in the age distribution of the US and world population.

The latter analogies closely parallel the actual problem of interest. Our young technological species (age ~100 yr) is typical in age of other young technological species by definition, *no assumption required*. Are we typical in age (within the middle 95th percentile) of the expanded reference class of *all* technological species? The fundamental *assumption* of Paper I is – yes!

Admittedly, these analogies are chosen specifically to illustrate why the anthropic selection effect of our early status does not negate the application of the POM assumption to the expanded reference class of all technological species, as was done in Paper I. We might imagine other analogies in which the narrow reference class is not included in the middle 95th percentile of the expanded reference class (for example the narrow reference class of infants). Nonetheless, in the absence of any contrary evidence and having only a single datum, the POM is generally acknowledged to be the best assumption. This is true for any given reference class (for which we have no contrary evidence), including that of *all* technological species.

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