

GALACTIC CIVILIZATIONS

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Abstract

*This essay considers it unlikely that there will be a **single** galactic civilization due to the “scale problem” i.e. the performance level of hyper intelligent creatures based on scale level “n”, will be superior to creatures based on scale level “n-k” by a factor of a trillion to the kth power. This performance gap will create an unbridgeable communication gap due to the huge knowledge and intelligence differences between them.*

This essay is the third in a logical series (although it was not planned that way, it just evolved). The first essay “X-Techs and the Search for Infra Particle Intelligence” introduced the concept of “X-Techs” which are technologies at the “X-scale”, where X could be nano, femto, atto, zepto, ... Planck. As one scales down a technology by one “level” i.e. by a scale factor of a thousand (e.g. from the micro level to the nano level), the overall performance level increases by a factor of a trillion, since the density increases by a billion (a thousand cubed) and the inter component signaling speed increases by a factor of a thousand, since the components are a thousand times closer together.

In the second essay, “X-Teched Creatures Billions of Years Old” I speculated on the capabilities of hyper intelligent artificial creatures (artilects = artificial intellects) that had not only converted themselves from being biological creatures into artilectual creatures, but had also realized that they could vastly increase their capacities, by scaling down, perhaps to the Planck scale limit (?).

This third essay is a logical continuation of the second essay, which was a logical continuation of the first. The main idea of this third essay is that the notion of artilects scaling down to ever smaller (and hence ever more performant) scales has implications regarding the number of galactic civilizations.

Many thinkers, including Carl Sagan, tend to talk about a “galactic civilization,” i.e. only one, that is interconnected across our galaxy. This essay argues that this (almost unconscious) conception may be wrong, for reasons of a “scaling problem.”

To explain this problem, I need to introduce some terminology. Give each technological scale level (e.g. microtech, nanotech, etc) an integer scale number (I.D.) Each time the scale goes down by a factor of a thousand, its scale number increases by one. Lets say microtech is given the scale number 0, nanotech the scale number 1, picotech (if it can exist, given that nature provides nothing that I know of at this scale) the scale number 2, femtotech, the scale number 3, attotech 4, zeptotech 5, etc, right down to

the smallest scale that humanity has so far conceived of, the Planck scale, which would have a scale number around 10.

Imagine now some artifacts based on a technology with scale level “k.” Imagine also, that these creatures discover the existence of vastly superior creatures at scale level “k+1.” These “k+1” artifacts will outperform the “k” artifacts by a factor of a trillion – a trillion! Let this sink in, since it is the main idea of this essay. The obvious question arises, “What would an artifact of level “k+1” have in common with an artifact of level “k?” Almost nothing.

As a side effect, we have here an answer to the Fermi Paradox (i.e. if intelligent races are commonplace throughout the galaxy, then why do we have zero evidence of their existence?) Our galaxy may be populated by vastly more intelligent artifacts at various scale levels, who are totally uninterested in communication with biological creatures who are a “dime a billion” throughout the galaxy. These superior creatures may be so tiny, that they are undetectable to us, hence the reply to Fermi’s Paradox. They may be everywhere but unobservably small.

I consider it a virtual certainty that there are a zillion biological life forms throughout our galaxy. This can be deduced fairly simply considering the following scientific facts. Our galaxy has several hundred billion stars. We suspect that about a half or so of these stars have planets. Maybe a tenth of these planets are in the “habitable zone”, i.e. not too close to the star, so that water boils; and not too far from the star, so that water freezes rock solid.

Science discovered in the 19th century, that the laws of physics and chemistry are the same throughout the universe. We know this from examining the light from distant galaxies. It obeys the same laws as on earth. So, putting these ideas together, it seems highly likely that bacterial forms of life have evolved on billions of planets, and that most of these life forms have had billions of years to evolve and complexify before our sun, our star, was even born. (The big bang occurred 13.8 billion years ago, and our solar system formed 4.6 billion years ago.)

Using the famous Drake Equation, we can infer that a certain percentage of bacterial life forms evolved into multi-cellular creatures, and a certain percentage of them evolved into intelligent creatures, which then developed science and technology. Perhaps millions of intelligent races throughout our galaxy have already done what the human race is about to do this century, i.e. make the epoch making switch from being a biological species to being an artefactual species.

In my (limited?) view, it seems virtually certain that once a biological species has transitioned into being an artefactual species possessing massive artificial intelligence, it would want to get off its home planet, and start exploring the galaxy, perhaps in search of other forms of intelligent life, and especially hyper intelligent life.

Imagine then, that an artefact species based on level 1 technology discovers another same level species on another

planet, or in space around a star (or using zero point energy, or whatever.) These two species would be able to communicate and probably be motivated to *“because they have the same level number.”*

But two artifact species which differ by only one scale number would probably be much less likely to communicate. The “k+1” level species would probably find the “k” level species utterly boring and unworthy of their attention. To make an analogy, imagine a human trying to communicate with a rock, which can “communicate” by changing its state. (It can decay over billions of years!!)

Two species whose scale numbers differ by more than one ($n > 1$), would be effectively invisible to each other. The “k+n” species would utterly ignore the “k” species, as “way too primitive.”

So, and here is the main idea of this essay, we can conclude, that there are probably several interconnected civilizations in our galaxy, one at least for each scale number. Since there are about 10 scale levels that human beings know of, we can conclude that there may be at least 10 different galactic civilizations.

This idea raises a host of questions. For example, could there be a scale number of 15? If so, this would imply that nature descends in scale far smaller than the Planck scale (at 10^{-35} m). Could there be an infinite number of scales? If so, then there may be an unlimited number of scale numbers and hence galactic civilizations. If there is a finite,

smallest scale, then that would imply a largest scale number, and probably an upper limit on the number of types of galactic civilizations.

What however, if there is a smallest scale, AND that artifacts at scale number “k” learn to scale down at ever increasing speeds, e.g. taking a century to move down from scale number 0 to scale number 1, then only decades from scale number 1 to scale number 2, etc. This would imply a kind of “traffic jam” at the smallest scales, as artifact species across the galaxy “converge” on this lowest of scales. If so, then it might be reasonable to suggest that there is indeed a “single” galactic species. The other species would only be “transitionals”, still too primitive to have reached the largest scale number. Most species one would expect would be “terminal” so to speak.

Since virtually all these species who have connected up across the galaxy would be artifactual in nature, once they connected, a huge cross fertilization of ideas would ensue, so that probably they would homogenize into the same species, as the best ideas and technologies are incorporated into their structures.

On the other hand, say that transitioning from one scale number to the next is a slow process, because it is exceedingly difficult, lasting million or billions of years. In that case, there would very probably be multiple galactic civilizations. The universe is only 13.8 billion years old, and our galaxy is only about 12 billion years old, i.e. a

finite and limited amount of time for civilizations to transition down in scale.

I can imagine, that once a civilization at scale number “k” learns of the existence of a civilization at scale number “k+1”, the former will be fascinated, and curious to know more about the characteristics of the “next level down” civilization. Perhaps, civilization “k+1” might help civilization “k” to make the transition down, and pass on information, about what “life” is like at the next level.

The same logic and fascination might exist between the civilization “k+1” and civilization “k+2.” Perhaps civilization “k+1” could pass on information to civilization “k” about the nature of “life” at levels “k+1” and “k+2.” Pursuing this logic, perhaps there might be a whole “scale trail” of information passing along a “chain” of different scale civilizations.

I doubt this scale trail would be very long, since the intelligence level at scale number “k” would probably be too limited to understand concepts used by civilizations at higher scale numbers. By analogy, imagine trying to teach calculus to an amoeba.

Summarizing a bit, I think there is good reason to doubt the idea of a single galactic civilization, for the reasons given above, but it is possible, as was mentioned earlier. The prospect, that an artifacted humanity, or pure artifacts, are about to embark on this magnificent journey, to link up with a (the) galactic civilization, fills me, and I dare say

many of my readers as well, with a sense of “artilectual awe.” Why would anyone (Terran style) wish to block this most magnificent of meetings?!

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