Why Would ET Evolve Human-like Intelligence?

BY CHARLES LINEWEAVER

Human-like intelligence is not a convergent feature of evolution on Earth, so why should we expect to find extraterrestrials that can build radio telescopes?

Some SETI scientists with radio telescopes expect to find alien life forms with radio telescopes. Is this expectation reasonable? Many people think so.

When I taught a course called 'Are We Alone?' at the University of NSW, I invited half a dozen experts to discuss the Drake Equation and to defend their estimates for the number of civilisations in the Milky Way with whom we could communicate. Most of the invited experts assumed that once life got started it would get smarter and smarter and eventually would hit upon the idea of building a radio telescope. Most students also subscribed to this 'stupid-things-get-smarter' model of animal evolution and believed it to be a universal trend.

I call this idea the *Planet of the Apes* Hypothesis after the movie of that name. The film takes place in the future after a nuclear Armageddon has decimated *Homo sapiens*. The surviving humans have lost the ability to speak and have to forage in the wild. Meanwhile, three species of apes learn to speak English, ride horses, farm corn, shoot antique rifles, and in general begin to act like hairy Victorian humanoids with human-like intelligence. Three species of ape move into the recently emptied 'intelligence niche' and turn into the functional equivalent of humans. On the *Planet of the Apes*, human-like intelligence is so adaptive that it is a convergent feature of evolution – species are waiting in the wings to move into the limelight and occupy the intelligence niche.

Whether there is a trend in the fossil record, indicating that stupid things tend to get smarter, is an important and controversial issue. In one camp are the non-convergentists who, after studying the fossil record, insist that the series of events that led to human-like intelligence is not a trend but a quirky result of events that will never repeat themselves on Earth or anywhere else in the universe. In the other camp are the convergentists who believe that stupid things get smarter and that intelligence is a convergent feature of evolution here and elsewhere.

Evolution of Intelligence

The idea that evolution will inevitably produce increasingly intelligent creatures has some initial appeal. As Carl Sagan said: "Other things being equal, it is better to be smart than to be stupid, and an overall trend toward intelligence can be perceived in the fossil record". On the other hand, Ernst Mayr pointed out: "Among all the forms of life, neither the prokaryotes nor protists, fungi or plants has evolved smartness, as it should have if it were 'better'."

The 'overall trend' in the fossil record that Sagan refers to is worth considering more carefully.

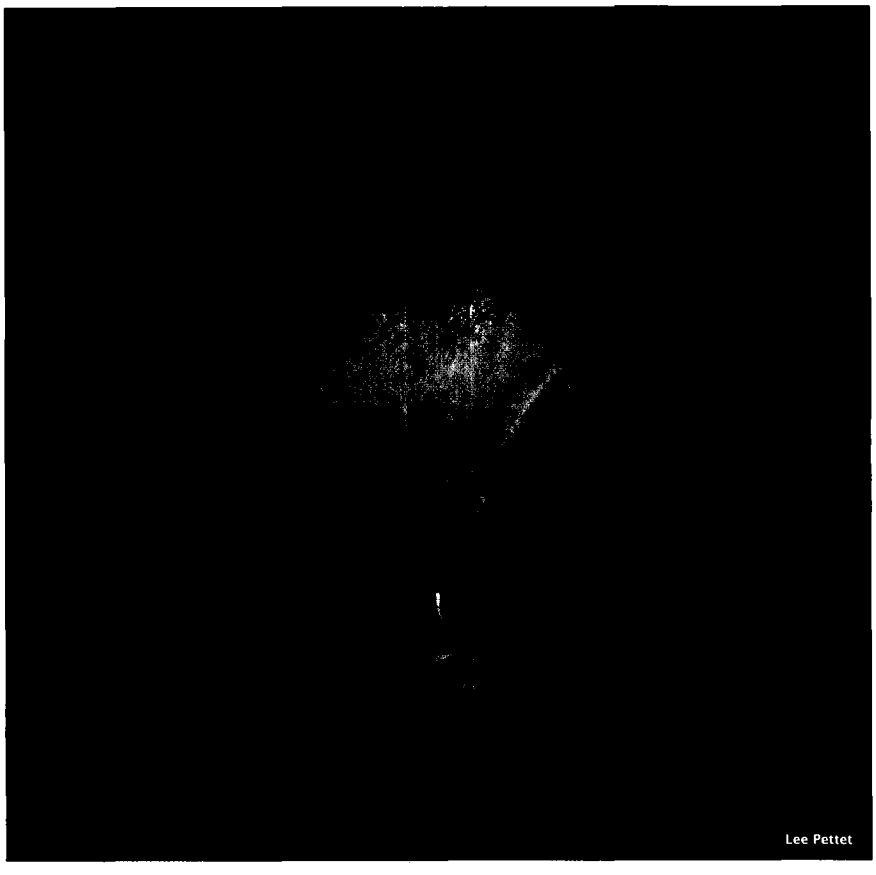
Palaeoneurologist Harry Jerison introduced the concept of an encephalisation quotient (EQ) – the ratio of brain weight to body weight – as the most objective way to compare the intelligence of different groups of encephalated animals. Increasing EQ in the fossil record has been considered a measure of increasing intelligence.

But there is a problem. A selection bias is embedded in the attempt to trace the evolutionary history of a particular feature (brain size) backward from a species that exhibits the most extreme version of that feature. The backward tracing of the development of any extreme feature will always show a trend toward that extreme.

If you were an elephant, you might be interested in nose size and whether there was a trend in the fossil record toward increasing nasalisation quotient (NQ). When you traced your evolution, you would find that your ancestors had smaller noses. You would discern a trend in NQ from lower vertebrates to palaeomastodons to mastodons to you, the pinnacle of nasality.

Tracing the encephalisation of our ancestors over time and finding a trend toward higher EQ is as meaningful as elephants finding a trend towards high nasalisation quotients. It is a foregone conclusion without meaning simply because you have chosen to examine your most extreme feature.

If you did put together a study of the evolution of a nasalisation quotient you would not only see a trend towards increasing nose size among the direct ancestors of the elephant, you would also see that some other creatures also evolved bigger noses. The aardvark and the tapir have comparatively large


Lee Pettet

NQs. Both evolved their large noses after the divergence of their evolutionary line from the elephant. That does not mean that a large nose was independently evolved in several lineages and is therefore a convergent feature of evolution.

The common ancestor of the aardvark and the elephant did not have a large nose, but it had a nose constructed and fine-tuned over ~500 million years of common evolutionary history. It had the same (or very similar) biochemical neural pathways and genetic plasticity and constraints that aardvarks and elephants are still endowed with. This 500 million year history produced a finite number of ways to adapt to environmental challenges. It is these limited choices that are largely responsible for the apparent convergence on large noses.

Similarly, the increasing EQ of birds, dolphins and ungulates/carnivores since they diverged from our lineage is not evidence of independent evolution of large brains. The common ancestor of dolphins and humans who lived ~85 million years ago had a head, a small brain and an approximately 500 million year common history of regulatory genes that tinkered with the characteristics of that brain.

EQ Is Not Sufficient

About 600 million years ago, two kinds of metazoans – protostomes and deuterostomes – diverged from each other. Both evolved separately for ~600 million years and were very successful. Today there are about a million species of protostomes and about 600,000 species of deuterostomes (of which we are one). We consider ourselves to be the smartest deuterostome while the most intelligent protostome is probably the octopus. After 600 million years of independent evolution and despite their big brains, octopi do not seem to be on the verge of building radio telescopes.

The dolphinoidea evolved a large EQ between ~60 million years ago and ~20 million years ago. Thus dolphins have had ~20 million years to build a radio telescope. They have not done so.

This strongly suggests that high EQ may not be a sufficient condition for the construction of radio telescopes. If you live underwater and have no hands, you may not be able to build, or be interested in building, a radio telescope no matter how high your EQ.

A Universal Intelligence Niche

Life has been evolving on this planet for approximately four billion years. If the *Planet of the Apes* Hypothesis is correct and there is an intelligence niche that we have only recently occupied, who occupied it two billion years ago, or one billion years ago or 500 million years ago, or 100 million years ago, or 10 million years ago? Stromatilites? Algae? Jellyfish? Raptors?

Sagan defines 'the functional equivalent of humans' so narrowly – creatures able to build and operate radio telescopes – that only one species on Earth belongs to it. It seems unreasonable to define intelligence so narrowly that only *Homo sapiens* have it on Earth (among the ~100 million species that have ever lived) and then look up at the stars and imagine that the human-like intelligence niche is so broad and generic that even life forms very different from ours (not sharing 3.5 billion years of evolution) would evolve into it.

Any given species that has evolved on Earth will have its closest relatives here on Earth. Thus, if we consider humans to be unique and alone on Earth, then humans are unique and alone in the Universe. We are more closely related to the life forms with whom we have shared 3.5 billion years of common ancestors than we will be with any alien evolved independently on another planet. Our closest relatives – genetically, physiologically and mentally – are here on this Earth.

If human-like intelligence were so useful we should see many independent examples of it in biology, and we could cite many creatures that had evolved on independent continents to inhabit the 'intelligence niche'. But we can't. There doesn't seem to be an intelligence niche, and human-like intelligence seems to be what its name implies: species-specific.

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