

## **Is AI the Next Phase in Evolution?**

*By Louise O Fresco in NRC, August 11, 2023*

An evolutionary perspective on artificial intelligence provides a counterbalance to the anxious concerns, writes Louise Fresco.

Everyone is familiar with some version of the cartoon of our lineage: in a few steps from an ape moving on four limbs, to a spear-wielding upright hominid, to a suit-clad office clerk. In some versions, the last step in that evolution is an elegant lady in high heels. In other cartoons, the endpoint is a humanoid figure made of steel and electrical wiring. The suggestion is clear: the robot is the endpoint of evolution, or rather, of the human species.

Until recently, this idea could be dismissed. After all, no matter how many functions robots and, more generally, computers and information networks can perform, they will never become human. At most, they are 'dumb' trained helpers for heavy and dangerous tasks, for example in mining, somewhat less 'dumb' work in elderly care and in the hospitality industry, and increasingly as 'smart' helpers in medical diagnostics and interventions. Most of these helpers are actually more or less rigid robotic arms aimed at a single specific task such as welding and surgical assistance or information provision. Yes, they can develop unexpected moves in chess and Go at a global level and beat the best players through sheer combinatorial powers, but that's about it.

But that is for ever in the past. The dizzying developments in computer sciences, from computers to self-learning artificial intelligence (AI) and large language models, have changed everything. They raise not only questions about their manageability. They also prompt thoughts about evolution itself. Could you draw the cartoon about our evolutionary lineage in such a way that not a bionic robot but a complex information network could be the last step? Put differently, will humans eventually disappear, and will artificial intelligence take over? Although biologically speaking, evolution has no endpoint and no hierarchy in which *Homo sapiens* (or any 'successor') would be at the top, it is not absurd to explore AI in the context of the evolution of life on Earth.

Opponents already speak of 'existential' risks, of the possible extinction of humans. Could we see AI as part of evolution? Is AI a human tool, like a printing press or a nuclear power plant, or an extension of ourselves (see the iPhone) or really 'something' radically different? And what is that something?

Life distinguishes animals and plants from inorganic materials like minerals. Biologically speaking, AI does not fit neatly into the definition of life. Life is characterized by manifestations of growth, reproduction, functionality, and

continuous change. AI does not involve genetics (DNA), cell structures, or metabolism as found in all life forms. There is no photosynthesis, as in plants. AI systems do not use oxygen (though many anaerobic organisms can also do without it).

But if you view AI and related fields as combined networks, they come close to some of the characteristics of life, albeit in a non-classical way. You could speak of an energy metabolism: electricity converted into heat and bits. AI systems also respond to external stimuli, from humans, but also from connected systems (e.g. a thermostat shutting down production). There is also a form of reproduction because AI systems can, in principle, replicate themselves and build new systems, including robots, and make improvements in subsequent generations. From an evolutionary perspective, one could argue that AI evolves through a form of natural selection. The best-adapted systems are continued. Adaptation then means, as in biology, greater survival chances, thus the greatest suitability for the circumstances (what Darwin called fitness). Machines or networks have no consciousness, regardless of what science fiction writers suggest. That is not a requirement for life either, consider bacteria which are unlikely to be conscious and have survived for billions of years. Moreover, AI networks powered by solar energy and based on biological, self-replicating organic molecules are a conceivable option in the future.

AI would not have existed without humans and cannot survive without humans for the time being. But forms of symbiosis between life forms are well known in nature, think of epiphytes like orchids. And viruses cannot survive without their host organisms. Without endosymbiosis, the uptake of whole bacteria into plant cells, there would be no chloroplasts and thus no photosynthesis. AI cannot do without us and we, it seems, can no longer do without AI and digital support. All in all, AI systems cannot be considered a biological species, but they may be seen as a group of defined identities that share some traits with living organisms.

There is a distant parallel with the rise of synthetic biology, from 2010, by Craig Venter, the father of the sequencing the human genome. He believed the creation of synthetic life was within reach by incorporating DNA sequences for specific functions into more or less artificial cells. This has been embraced by a small group of bio-hackers but has also led to years of prestigious IGEM competitions where international students build genetically modified machines. This development, too, was initiated by humans and can theoretically take its own direction. After initial resistance and legitimate ethical questions, it has become relatively quiet around synthetic biology.

Biological evolution is only one side of the story. Cultural evolution and human creativity make us human. AI can't match that, you hear all around. Chat-GPT, Bard, and the like are a diluted, parroted version of human thinking, incapable of the

original emotions that produce a Schubert sonata, let alone the transformative vision of cubism. But one might also wonder if algorithms might eventually make equally unexpected leaps, leaps that have not previously been considered. A digital meta-instruction code that enforces the unexpected, for example. Most likely, most of the results that follow will be uninteresting, but just as with human creativity, it is not impossible that a brilliant moment will occur.

But what about curiosity, the trait that characterizes countless species from bumblebees to hyenas and probably provides an evolutionary advantage (such as new sources of food)? Our individual survival no longer depends solely on having good genes and a favorable environment. Humans are able to accumulate and transfer knowledge intergenerationally, allowing each individual to theoretically benefit from all non-genetic innovations previously developed. Curiosity increases that knowledge. But nothing a priori prevents proto-intelligent systems like AI from exploring unknown paths, learning from all possible human and self-generated options.

We humans have designed AI systems. Our brain with its neural networks and our manual dexterity combined with chance and a favorable environment have enabled the development of tools over hundreds of millennia. Other animals also use tools, but the exceptional variety and refinement are uniquely human: from the piano to the nuclear bomb and ocular implants. AI systems have emerged as tools of humanity but can operate to a large extent as independent entities. In that sense, they are more than 'just' tools. Their further development could very well take place independently of us. Perhaps forms of AI are a logical semi-biological step in evolution. But much more interesting than the fear of self-programming computers and robots is how forms of cooperation develop between humans and information systems and machines.

After all, evolution is driven not only by natural selection and competition but also by cooperation between species. For now, we cannot consider AI systems as new life forms, but they have traits that make them more like life than inorganic material.

Darwin showed that evolution can lead to very complex adaptive systems, such as the eye, without any guidance from an outside Godlike force. Maybe we should also see AI that way. It is our task to seek conditions and opportunities for cooperation, in a distant parallel with how bacteria grew into chloroplasts and mitochondria, structures that proved essential for life on Earth. The potential for AI in science is enormous, especially if we add Darwinian selection mechanisms to it.

It's a nice twist in evolutionary unknown territory. Much is still speculation, but an evolutionary perspective provides a counterbalance to the anxious concerns in some

societal quarters, even if this means that in the long term we leave the Anthropocene; the era in which humans are the main force shaping the Earth.