

Alberta Doctors' Digest

Stardust, Darwin and time

Having left clinical practice, I find my interest has turned, or more properly has re-turned, to the wider panoply of biology. In particular I've come to better appreciate the observational genius of Charles Darwin. His work's been poked, prodded and modified but his evolutionary theory remains a supreme accomplishment in our understanding of the history of living things.

In [On the Origin of Species](#), he drew a schematic representing the tree of life, using it as a metaphor for the broad scope and branching nature of evolution over time. This schematic has been reproduced countless times in books and periodicals, except that for years the arborization of life, with one thing leading to another, has depicted man at the top of things, suggesting we're some sort of apical achievement.

While there's evidence galore regarding our remarkable species, including 20 or so hominid precursors, there's a lot not to like and we've come to realize – perhaps painfully – that we may only be another step in the process, with more to come. In general, the world post-Darwin teems with life, posing disturbing questions: Are we alone in the universe? Do we have brothers, sisters – anyone! – out there? The questions roll and roll around our heads. Heaven knows, we're looking.

I'm bewildered at the stuff we're shooting into space, or caching here and there hoping to communicate with a vagrant extraterrestrial. We draw stick figures, or pi, relating the diameter of a circle to its circumference, or other stuff derived from physics. I hear, too, that we've stashed a 3D printer somewhere out there. It's puzzling, and it seems to me that we're looking for ourselves, possibly smaller or larger, or a little greener, but nevertheless ourselves, or close approximations that might blink back across unfamiliar terrain, unfathomable distances.

Hubris – the Greek sin of excessive pride and even arrogance – may be the word most appropriate to our space-age anthropomorphism.

There's been a recent push to look for more mundane but promising harbingers of life, like water, or even to find so-called Goldilocks zones on a burgeoning number of planets. Not much else has happened so far. The hype about alternative or parallel universes only adds to our conviction: there's got to be life out there.

I'd say it remains a long shot, a very long shot.

If there is life out there, and if it is intelligent, given any usual sense of that word, I'd think it would want to avoid a globe teeming with warsome folk and imperialist tendencies. Two years ago Elon Musk's SpaceX firm sent a red [Tesla](#) into space with a mannequin called Starman at the wheel, complete with music too: David Bowie's *Space Oddity* playing on repeat. If this doesn't send would-be aliens packing, I don't know what will.

Rather, wearing my neo-biologist's hat, I'd argue that the time's not right for an intergalactic look-see and we're nuts to expect an alien but friendly tap on the shoulder anytime soon. If kids in the backseat of our cars ask, "Are we nearly there yet," we're likely to respond, "Yup, nearly there," but we may not even be close. We may be looking for novel intelligence in the wrong place. Perhaps we don't need to consider smarty-pants dolphins, chimps and elephants at all. Maybe there are promising sprouts of intelligence all around us, in places we never expected. Given the very long string of evolutionary time, there's promise of radical braininess here at home. Just give it time.

Consider [cephalopods](#), for instance, highly interesting creatures that include octopuses, cuttlefish and shrimp, animals that emerged in oceans some 400 million years ago, predating mammals by several hundred million years. Octopodes are quirky creatures with a flair for camouflage, but they're brilliant escape artists, able to traverse mazes and open containers from within and without. Their nervous systems are similar to our own with a central aggregate of nervous tissue near an esophagus, but they have linked ganglia running through eight limbs and, as such, are outfitted for both local and central control.

They can use tools, including their rigid "beaks" to open clamshells and, speaking of shells, they've been known to use discarded ones as mobile homes they can tote along with them. Creative octopuses have been known to climb from their tanks to cross floors and feed from other tanks, only to later return whence they started. They're strategists, too, and have been seen tapping shrimp on sides opposite them, propelling frightened shrimp into eight waiting arms. A demo that has impressed me regards two octopuses in adjacent water chambers separated by a glass partition. While octopus one opened a complicated jar, octopus two watched – and learned – and was able to implement the successful manoeuvres it had picked up by watching. Pretty impressive stuff.

Consider, on another front, the intelligence of [crows](#) who, along with ravens and jays, belong to the Corvidae family of birds. (A group of crows is called a "murder" of crows.) They're known to recognize individual human faces and can carry a grudge. They're tool users too, most commonly with twigs and branches to dig out grubs and insects from trees. In Aesop's *Fable of the Crow and the Pitcher*, a thirsty crow drops objects into a water jug to raise the water level and, fable aside, they've been observed doing just that. They're in good company here, since children understand displacement too, but only once they're five to seven years old.

Crows are known to hide food. If they suspect someone is watching, they'll use subterfuge to move it elsewhere. They can solve multi-step problems and understand abstract analogies too, pairing objects with notional relationships to each other such as a square and a circle – all this with a brain lacking a neocortex and smaller than a fingertip.

If the braininess of octopodes and ravens fails to impress, consider certain plants, particularly the mimosa. Native to parts of Central and South America, the mimosa plant is small, with paired leaflets along each stem. Touch one of the leaves and – presto! – the entire plant folds its leaves.

Several hundred years ago, French botanist [Rene-Louiche Desfontaines](#) was astonished at this reactivity and carried a plant round Paris in his carriage, showing others. This happened at a time, it must be remembered, when the prevailing Aristotelian view of plants regarded them as barely alive. Touch-sensitive and insectivorous plants and their ability to move quickly, have been long regarded as truly enigmatic.

In 2013, Stefan Mancuso and [Monica Gagliano](#), working at the University of Florence, sought to replicate Desfontaines's findings. Mancuso developed a means of testing mimosas, with a controlled 15 centimeter fall onto a padded surface. As expected, on falling each mimosa folded its leaves, not learning from its fall, at least not right away. Plants recovered after this, but responded in like fashion to a fall later in the day. On repeated drops at five to 10 second intervals, the mimosas seemed to figure things out, however, no longer closing their leaves.

Gagliano let her plants rest three days and repeated her experiments. In her words⁶:

“Like seasoned little base jumpers, these plants continued to disregard the drops as they had learned during their training, and by ignoring it now, they were showing me they could remember the drop flawlessly ... They had the facility of memory and their behavior was not hardwired in DNA but learned.”

The notion of plant memory has been slow to gain acceptance but workers have found that drought, temperature extremes, excessive salinity and herbivore attack can all elicit responses that we would regard as memory. Just where memory resides in plants is unknown but would seem to involve calcium channels and hormones. Whether all plants have memory is as well unknown, but reasonable, given all organisms' common needs for nutrition, habitat and survival sufficient for reproduction.

I think that in our search for intelligent, unexpected life we may miss out if we don't look in our own backyards. Evolution, as biologist [Stephen Jay Gould](#) would remind us, is both quirky and contingent. Given enough time, anything can happen, and one day it may behoove us to place some other being at the top of our refurbished tree-of-life diagrams.

It may all happen close to home.

Editor's note: The views, perspectives and opinions in this article are solely the author's and do not necessarily represent those of the AMA.

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