SIX INCIDENTS OF EVOLUTION USING TIME TRAVEL

Derek Künsken

After leaving molecular biology, Derek Künsken worked with street kids in Central America before finding himself a diplomat in the Canadian foreign service. He now writes SF in Gatineau, Québec. His short fiction has appeared in *Beneath Ceaseless Skies, Analog, Clarkesworld,* and *Asimov's,* as well as several year's best anthologies. He has two space opera series, beginning with *The Quantum Magician* and *The House of Styx* published by Solaris. Critic Rich Horton describes him "as one of the best pure 'hard science' writers of the current generation." Derek makes his internet home at https://derekkunsken.com/index.html, tweets from @derekkunsken, and is currently welcoming a newborn son into his life. We're not sure if his earliest career path contributed to his intriguing examination of . . .

SIX INCIDENTS OF EVOLUTION USING TIME TRAVEL

Life is irrepressible. It evolves around threats and setbacks, driving through errors, throwing the dice on new fields and oceans, seeking to live just moments more. Life's vigor seemed so intentional in science's early days that natural philosophers conceived a fiery spark the French called the *élan vital* that imposed an axis upon the world, thrusting toward greater complexity. Although this *élan* does not exist, life acts as if it does, eroding every obstacle and coopting complex systems, patiently, relentlessly, through the millennia and eons.

* * *

I

The lancet liver fluke is a parasitic worm that needs a vector to carry it from its snail host to its mammalian host, so the larval parasite is excreted by the snail to be eaten by an ant. Once inside the ant, the parasite moves to the brain and changes the host's behavior, forcing the ant to climb to the top of a blade of grass, so that it will be eaten by a grazing mammal.

Similarly, the trantus worm is a behavior-altering parasite that infects many intelligent species of the Galaxy. Hard-wired into their extremely large genomes is information on how to build time travel devices. No one knows what evolutionary pressures caused this knowledge to nestle among the Trantus genes. When the parasite's population reaches a certain density in the host's brain, the gene is triggered, rewiring neural pathways to inscribe new, never-experienced memories in the host.

Some species perceive these new understandings as a kind of religious revelation. Others experience the information as stirring dreams or hounding nightmares. Yet others interpret these new thoughts as breakthroughs within existing theories of physics, cosmology, or engineering, epiphanies from which legends of genius are woven.

Regardless of how they conceptualize this new knowledge, they build time travel devices. The parasites catalyze new kinds of intelligence, faster thinking, broader reasoning, sometimes with a more technical flourish, sometimes with a more artistic color. The motivation may feel feverish and inspirational, tipping into the charismatic or cultish in recruiting other infected intellects. *In extremis*, major distortions in the politics and structures of civilizations have been observed in host species, and few know that this is all driven by the impelling vigor of the parasites.

Depending on the genotype of the parasite, their DNA may encode a temporal Einstein-Rosen bridge, or a teleportation device, or a tachyon engine, or some kind of wheeled time machine. The construction may take months or decades. Larger and more complex time machines take centuries. No matter. The parasites are patient, and time is a construct whose scale varies by species.

When the time machines work, the pilots journey through the centuries, millennia, and sometimes eons, to early metal-poor stellar nurseries or to epochs after the extinguishing of the stars. All eras contain new worlds, and where those worlds harbor intelligent life, the parasites infect new hosts, the fiery vitality of their influence birthing new ways of thinking in these ages.

And where the parasites encounter unintelligent life, they trigger mutations in their hosts, increasing the neural complexity, birthing cognition. Whenever some new host develops an improvement in a time machine, the parasites record these innovations to carry into their next infection cycle. When the time machines have served their purpose of transporting the parasites to new ecosystems, they're left where they fall, like eggshells or cocoon casings, of no further interest to parasites or host.

Sometimes, the time machine designs hard-coded into DNA do not work. The passage of time can introduce errors into mutable DNA. Those parasites spread no more and die off, leaving their hosts bewildered by the passions and drives that gripped them for years, to reflect on the indelible changes and the weird echoes of speciating dreams.

The most important part to remember, though, is this: neither parasite nor host could have leapt the centuries and millennia alone. An infection by a trantus worm is a spark of inspiration, a compelling need to act, a fiery muse that urges change. The increase in intelligence and the foothold on new worlds and in new eras have sparked new civilizations like the rock-sculptors of Mercury, the x-ray feeding colonies orbiting along the edge of the event horizon of Sagittarius A*, the singing leviathans of Kappa Andromedae b, and the uploaded networked matrioshka brains of Adhara. Although

the relationship is parasitical by the strictest definition, measured across the generations, the host, evolved and grown by another, is much the beneficiary.

* * *

II

In Darwin's time, the Galapagos Islands had thirteen species of finches. The world today counts over two hundred. But though they are many species, they are all finches. Similarly, there is a group of alien intelligences, some species of which are called the Qualiel Prime, and others the Ifnila, among many other names. They are all descended from an ancestral Qualiel Base subtype that had a natural affinity for finding temporal phenomena, which to their minds appear beautiful and good.

Armed with genetic technology, they began to engineer the senses of their unborn children to better find time machines and the temporal fractures they leave in the Galaxy. Over the centuries, they erected art forms and religions around the time travel devices they found, and raised temples and monuments to honor them. These were not individual projects of passion, but the marshaling of population-scale expression, from mobilized armies of workers to children donating their festival treats.

Some time machines they found were built by parasitized intelligences, overgrown and abandoned. They discovered Tipler cylinders, negative energy portals, faster-than-light rockets, tachyon telephones, and temporally displaced space-time bridges. They mended and refurbished these cosmic artifacts, raising cathedrals and museums and universities around them, as they continued to evolve themselves. Generation after generation, their senses became more acute, until their eyes could see the tiny fissures in space-time itself, the footprints of time travel, which they lovingly framed in lattices of diamond, light, and antimatter.

The early species of the Qualiel colonized the eras using the time machines, establishing new species of themselves in new millennia, building their reliquaries and observatories and museums. The end points of many time machine journeys were hostile environments, whether it was the dim red stars at the end of their trillion-year lifespans, or the early primordial era when the Universe first became transparent, or the radiation baths around the hypernovae lighting the cosmos before galaxies had formed.

Rather than flee these hostile eras, the descendant species continued to engineer themselves, adapting to live near the heat death of the Universe or the supernovae of the early stelliferous period. They did this because they loved the time machines, not just in all their variety, but in the twisted, vibrant concept of them, the ridiculous, illogical, paradoxical proof that their Universe had hidden mysteries for those who sought them. Their appreciation for this type of beauty was written into their genes, and as they spread far and wide, so too did the concept of beauty itself.

* * *

III

The Qualiel and their descendant species are not the only ones who have found time travel devices. Some vanished species in the far future, already adept at manipulating space-time structures with strange matter tools, found wormhole time travel portals. Like magpies collecting shiny pieces of tin foil and bottle caps, these collectors assembled portals at a humble world. As if lining a nest, they hung these time portals like tapestries on the walls of their subterranean warrens, each one opening onto another across the centuries. Whatever the species had been, the forgotten curators evolved

and departed or, satisfied with their time in this life, contentedly went extinct.

Their nest was later found by two warring factions of a species called the Tutan, who appreciated the military implications of a honeycomb of time travel portals. Rival infantry units hustled through them, mapping directions in time and space, identifying chokepoints and strategic clusters in the vast network, reinforcing those they held, capturing those they did not. So powerful was the ability to strike at an enemy in the past or to rewrite a loss, that both sides abandoned their previous territories to fight their war exclusively in the tunneled subsurface galleries.

Their abandoned former territories recovered from poisons and explosives, greening with life again, while the warring fractions began to change in the dark. Rewriting history is essentially a computational process governed by the rules of information theory. Rewriting a binary bit in computer memory takes energy and releases waste heat. Replacing a whole event in history, like a battle, takes a great deal of energy and releases an enormous amount of waste heat. As each faction did this over and over, through the various laneways and paths of the honeycombed time portals, the little world they occupied began to heat.

Soon the world became so hot that each faction held councils of their senior officers to decide whether to negotiate for peace or not. Some officers wanted peace talks. Others decided to genetically engineer their proteins to not denature in the heat, giving them one last chance to strike so as to begin negotiations from a stronger position. When these last attacks were done, the planet had heated so much that the officers arguing for peace had expired. Only those engineered to endure more heat lived to argue in subsequent officer councils.

And so it went. In the complex, chaotic war through a maze of time portals, each side co-evolved, each being selected for heat resistance and for their willingness to fight on. Those warring factions are still fighting now, and their new world throbs with heat, radiating a sullen red glow into space. The factions have lost the ability to see each other as people and cannot even conceive of the idea of speaking with the other. From time to time in their tunnels, they run across earlier generations of themselves, sweltering in suits to protect them from the heat, but they do not recognize what they used to be. War is a closed loop in time, possessing a kind of sterile vitality.

* * *

IV

Only when there is some symmetry in the struggle do we call it *war*. Most confrontations in nature are asymmetric: the prey flees the predator because when the predator wins, they win the present and future all at once. A peculiar vacuum-living life form called the skates, named for their flat triangular bodies, are prey to the shaghal. The skates live and grow on asteroids orbiting pulsars, powering themselves on the microwaves of these dead stars in imitation of photosynthesis. Their hives move from asteroid to asteroid, jetting on compressed gasses they find among their scratching and foraging in the regolith. They are peaceful, communal, and very good at camouflaging themselves.

However, as the elliptical orbit of the asteroids approaches the pulsar, the predatory shaghal, which need more energy, are hatched, hungering. The skates flee; some hide. Many more are caught and consumed, their minerals nourishing their killers. A very few of the most vital and ambitious try something very difficult and very dangerous. These few fly closer and closer to the pulsing neutron star, nearer than any of the asteroids, delaying their thrust, even as the shaghal chase them closer and closer. And finally, at the closest approach, when the gravity of the pulsar is ready to

crush them to powder, the skates thrust. The dead star's mass slingshots them to such terrific speeds that time slows down for them, until every beat of their silicon hearts lasts weeks.

At relativistic speeds, the skates see the stars ahead shifting brighter and bluer. Stars that were faint or invisible before blue-shift shimmer into visibility, guiding them onward, like a hidden map. The shaghal, who cannot approach the pulsar as closely, fall far behind, years behind.

The skates did not set out to travel through time, any more than migratory birds or fish have intention. They did not invent this time travel, nor do they even completely understand that this is what they are doing. The will to live, the aching desire to find safety and a better life for themselves and their offspring, drives them.

* * *

V

The proportion of males to females in a population is optimized for many species, and can change with environmental conditions. The sex of many turtles, crocodiles, and alligators is determined by the incubation temperature of the eggs. Clownfish schools are led by one large female, and when she dies, the largest male becomes a female to take her place.

The Plothus are an insectoid species native to the triple star system of HD 131399. Their sex is determined by the temperature of their world, which undergoes wild environmental swings that can badly skew the male-to-female ratio.

This can be corrected. If the population has many males, the cocooning larvae will have been exposed to large quantities of male pheromones, which causes the males to metamorphose into females. If the population has few males, the lack of exposure to male pheromones causes the females to metamorphose to male. This process, however, is slow, and the Plothus population can sometimes drop close to extinction-level before the proportions are corrected.

However, some centuries ago, a Trantus parasite left a functional time machine there that would send creatures back in time one year. Now, when the chaotic triple stars swing the planet into a decades-long winter, some Plothus larvae risk going through to the past, seeking better climates, and thereby insert gender balancing into the past. Since the arrival of this time machine to their homeworld, the Plothus population has been steadied by this negative feedback loop through time.

* * *

VI

It is precisely the subtlety of moving information through time that defines a rare intelligent species of plant. Sometime in their prehistory, this species of cold-living, slow-moving vegetable intelligence happened to grow in the vicinity of a small time portal. This portal was unimpressive. It opened eleven years in its own past and cannot transmit anything larger than a pollen grain.

However, the faint air pressure is slightly higher in the present than in the past, so a gentle wind moves through the portal, backward in time. As decades passed, the gasping wind carries pollen from the vegetable intelligences back in time eleven years, where it fertilizes eggs, to produce seeds of parents from different times.

This would be a relatively banal use of time travel, except that their world circled

a red dwarf star, whose luminosity varied, generating wild environmental shifts, including solar flares that could temporarily melt the deep layers of ice, submerging the plants. Without any idea of what the environment of the next generation would be, the future was dangerous and frightening for these intelligent plants. Their large genomes code for plant forms to survive almost any climactic shift, but changing from one form to another is slow and difficult.

So natural selection acts through time travel. The plants that survived to maturity in the present, by definition, were suited to that environment, and transmitted the most pollen backward in time, genetically guiding ancestor seeds to success in the present. The intelligent plants alive eleven years in the future send their pollen to the present, giving the plants today eleven years to prepare for tomorrow. Generation after generation of these peaceful vegetable intelligences is given warning of the wild climactic swings of their unstable star.

This is not the most remarkable quality of these vegetable intelligences, however. Their modest time portal cannot pass true thoughts nor ideas back in time, but the vicissitudes of life write kinds of experience onto DNA as epigenetic tags. So those pollinated in the past are gifted with impressions and dreams of the future, the kind that give hope, the kind that help them struggle against the obstacles and dangers of their world. And through those dreams of the future, they can find the strength to push forward.

* * *

Life is irrepressible, vigorous, tireless. Life changes shape to adapt to new challenges. Life takes risks, tries and fails, and rises again, sometimes genuinely learning from its failures, but often simply throwing itself at an obstacle like an invading army, until some combination of chance unlocks the next step. Life has colonized every environment; geography is no barrier. Time travel, thought to be an impassable bastion, a wall erected by the laws of physics, has turned out to be no more forbidding to life than another mountain range or surging river, to be grown around, flown over, tunneled through.