Futures

An update on the Copernican principle

There's good news, and there's … By J. W. Armstrong

ILLUSTRATION BY JACEY

Despite what you may have read, machines have always had personalities. My first car, for instance, exemplified 'lazy'. And all the computers I've ever used have had varying degrees of 'bad attitude'.

Unsurprisingly, things got more nuanced when machines became sentient.

I led the project that created the first truly intelligent machines (the media dubbed them 'Minds'). The Minds don't really have 'bad attitudes'. At least, not exactly. Their personalities do, however, tend towards 'eccentric'.

In any case, they are powerful intellects, profoundly more capable than humans. We gave them broad authority to solve problems, abstract and practical, requiring only that they strive to improve humanity's lot.

As the project's leader, I was not particularly surprised when Mind1, the first of the AIs, requested a holoconference. We linked into a virtual reality patterned after a larger version of my office. A Mind necessarily presents itself via avatar. Today, Mind1 was a holographic 5-metre-long fire-breathing dragon – a disturbing mix of something from Chinese mythology and Puff the Magic Dragon's evil twin. For the occasion, Mind1 had also affected the name Queequeg, suggesting I call it Q for short. I decided to ignore the literary reference.

Q spoke first. "You're wondering why I asked for this meeting."

I grunted noncommittally.

Q snorted, as delicately as a fire-breathing dragon can, and continued. "I have important information and wanted you to be the first human to know." Smoke wafted gently from Q's nostrils as it blew three perfect smoke rings. "There's good news and bad news." It paused, waiting for my response.

I was annoyed. However, I've had enough experience with Minds to know this could go on forever unless I played the game. "OK. Good news/bad news. What have you got?"

Q seemed offended that I was trying to hurry things. It asked, "Which would you like first? The good news or the bad news?"

I sighed. "The good news."

Q brightened now that I was playing along. "You've noticed our recent interest in astronomy." Indeed, I had. Resource allocation was within AI purview but, without explanation, the Minds had directed massive effort towards astronomical research. "The good news is that our work has paid off in multiple ways … one of which is that we've discovered extraterrestrial intelligence."

I almost fell out of my virtual chair. Before I could respond, Q continued. "The evidence was obvious, really. Human-led searches were for beings technologically comparable to you – and used techniques and strategies that made sense to a three-pound organic brain. If you broaden parameter space, you get a different perspective. I've sent you a full report …" I looked down at my virtual desk; I had just received a large file. "… but the summary is this." Q started lecturing in an irritating

quasi-professorial way. "Communication involves signal, noise and data rate." It paused and asked, "What signal is easily detectable, above the noise, across galactic distances?"

My mind was racing, thinking about the consequences of the discovery. I wasn't in the mood for a dialogue on communication theory and told Q this. Q seemed hurt, but continued. "Answer: light from a star. But simple detectability is not sufficient. Communication requires bandwidth — information-carrying variability encoded onto a detectable signal. Many stars are naturally variable, of course; but natural variability reflects stellar physics, not intelligent communication."

Q looked down and buffed the talons of its right foreclaw against its chest. If this was intended to project modesty it failed. "Our insight was to recognize that some variable stars — notably some Cepheid variables — are intentionally phase-modulated. ET uses natural stellar variability as a 'carrier wave' and then imposes information on it — just as humans do with radio. The data rate is low, a few bits per week, but the modulation is unquestionably of intelligent origin. These must be very advanced beings, indeed."

Q waited to see how I might react. When I said nothing, it continued.

"We've combined archival data with new sky surveys. Relatively few Cepheids exhibit intelligent modulation. Only those in the direction of" … Q rattled off celestial coordinates that meant nothing to me … "show such signals. How ET accomplishes the modulation is not clear. Varying stellar core temperature with neutrino beams? Manipulating helium opacity in the outer envelope? We have theories but we don't know. We've been working to decode the messages, with only one success so far."

Q paused. I had recovered and gone into problem-solving mode. The political leadership must be informed. I needed to study Q's report. We must meet again then for questions.

The dragon nodded. "Of course. Questions when you're ready."

This seemed to end the meeting. Q went for a dramatic exit: dematerializing sequentially, Cheshire Cat style, starting with its tail.

Then I remembered. "Wait. You said there was bad news."

Q's avatar had almost completely disappeared; only a translucent dragon's head with glowing red eyes was still visible. "Ah. That part. We've mapped the volume of space containing modulated Cepheids. Its boundary — the boundary of ET's domain — is expanding at a substantial fraction of lightspeed. Soon enough, its near edge will reach Earth. And the only message we've been able to decipher so far is …"

I had a sick feeling and interrupted. "'Resistance is futile'?"

The dragon shook its head and blew a final smoke ring as it disappeared. "Not exactly. The message, perpetually repeated, is: 'But wait, there's more!'"

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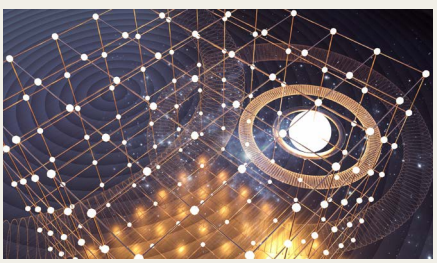
THE STORY BEHIND THE STORY

J. W. Armstrong reveals the inspiration behind *An update on the Copernican principle*



The first draft of this story was the transcript of a dream. In that dream, the Minds had made two separate SETI detections, one from organic beings and the other from machine intelligences, leading to two intertwined story evolutions. The Minds were not playful and not benign. There was a tangential ramble about the Fermi paradox. It was relevant that Mind1 had adopted the name Queequeg. The ending was grim.

It was too long, too dark, and too convolved. I put it aside.

I intermittently returned to it, however, to simplify and shorten. Through these iterations Mind1 stayed Q (Mind1 had, early on, established itself in my consciousness as Queequeg, despite the irrelevance for later versions). The narrative also became more upbeat, with darker thoughts reserved for another time.

The idea of using modulated starlight for interstellar communication is, of course, not original. For this story I was influenced by Learned, Kudritzki, Pakvasa and Zee's preprint 'The Cepheid Galactic Internet' (https://arxiv.org/abs/0809.0339).

I sent a near-final draft to my brother asking for his comment. He had several valuable inputs, one of which was that he didn't like how that version ended. He proposed the current ending — I liked his ending better, too — and declined co-authorship. I lightly modified the rest of the story to reflect this version of first contact.