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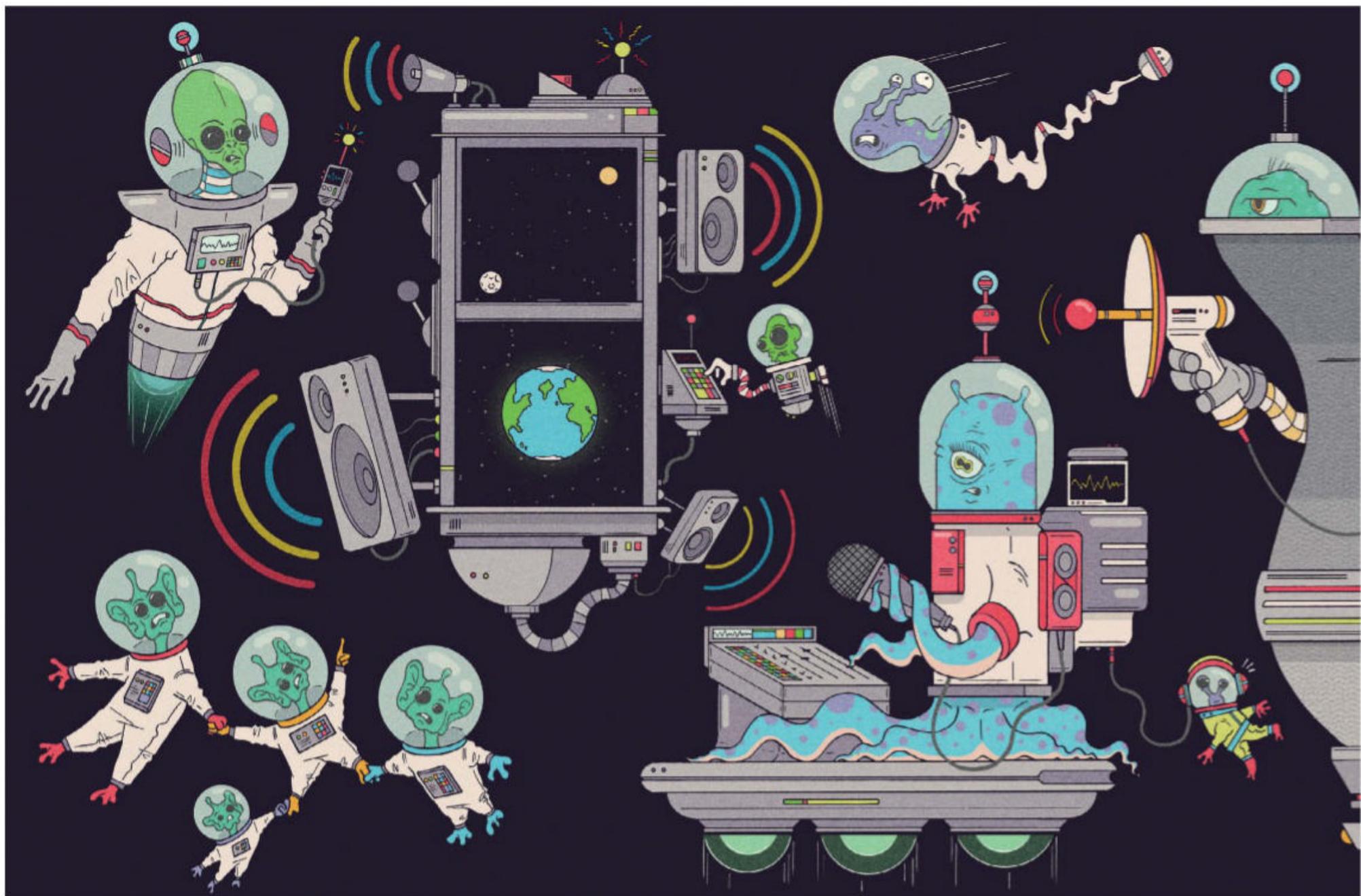
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KYLE ELLINGSON

Hello, space alien

We have been sending messages to other galaxies for decades. What are we trying to say, asks **Abigail Beall**

WHEN Jonathan Jiang was a child, his father told him about a group of astronomers using a huge telescope to send a message into space, in the hope that aliens in some far-flung galaxy would hear it. “They shouldn’t do that,” Jiang remembers his dad saying. “The contents should be approved by the citizens of the Earth.”

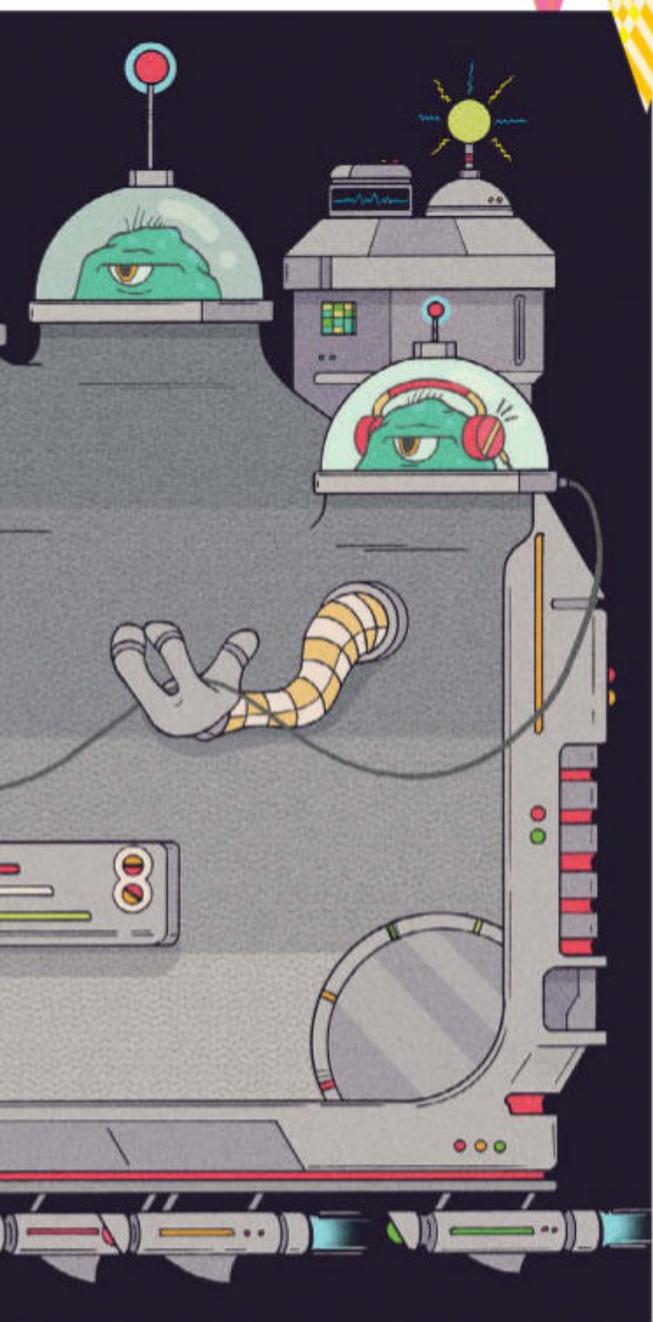
The message, broadcast in 1974 from the Arecibo Telescope in Puerto Rico, was headed for a cluster of stars in a galaxy

called Messier 13, or M13. It will arrive in just under 25,000 years – though, of course, we don’t actually know if there are aliens there.

What we do know is that most stars in our galaxy host planets, and that many of these are potentially habitable. This means there is a chance that at least one of those billions of planets is home to intelligent life. Those odds are sufficient to suggest we should try to say hello. Or at least that is the rationale for sending targeted radio signals into space.

Over the past few decades, we have broadcast a mixed bag of signals, ranging from serious attempts to communicate with extraterrestrial civilisations to accidental broadcasts and daft publicity stunts. Put together, it makes for a slightly odd representation of us Earthlings. Given how much more we now know about the cosmos beyond our solar system, astronomers like Jiang, who works at NASA’s Jet Propulsion Lab in Pasadena, California, think it is time we beamed a new postcard to the stars.

You could say we have been broadcasting our presence to space since commercial radio began in the 1920s. Radio messages are sent in a particular direction, but they tend to be sent in large beams, which leak out into the universe. They travel at the speed of light, which means one of the first signals any intelligent life within 100 light years of Earth could have heard is the results of the 1920 US presidential election broadcast by a manufacturing company in



“After a few drinks, a pair of astronomers fired off the word ‘cheers’”

If there is intelligent life there to receive it, they will be faced with 73 lines of binary code, each with 23 characters. Decoded, it amounts to a grid of squares depicting the double helix of DNA above a stick drawing of a human and some numbers, including 4 billion, which was the human population at the time. There was also a map of the solar system, with Earth to one side, and a depiction of the Arecibo telescope. The idea was that any aliens able to receive the message could understand a bit about Earth and the intelligent life there.

The messages we have sent since have been more haphazard. In 1983, after a few drinks, a pair of astronomers at the University of Tokyo, Hisashi Hirabayashi and Masaki Morimoto, fired off a message that included the chemical symbol for ethanol and the word “cheers” in the direction of the star Altair. It is unlikely to have made its way to intelligent life, says Hirabayashi. “I don’t think that the signal was received.”

Klingon opera

Then came a barrage of cultural and commercial morsels. In 2008, NASA transmitted the song *Across the Universe* by The Beatles towards Polaris, also known as the North Star, while the University of Leicester in the UK worked with crisp brand Doritos to send a 30-second advert towards the constellation Ursa Major. That same year, a high-powered radio signal was sent towards Gliese 581c, a star 20 light years away that is known to have a super-Earth planet orbiting it. This signal contained 501 messages, each selected through a competition on the now defunct social network Bebo. In 2010, a Klingon opera was beamed towards Arcturus, the brightest star in the constellation Boötes.

All of which was a bit of fun and would arguably offer a reasonable, if decidedly partial, insight into Western civilisation – pop music, junk food, social media. But if we are serious about reaching out to possible extraterrestrial civilisations, we can surely do better.

That is certainly Jiang’s feeling. He has been working with colleagues around the world to

create an updated version of the Arecibo message that would be easier for aliens to decipher. It uses observations about the universe around us, assuming aliens would also observe the cosmos. To let them know where the signal is coming from, for example, the researchers created a map of the Milky Way using bright, tightly packed groups of stars called globular clusters as coordinates. To give an idea of the concept of time, they created a measure of time based on the frequency of a hydrogen atom and used the cosmic microwave background, the leftover radiation from the big bang, as the clock’s first tick.

The Pioneer plaques, a pair of engraved plaques sent out into space attached to both the Pioneer 10 and Pioneer 11 spacecraft, included a man waving while a woman was just standing by. In the updated Arecibo message, both a man and a woman are raising their hands. “We want it to reflect the equity of man and woman,” says Jiang. Like the original communication, the updated message shows the structure of DNA, but it also includes a map of Earth, showing the molecules in our land, oceans and air. It ends with a return address, which shows the position of Earth within the globular cluster and a time stamp of when the signal was sent. “We want them to reply,” says Jiang.

Then again, many astronomers wonder if we should be sending signals at all. “We know very little about what’s out there, and nothing about our universe’s other inhabitants,” says Werthmer. At a meeting 15 years ago, 98 per cent of 200 astronomers surveyed said messaging extraterrestrial life was potentially dangerous. If aliens learned that Earth contained an element they needed, would they decide to grind our planet to dust to access it? “We should be listening at first,” says Werthmer, “learning more about the universe and its inhabitants.”

Jiang and his colleagues published the final draft of their message in March 2022, but there are no plans to broadcast it yet. In principle, anyone with access to a powerful radio telescope could send it out. Ultimately, however, Jiang says that anyone thinking about broadcasting to alien civilisations should first consult the United Nations. Just as his father told him all those years ago, “it is not one group’s statement, or even one country’s”, he says. “It has to truly represent the citizens of the Earth.” ■



Abigail Beall is shouting into the void

Pittsburgh, Pennsylvania. By the 1950s, TV was also leaking out into the cosmos. “Our early TV shows have so far gone past about 10,000 stars,” says Dan Werthimer, a radio astronomer at the University of California, Berkeley. “The nearby stars have seen *The Simpsons*.”

In 1962, Soviet scientists deliberately transmitted three words, in Morse code, towards Venus: *mir*, which means peace in Russian, “Lenin” and “USSR”. The next attempt, the one Jiang heard about as a child, was more ambitious. In 1974, astronomers led by Frank Drake at the Green Bank Observatory in West Virginia sent the first deliberate transmission to declare our presence to an alien civilisation from the Arecibo radio telescope. Known as the Arecibo message, it was directed towards M13, which contains 300,000 stars and, astronomers guessed, at least as many planets. “At the time, the only planets we knew of were in the solar system,” says Jiang.