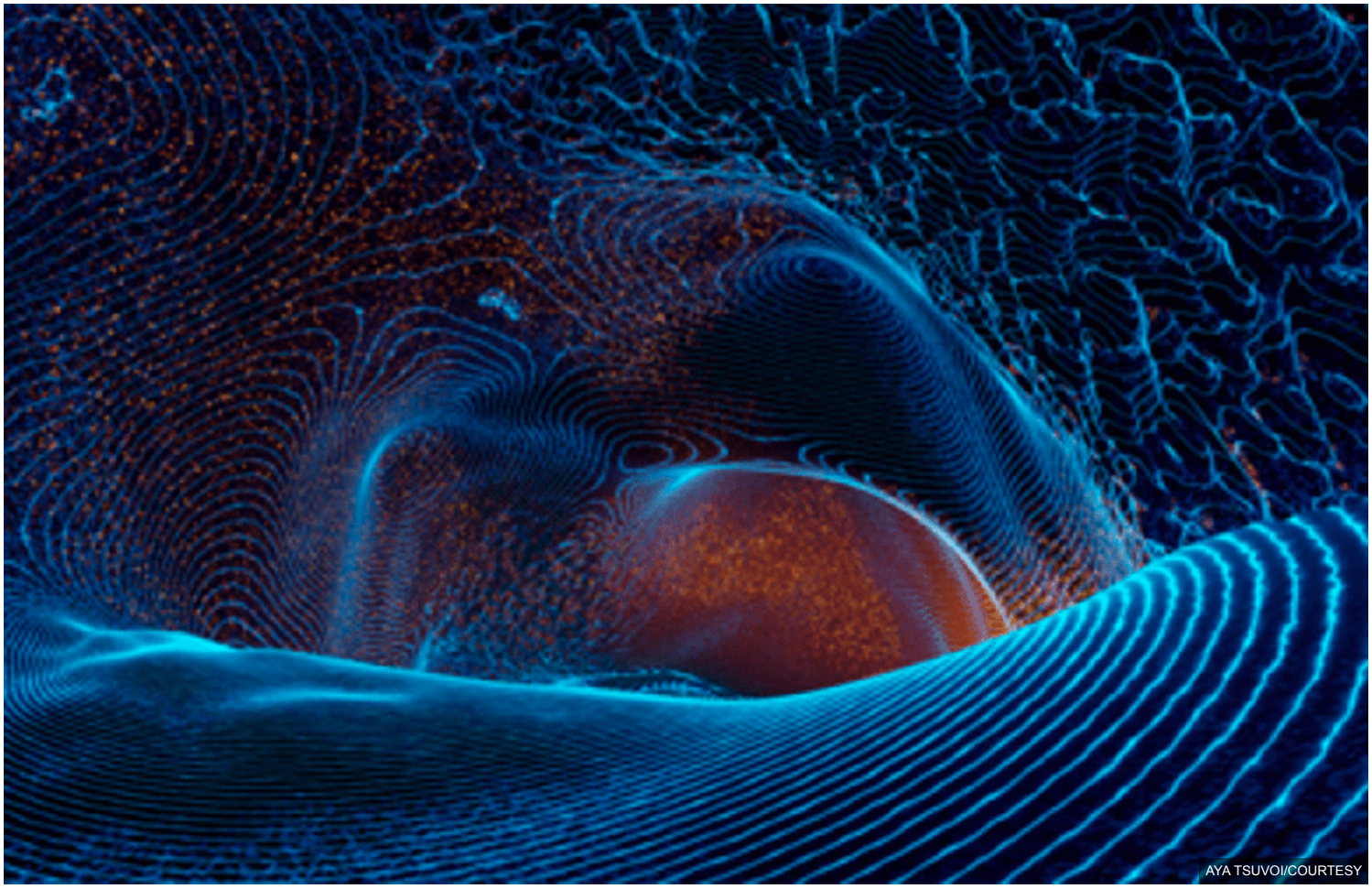
# UC Berkeley professor helps theorize how particles in universe may have saved life from annihilation


AYA TSUVOI/COURTESY

BY MAXINE MOULY | STAFF

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Particles in the universe may have saved life as we know it from annihilation, according to UC Berkeley professor of physics Hitoshi Murayama, along with other researchers worldwide.

It is theorized that matter and antimatter were created in equal quantities in the universe, according to Graham White, co-author of the study and postdoctoral research associate at Canada's particle accelerator center, TRI-University Meson Facility. Naturally, the two would have destroyed one another, resulting in annihilation. Given life on Earth, however, the universe was able to create an imbalance and tip the scales in favor of matter over antimatter.

"One of the hardest questions to answer is how we are saved from annihilation since the most plausible answer involves physics that would take a machine larger



Matter and antimatter have opposite charges and, because the charge is fixed, electrically neutral particles are the only particles that can "preferentially" decay into matter over antimatter, White said in the email. He added that the only known electrically neutral particles are sterile neutrinos.

In other words, these particles may have caused an imbalance of increased matter over antimatter in the universe, resulting in the formation of cosmic strings, according to the research paper, which was published in the Physical Review Letters on Jan. 28.

As these cosmic strings evolve, gravitational waves are produced, according to White.

Gravitational waves, which are ripples in space-time, were first discovered using the Laser Interferometer Gravitational-Wave Observatory by observing the combining of two black holes, White said.

“This sparked a new way of looking at the Universe with many experimental proposals cropping up as a result,” White said in the email. “The most exciting thing about gravitational waves is that the universe is completely transparent to them.”

The next major steps in answering the question of why we exist are “on the way,” White said in the email.

More precise gravitational wave detectors will be developed within the next few decades, according to White. He added that researchers might then be able to detect these gravitational waves and use them to discover whether sterile neutrinos have the appropriate properties to explain our existence.

“This question of why we’re safe from annihilation is untestable and it turns out that that’s becoming less and less true as we understand it more,” White said in the email. “The moral of the story is if you hear something’s difficult to test, that’s a scientific challenge rather than a final statement.”

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