NEW YORK: Astronomers working with NASA's Kepler planet-finding spacecraft said on Thursday that they had found the most Earth-like worlds yet known in the outer cosmos, a pair of planets that appear capable of supporting life and that orbit a star 1,200 light-years from here in the constellation Lyra.

The newly discovered planets are the two outermost of five worlds circling a yellowish star slightly smaller and dimmer than our Sun, heretofore anonymous and now destined to be known forever in the cosmic history books as Kepler 62. These planets are roughly half again as large as the Earth and are presumably balls of rock, perhaps covered by oceans with humid cloudy skies, although that is at best a highly educated guess.

Nobody will probably ever know if anything lives on these planets, and the odds are that humans will travel there only in their faster-than-light dreams, but the news has sent astronomers into heavenlyraptures. William Borucki of NASA's Ames Research Center, head of the Kepler project, described one the new worlds as the best site for Life Out There yet found in Kepler's four-years-and-counting search for other Earths in the stars. He treated his team to pizza and beer on his own dime to celebrate the find (this being the age of sequestration). "It's a big deal," he said.

Looming brightly in each other's skies, the two planets circle their star at distances of 37 million and 65 million miles, about as far apart as Mercury and Venus in our own solar system. Most significantly, their orbits place them both in the "Goldilocks" zone of lukewarm temperatures suitable for liquid water, the crucial ingredient for Life as We Know It.

Goldilocks would be so jealous.

Previous claims of Goldilocks planets with "just so" orbits snuggled up to red dwarf stars much dimmer and cooler than the Sun have been beset by uncertainties in the size and mass and even the existence of these worlds, said David Charbonneau of the Harvard-Smithsonian Center for Astrophysics, an exoplanet hunter and member of the Kepler team.

"This is the first planet that ticks both boxes," Dr Charbonneau said, speaking of the outermost planet, known as Kepler 62f. "It's the right size and the right temperature." Kepler 62f is 40 percent bigger than Earth and smack in the middle of the habitable zone, with a 267-day year. In an interview, Mr Borucki called it the best planet Kepler has found

Its mate, known as Kepler 62e, is slightly larger — 60 percent bigger than Earth — and has a 122-day orbit, placing it on the inner edge of the Goldilocks zone. It is warmer but also probably habitable, astronomers said.

The Kepler 62 system resembles our own solar system, which also has two habitable planets: Earth and Mars, which once had water and would still be habitable today if it were more massive and had been able to hang onto its primordial atmosphere.

The Kepler 62 planets continue a string of breakthroughs in the last two decades in which astronomers have gone from detecting the first known planets belonging to other stars, or exoplanets, broiling globs of gas bigger than Jupiter, to being able to discern smaller and smaller more moderate orbs — iceballs like Neptune and, now, bodies only a few times the mass of Earth, known technically as super-Earths.

Kepler 62's newfound worlds are not still not quite small enough to be considered strict replicas of Earth, but the new results have strengthened the already rabid conviction among astronomers that the galaxy is littered with billions of Earth-size planets, perhaps as many as one per star, and that astronomers will soon find Earth 2.0, as they call it — our lost twin bathing in the rays of an alien sun.

"Kepler and other experiments are finding planets that remind us more and more of home," saidGeoffrey Marcy, a veteran exoplanet hunter at the University of California, Berkeley, and Kepler team member. "It's an amazing moment in science. We haven't found Earth 2.0 yet, but we can taste it, smell it, right there on our technological fingertips."

(An artist's impression of a sunrise on Kepler 62f. The two outer planets of the Kepler 62 system may lie in the habitable zone, where liquid water could exist on the surface.)

A team of 60 authors, led by Mr Borucki of Ames, reported the discovery of the Kepler 62 planets in an article published online in the journal Science on Thursday.

As if that weren't enough, a group led by Thomas Barclay of Ames and the Bay Area Environmental Research Institute also reported the discovery of a planet 1.7 times as big as the Earth in the Goldilocks zone of Kepler 69, a star almost identical to the Sun, 1,040 light-years distant. The group's paper is destined for The Astrophysical Journal.

And in another paper submitted to the same journal, a group led by Lisa Kaltenegger of the Harvard-Smithsonian Center for Astrophysics and the Max Planck Institute for Astronomy, inHeidelberg, Germany, took the first stab at trying to model conditions on the Kepler 62 planets. That is a tough job because Kepler 62, like the other Kepler stars, is too far away for astronomers to measure the masses of these planets, which would allow them to pin down their densities and composition.

Scaling up from the properties of the Earth, Dr Kaltenegger and her colleagues concluded that both of them were probably ocean worlds with humid, cloudy skies. Any life on them would

probably be aquatic, she said, but "it might even be cooler life than we have here. Looking at the oceans, we find a lot of interesting life-forms there."

Dr Kaltenegger said she envisioned the pair as a kind of Darwinian test tube and wondered in an e-mail if life would evolve on both worlds and, if so, "Would life evolve 'the same' way or would there be very different life?"

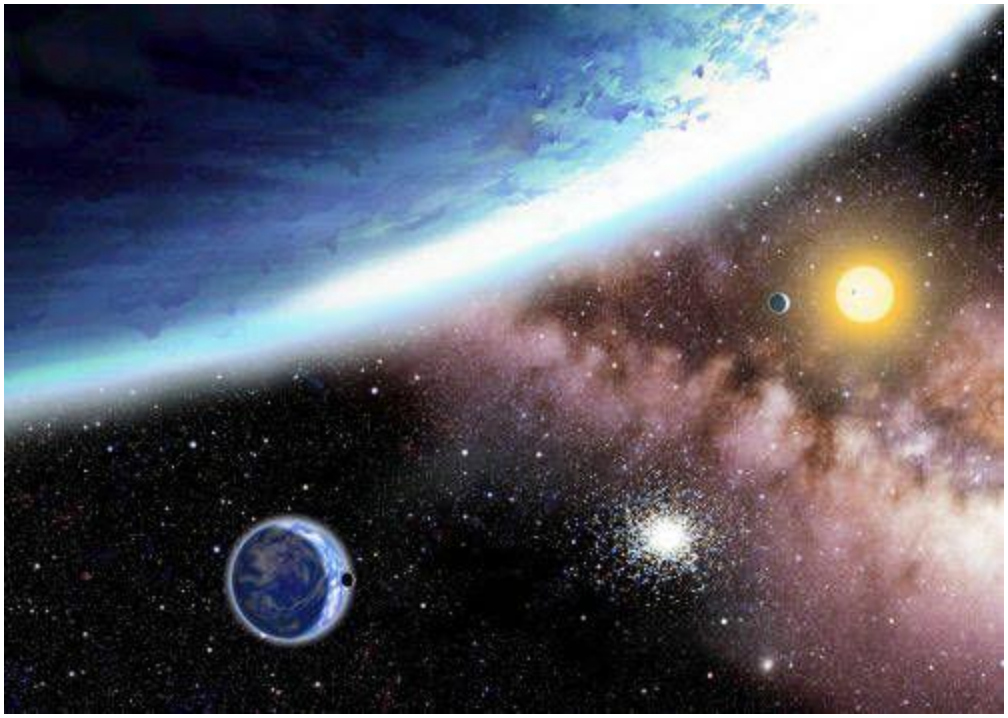
"This is huge for the overall life-elsewhere question," said Sara Seager, a planetary expert at theMassachusetts Institute of Technology who was not part of the work.

Kepler, launched in March 2009, hunts planets by staring at 150,000 stars in a patch of Milky Way sky, monitoring their brightnesses and looking for blips caused when planets pass in front of their home stars. To date the spacecraft has identified 115 planets and has a list of 2,740 other candidates. (Over all, the world's astronomers now know of some 800 exoplanets.)

But Kepler, which had its mission extended for another three years last spring, is only now coming into its prime. A minimum of three blips is required to register a planet, and so planets like the Earth that take a year to make an orbit are only now coming into view in the Kepler data. Indeed, the new Kepler 62 planets each registered just three transits, as they are called.

But there is a hitch, Dr Seager and others cautioned. Because the Kepler stars are all too far away — hundreds or thousands of light-years — to be reliably weighted, astronomers will never be quite completely sure what any particular planet is made of or whether anything can or does live there.

In the case of Kepler 62, said Natalie Batalha of San Jose State University, a Kepler missionscientist, the astronomers had determined the composition of the new planets by comparison to three earlier objects that had similar sizes and turned out to be rocky.

"Mass by association," Dr Batalha called it in an e-mail message.

Which is fine if all you want is the statistics of the cosmos. As Dr Seager pointed out, "Kepler was not designed to tell us which planet to go live on, only how common Earth-like planets are."