

The discovery of a system with seven “Earth-like” exoplanets

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The detection of a nearby solar system of potentially Earth-like exoplanets orbiting the star Trappist-1 has evoked widespread public interest and enthusiasm. Millions of people have read reports, watched videos and posted on social media about the seven worlds that might have liquid water on their surfaces.

The Trappist-1 system is comprised of seven planets that orbit a nearby ultracool dwarf star (so-called for its comparatively low temperature). Six of the planets have been confirmed to have an Earth-like size, mass and density. None of them have any hydrogen in their atmospheres, further confirmation that these are all terrestrial, rocky worlds like Mercury, Venus, Earth and Mars. Moreover, due to the gravitational interactions between all seven planets and Trappist-1 itself, every world in the system may have liquid water.

Of particular interest is the fact that the planets are very close. They are Earth’s next-door neighbors, relative to the vastness of the universe. Trappist-1 is only 39 light years away—that is, it takes light, traveling at about 300,000 kilometers per second, 39 years to travel the distance. In comparison, the Milky Way galaxy of which our sun is a part has a diameter of 100,000 light years, and it is about 2.5 million light years to its larger companion, the Andromeda galaxy, one of trillions of galaxies in the Universe.

The planets are so close that, in the not-too-distant future, it should be possible to make far more detailed analyses and even direct observations of exoplanets.

The discovery of these worlds is the most remarkable of a wave of new scientific findings since the first “exoplanet”—a planet outside of our solar system—was discovered around a Sun-like star in the mid-1990s. At the time, while exoplanets had been predicted for nearly four centuries, none had been conclusively detected, let alone directly observed.

Advances in measuring techniques and the use of instruments placed in the orbit around Earth, free of the distortions of the atmosphere, made it possible to detect very slight dips in the brightness of stars. When those dips were observed with regularity, they could be attributed to the motion of planets across the line of sight between the star and the observers.

When the first detection occurred, it opened a whole new realm of astronomy. The gravitational effects of these unseen planets could also be studied, providing evidence of their mass, density and other physical characteristics. Today, not only have scientists detected more than 3,400 exoplanets, the knowledge built up over the past 20 years makes it possible to visualize what these worlds might look like, either from space or from the surface. And with the launching of the James Webb Space Telescope next year, it should be possible to make far more detailed analysis and even direct observation of exoplanets.

Like most significant astronomical advances, the planets’ discovery was an international endeavor. The detection of exoplanets around Trappist-1 began in May 2016, when a team of astronomers used the Chile-based Transiting Planets and Planetesimals Small Telescope (TRAPPIST), remotely operated from Belgium and Switzerland, to first observe the star. They discovered three Earth-sized planets orbiting it, with the outermost one likely within the star’s habitable zone.

This encouraged further observations, which were conducted by a series of ground-based telescopes located in Chile, Hawaii, Morocco, Spain and South Africa. The Spitzer Space Telescope was also commissioned to use its higher precision and greater ability to see in the infrared to study the system. When it was discovered that the system had not three, but

seven planets, the Hubble Space Telescope was employed to do an initial survey of the planetary atmospheres for hydrogen. Astronomers across Africa, Europe, the Middle East, North America, South America and Southeast Asia coordinated their efforts to make sense of the data.

The discovery of a planetary system around Trappist-1 is not merely a piece of luck. It is the confirmation of a scientific hypothesis, first advanced in 1997, that, due to the physics of stellar formation, stars with about a tenth of the mass of the Sun are more likely to have terrestrial-sized planets. Trappist-1 is one of many candidates to be studied using this hypothesis, and the first for which the idea has been borne out.

This scientific breakthrough is the culmination of several centuries of advances in astronomy and physics: the understanding of how solar systems are formed; the analysis of visible light and other forms of electromagnetic radiation; and mathematical methods of analysis used to discover the subtle signals in the data from stellar observations.

Trappist-1 is a demonstration of the power of human cognition, science and reason. It is a powerful rebuke to the incessant contemporary glorification of irrationalism, whether through the cultivation of backwardness and religious prejudice or the promotion of postmodernism and its rejection of objective truth, and a mighty vindication of the materialist understanding of the world, that there are objective laws of nature and that humans can comprehend them.

Among millions of people inspired by such discoveries, there is an instinctive understanding that the methods employed to find the Trappist-1 planets and make other scientific and technical advances should be used to solve social and economic problems, to provide sufficient health care, education, shelter and food for all humanity. How can our society discover seven potentially Earth-like worlds more than 350 trillion kilometers away, yet proceed, through environmental recklessness and nuclear-armed militarism, to destroy the planet on which we live?

The exoplanet discovery was based on collaboration towards a common goal whose driving force was the pursuit of knowledge, not the amassing of insane amounts of personal wealth. This sort of thinking is totally alien to the world's ruling elite, which flaunts its backwardness, vulgarity, ignorance and parasitism,

personified in the figure of Donald Trump.

This discovery highlights another contradiction of modern society. The organization and planning required to produce these results is a testament to humanity's ability to rationally and scientifically coordinate resources on an international scale. The scientists on the project also had to reject the constant mantra of national chauvinism, espoused by the ruling elites throughout the world. While science probes the seemingly infinite distances of galactic space, humanity remains trapped at home within the prison house of the nation-state system, with barbed-wire fences, wars, invasions, bombings and mass flights of refugees.

The squandering of trillions of dollars, yuan, yen, roubles and euros to enrich a parasitic capitalist elite and to wage war around the globe is one reason why scientific announcements of this order are so rare. Immense resources, material and human, are wasted, which should be devoted to the improvement of the human condition and the conquest of knowledge of the material world.

The creation of a society in which the development of knowledge can be freed from the constraints of capitalism requires the application of science and reason to the evolution of society and to politics. In opposition to postmodernism and its many variants, which insist that there is no objective truth, Marxism is rooted in an analysis of the laws of socioeconomic development.

Driven inexorably by its internal contradictions, capitalism is leading mankind toward the abyss of world war and dictatorship. These same contradictions, however, also produce the basis for the overthrow of capitalism: the international working class. The objective process must be made conscious, and the growing opposition of millions of workers and youth around the world must be transformed into a political movement that has as its aim the establishment of an internationally coordinated, rationally directed system of economic planning based on equality and the satisfaction of human need: socialism.



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