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TRAPPIST-1: The dawning of the age of Aquarius…

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Article Body

The discovery by Gillon et al., [1] of seven potentially habitable worlds orbiting TRAPPIST-1, an ultracool dwarf star, ~39 light years from Earth in the constellation Aquarius; represents not only an interesting astronomical find, but also in our opinion, a potential refuge for the future of humanity.

Even in the absence of a worldwide catastrophe heralded by global warming [2], nuclear fallout [3] or some as yet unknown threat [4]; the clock is ticking - our own star will burn out in approximately 5 billion years; marking the end of our solar system and life as we know it [5]. By then, TRAPPIST-1 will still be in its infancy, with a projected life expectancy of ~10 trillion years; more than enough time to allow life to evolve from even the simplest of progenitors [6, 7].

Significant recent and predicted advances in space travel [8] and synthetic biology [9-12] have enabled us not only to reach these new worlds, but also to potentially colonise them [13]. Data on the atmospheric conditions native to these exoplanets (obtained *via* powerful ground and space telescopes, such as the European Extremely Large Telescope [14] and the James Webb Space Telescope [15]) will allow us to design and build synthetic molecules and microbes with the genetic elements necessary to survive and thrive in these new environments [16-18].

As we have previously outlined [19], these tailor-made colonists could be transported to the new worlds *via* nanocrafts (with payloads in the order of 1g – more than sufficient for consignments of lyophilized synthetic bacterial cells, or indeed synthetic DNA [16, 20]), attached to lightsails; propelled by Earth based lasers to fractions of the speed of light. Using this approach, it would be possible to cover the expanse to TRAPPIST-1 in ~200 years, or a tenth of that to reach Proxima b; an exoplanet situated in the habitable zone around, Proxima Centauri; our nearest stellar neighbour, a mere 4.2 light years from Earth [21].

Once *in situ*, these first generation synthetic settlers would begin the process of terraforming [22]; slowly modulating the evolution of their new environment; affecting atmospheric conditions, climate and nutrient balance [23]. If left unhindered, evolution should progress at its own rate, eventually leading to an ecological diversity resembling that which we currently enjoy on Earth.

Thus, perhaps the most pertinent question surrounding the discovery of these new worlds is not whether they once supported life in the past [5], but rather should they be made to do so in the future? In the words of Carl Sagan, "*We are ready at last to set sail for the stars.*"

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