

Settling in Space

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Human colonies in space and on other planets have long been a staple of science fiction. Although we are nowhere near establishing such settlements, it is worth considering whether their construction would be beneficial to humanity.

One of the main motivations for space colonisation is to allow our civilisation to grow and expand [1]. On Earth, the growth of humanity may be limited by overpopulation and competition for resources, but in space these resources are far more abundant. For example, the asteroid Ceres has enough material to build an orbital space settlement with a living area more than one hundred times that of all the land on Earth [2].

Constructing a colony from nearby resources would avoid the need to transport materials from Earth, conserving energy and reducing cost.

Another reason for establishing colonies is to safeguard our species against extinction. Society might not be able to recover from events such as asteroid impact or nuclear war, which could cause billions of deaths. Professor Stephen Hawking has said that "Once we spread out into space and establish colonies, our future should be safe" [3]. Other human colonies could send aid in times of need, and our species would be protected to some degree from catastrophes on Earth. Eventually, Earth will become uninhabitable and, if humans remain there, they will be forced to find a new place to live.

Current space colony designs are, as their name suggests, for structures free-standing in space (often in orbit around a planet), rather than on the surface of a planet. Planetary surfaces can be hostile environments to humans and would make poor places to live. Both the Moon and Mars have less gravity than the Earth, so people who were born and lived there would not develop the same amount of muscle and bone strength as people on Earth [1]. This would make it almost impossible for them to visit Earth without experiencing injury. On the other hand, colonies in space could rotate to create an artificial gravity by centripetal force [4]. This could be adjusted so that in the places where people lived the gravity would be comparable to that on Earth, eliminating any low-gravity health problems [5]. Without an atmosphere, orbital colonies would receive a much greater intensity of light: the solar energy available in orbit is 2.3 billion times that available on Earth [6].

It may be difficult for government to justify spending on colonies, rather than healthcare and education [7], especially as they would not be completed during the lifetime of a taxpayer. However, the enormous investment required

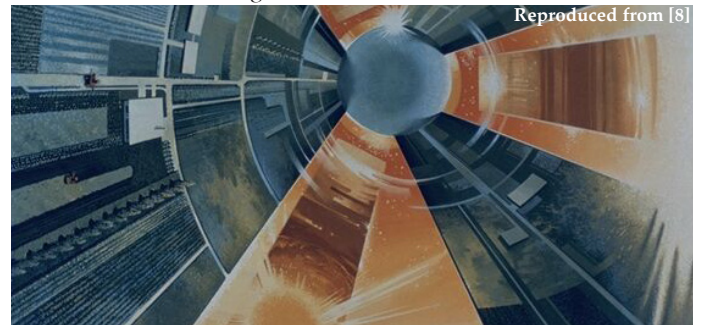
could be recouped by harvesting space resources. The small asteroid 3554 Amun contains about \$20 trillion worth of metals, including iron, nickel, cobalt and platinum-group metals [1,2]; if it and other similar asteroids could be mined then the initial costs could be justified.

Ultimately, space colonies would be for ordinary people, though the first few may understandably favour skilled individuals. For settlements to be feasible, the travel from Earth must be affordable. If transport wasn't available to the masses, only the rich would be able to leave Earth and begin new lives.

Certain groups may find the idea of space colonies especially appealing. People may choose to live with others who share their beliefs or values, and space settlements could allow for the experimentation with different social and political forms. On Earth there are many diverse groups of people who live in close proximity to each other, often with disastrous consequences. Space colonies offer the chance to avert conflict by allowing those who don't get along to live apart. However, a separation of ideologies and cultures may result in less tolerant communities and less diversity, leading to a stagnation of creativity. If the space colonies were self-reliant, and contained everything one could want, there would be little incentive to travel to another.

Migration into space would protect our species and encourage our civilisation to grow. The energy and resources obtainable from space could fuel the construction and maintenance of massive space colonies, giving people a better place to live. However in expanding our civilisation, we must guard against isolating groups of people and the breakdown of communication. Space colonisation is a chance to journey to the stars, not to run away from our problems on Earth. ■

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Interior View of Colony from Overhead. Space Colonization - Artwork by NASA Ames Research Center (NASA-ARC). Farming sections will be built in terraces with different crops grown on each of the levels.

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