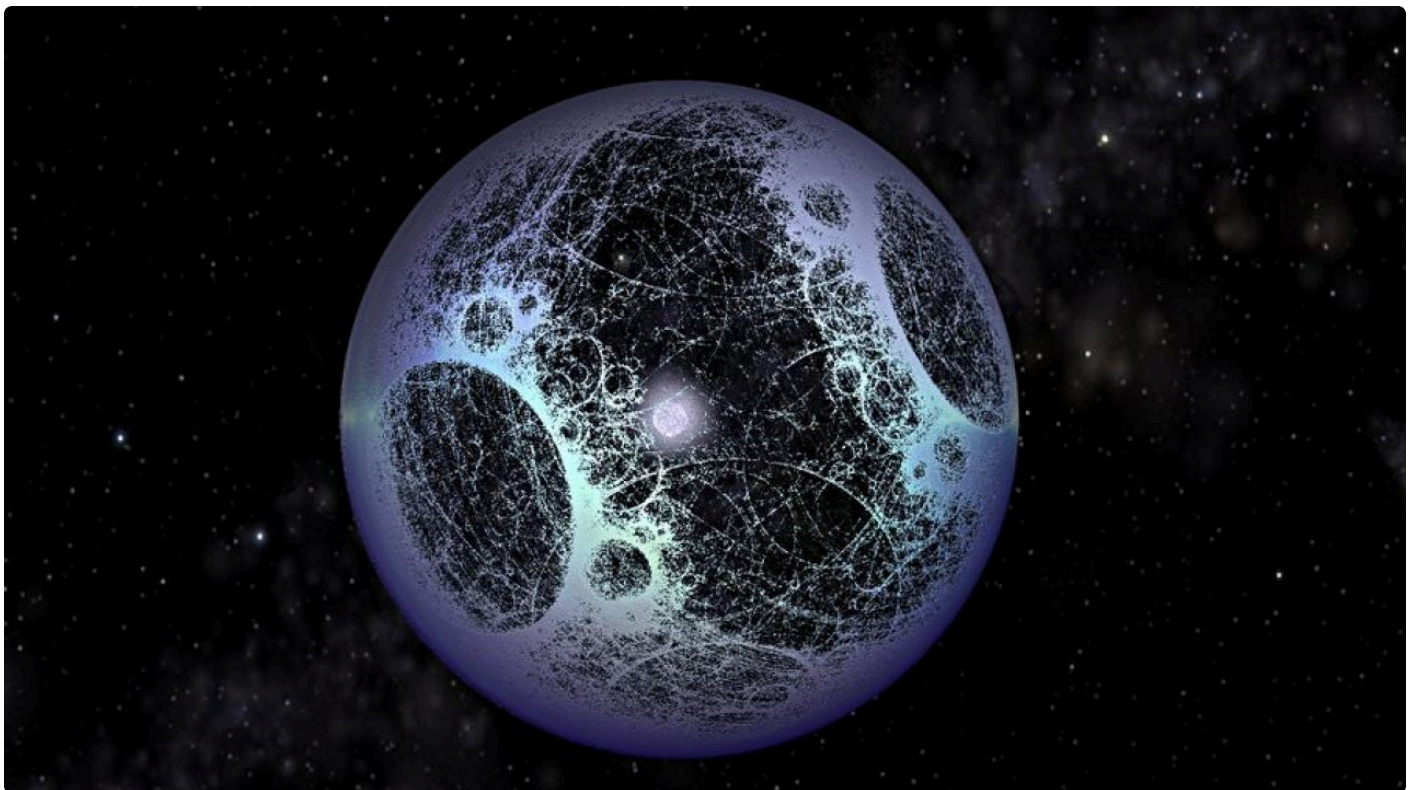




Universe Today is 100% AD-FREE thanks to our patrons. Here's how we do it →

A Dyson Swarm Made of Solar Panels Would Make Earth Uninhabitable

By Mark Thompson - March 19, 2025 10:30 PM UTC | Astrobiology



Artist's illustration of a Dyson Swarm. (Credit: Archibald Tuttle)

As civilisations become more and more advanced, their power needs also increase. It's likely that an advanced civilisation might need so much power that they enclose their host star in solar energy collecting satellites. These Dyson Swarms will trap heat so any planets within the sphere are likely to experience a temperature increase. A new paper explores this and concludes that a complete Dyson swarm outside the orbit of the Earth would raise our temperature by 140 K!

The concept of a Dyson swarm is purely a hypothetical concept, a theorised megastructure consisting of numerous satellites or habitats orbiting a star to capture and harness its energy output. Unlike the solid shell of a Dyson sphere, a swarm represents less of an engineering challenge, allowing for incremental construction as energy needs increase. The concept, first popularised by physicist Freeman Dyson in 1960, represents one of the most ambitious yet potentially achievable feats of astroengineering that could eventually allow a civilisation to use a significant fraction of its host star's total energy output.



Freeman Dyson.

Whilst presently only the stuff of theory and science fiction, it has inspired real scientific research. It's an idea that presents a potential solution for the enormous energy needs as we take tentative steps toward travel beyond our Solar System. If we, or any advanced

civilisations that might be out there succeed, then they would be classed as Type II on the Kardashev scale. The scale is used to articulate a civilisation's level of technological advancement based on the amount of energy it is capable of harnessing and using.

Dyson swarm structures are likely to use photovoltaic technology to convert stellar radiation into usable energy. Their efficiency in energy conversion is highly dependent on the temperature of the solar cells and, unlike Earth-based equivalents, must balance thermal exchanges with the Sun, outer space and the enormous surface area of their structure. Temperature regulation of the structure is one of the challenges that must be overcome since they must remain cool for optimal operation.



Artist illustration of a Dyson sphere under construction

It's not just the temperature of the structures that poses problems asserts Ian Marius Peters from the Helmholtz Institute Erlangen-Nurnberg for Renewable Energy. In his paper published in Science Direct, he explores the environmental changes of planets within a swarm or sphere. The research examines whether such a megastructure could be built using materials available in our Solar System while still preserving Earth's habitability, balancing the goal of stellar energy capture with the need to maintain conditions that support life on our planet.

The paper concludes that a Dyson sphere surrounding the Sun would significantly impact Earth's climate. Small spheres positioned inside Earth's orbit prove impractical, either becoming too hot for their own efficiency or having to great an impact on solar energy arriving on our planet. While large spheres enable efficient energy conversion, they would raise Earth's temperature by 140 K making Earth completely uninhabitable. A compromise might involve creating a partial structure (the Dyson swarm) at 2.13AU from the Sun. This would harvest 4% of solar energy (15.6 yottawatts or 15.6 million billion billion watts) while increasing Earth's temperature by less than 3K—comparable to current global warming trends. It's still quite an engineering feat though requiring 1.3×10^{23} kg of silicon!

Source :[The photovoltaic Dyson sphere](#)



OUR LATEST VIDEO — FREE ON PATREON

We Hardly See Other Planets. What's The Point of Searching for Life Out There

The extended edition: ad-free, with extra content. Free to watch — no account needed.

▶ [Watch it free](#)



Mark Thompson

Science broadcaster and author. Mark is known for his tireless enthusiasm for making science accessible, through numerous tv, radio, podcast and theatre appearances, and books. He was a part of the award-nominated **BBC Stargazing LIVE TV Show** in the UK and his **Spectacular Science theatre show** has received 5 star reviews across UK theatres. In 2025 he is launching his new **podcast Cosmic Commerce** and is working on a **new book 101 Facts You Didn't Know About Deep Space** In 2018, Mark received an Honorary Doctorate from the University of East Anglia.

You can [email Mark](#) here

Most read from Mark Thompson last 30 days

1 The Oldest Stars in the Galaxy Just Weighed In on One of Cosmology's Biggest Arguments

Jul 2026 · 23K reads

2 Rebooting a Spacecraft, 140 Million Kilometres From Home.

Jul 2026 · 20K reads

3 After a Billion Kilometres, China's Asteroid Hunter Finally Arrives

Jul 2026 · 20K reads

4 Watching Dawn and Dusk on a Distant Hot Jupiter

Jul 2026 · 17K reads

5 Listening for the Universe's Faintest Whispers, a Billion Supernovae at Once

Jul 2026 · 17K reads

PREVIOUS ARTICLE

← [Bridging the Gap Between the Cosmic Microwave Background and the First Galaxies](#)
-- duplicate, do not publish

NEXT ARTICLE

[Would We Know if a Supernova Was About to Hit the Earth?](#) →

© 2025 Universe Today

A space and astronomy news site

Support our ad-free content

[Become a Patron](#)

[Contact Us](#) [Privacy Policy](#)

This work is licensed under a [Creative Commons Attribution 4.0 International License](#).