The Journals

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Here we list recent interstellar-related papers in the **Journal of the British Interplanetary Society (JBIS)**, which has been published since the 1930s and in **Acta Astronautica (ActaA)**, the commercial journal published by Elsevier, with the endorsement of the International Academy of Astronautics.

JBIS

Five issues of JBIS have appeared online since our last issue, P52. They are – volume 79 issues #1 (January 2026) to #5 (May 2026). Of these issues, one was an Interstellar issue.

Volume 79 #2 February 2026 Interstellar

Ultra-Long Wave Civilization Filter: a Selective Approach to Interstellar Communication	Victor Zames	-

For decades, SETI projects have searched for extraterrestrial signals primarily in the centimetre and decimetre wave ranges. These searches implicitly assume that technologically advanced civilizations would broadcast in easily detectable bands. This paper proposes an alternative: the use of ultra-long waves (ULW), with wavelengths from hundreds of thousands to millions of kilometres, as a civilization filter — a deliberate physical and socio-technological barrier ensuring that only unified, interplanetary civilizations can detect and decode the signal. Such a model not only introduces a technological threshold but also an ethical safeguard, reducing the risk of premature or destabilizing contact. The ULW approach offers a potential explanation for the absence of detected signals despite decades of observation, suggesting that our current SETI strategies may systematically overlook a possible primary contact channel.

Laser-ZPE Interstellar Propulsion Revisited	Gregory L Matloff	USA

Obtaining useful energy from universal vacuum fluctuations is a very controversial topic. Recently, Casimir Space, a US startup, has announced the development of a chip that seems to produce a small amount of continuous, net Zero Point Energy (ZPE). This may be the first time that ZPE has been quantified. Although replication of this feat by other laboratories has not yet been reported, a useful exercise is to investigate the potential application of ZPE to interstellar travel. Here, ZPE is assumed to pump a large laser or laser array as the propulsion system of an interstellar generation ship. Apparently, such an approach as the primary propulsion system yields performance equivalent to that of fusion rockets or Sun-diving photon sails on voyages to the nearest extra-solar stars. But the ZPE laser, if it is feasible, can serve as a second acceleration stage and, if used continuously, can shorten voyage duration to more distant stars. This technology may allow the ultimate development of space habitats within the Oort Cloud, far from any source of radiant stellar energy.

Toward a Physics of the Ceiling: Structural Limits on the Evolution of Advanced Civilizations and the Emergence of Compact Final Forms	H Lapczynski	-

The classical Kardashev scale assumes that energy harvesting and spatial expansion can increase indefinitely. This assumption is incompatible with several universal physical constraints. In this work, we show that three minimal ingredients – (H1) finite propagation speed, (H2) attractive gravity with a compactness threshold, and (H3) the existence of a cosmic horizon-combined with information-theoretic and gravitational bounds (the Bekenstein limit and the gravitational radius) impose a finite admissible radius window $[R_{min,}, R_H]$ for any advanced civilization. Within this window, information, gravity, causality, and thermodynamics jointly impose a structural ceiling that prevents unbounded extensive expansion and drives sufficiently advanced civilizations toward compact, optimized hollow configurations. Building on this structural framework, we introduce a simple parametric model in a ΛCDM (Lambda Cold Dark Matter) universe that incorporates (i) construction logistics through an effective expansion velocity v_{eff}, (ii) finite cosmological lifetime through a remaining time T_{tot}, (iii) energy availability through an effective density ρ_{eff}, and (iv) the requirement of energetic autarky. Maximizing the total number of logical operations achievable over T_{tot} yields a distinct internal optimum radius $R_{opt} < R_{ceil} < R_H$, strictly below both causal and structural bounds. Taken together, the structural ceiling and the internal computational optimum provide a unified, physics-based reinterpretation of long-term civilizational evolution. The framework predicts that the most advanced civilizations should be faint, cold, compact, radiatively closed, and detectable primarily through negative observational signatures.

Optimal Energy and Resource Distribution in Kardashev Type III Civilizations	Erotokritos Skordilis	USA

In 1964, Nikolai Kardashev introduced a method for quantifying advanced extraterrestrial civilizations based on their energy production into three levels, namely planetary (Type I), stellar (Type II), and galactic (Type III). Since then, multiple studies have proposed megastructures for producing the amounts of energy required to reach Type II and III levels. This empirical study presents a decision-making framework that optimizes the resource utilization required to elevate an interstellar civilization to a Type III status, focusing on maximization of energy production and computation. Numerical simulations were based on a synthetic galactic environment, where a multidimensional action space incorporating a variety of megastructure construction decisions was considered. The results suggest that a Milky Way-sized galaxy can be fully converted into such an environment within ~1.3 Gyrs.

Mapping the Galactic Biosphere: A Fokker-Planck Approach to the Stochastic Distribution of Life	Elio Quiroga Rodriguez	Spain

This paper presents a stochastic model to estimate the probability of finding life in our galaxy using partial differential equations. The proposed stochastic equation, based on the Fokker-Planck equation, models the probability density function of the existence of planets with life in different star systems over time, modelling the variability and uncertainty in the emergence of life in three-dimensional space. The approach combines concepts from thermodynamics, statistical mechanics and astrobiology to address the complex question of the search for extraterrestrial life.

Consciousness Bandwidth and Frequency Orthogonality: An Energy-flux resolution to the Fermi Paradox	Bo Zhang	China

The "Great Silence" of the Fermi Paradox is conventionally attributed to the scarcity of extraterrestrial intelligence (ETI) or the insurmountable barriers of spatial distance. This paper challenges these sociological and spatial assumptions by proposing a physical framework based on non-equilibrium thermodynamics and signal processing theory. It is posited that human perception is confined by "Scale Geocentrism," a bias presupposing that intelligence manifests exclusively within mesoscale timeframes and chemical energy levels. By establishing a positive correlation between environmental energy flux (ΦE) and the coupling frequency (fc) of biological consciousness, a spectrum of life is constructed, spanning from high-frequency entities dominated by nuclear forces to ultra-low-frequency structures dominated by gravitation. Applying the Shannon-Nyquist sampling theorem, it is demonstrated that signals from these "ultrafast" or "ultraslow" civilizations are mathematically orthogonal to the human perception bandwidth (1,100 Hz). Consequently, these signals manifest as thermal noise or static physical background respectively. The paper concludes that the universe is not silent; rather, the detection bandwidth of current SETI methodologies is insufficiently tuned to demodulate the multi-scale cosmic symphony.

Volume 79 #3 March 2026 General issue

Orbit to Interstellar: A Kevlar Tether Deployment System	Douglas DeCandia	-

This paper presents a design for multi-target, unguided probe deployment from Low Earth Oribt (LEO) using commercially available materials. The model consists of multiple, 1 kg payloads mounted at the tip of 1,000 metre (1 km) rotating arms constructed from commercially available Kevlar. At 75.5 RPM, the tip velocity reaches 7.91 km^{-s}, more than sufficient for Earth escape velocity at LEO. We analyze stress distribution, axial load, and material constraints, confirming that Kevlar remains within tensile limits under optimized conditions for escape velocities once in LEO. The design offers a scalable, reusable companion to chemical propulsion, with implications for orbital logistics and interplanetary missions. The analysis shows that high-performance deployment systems can be constructed using conventional, low-cost, available materials and technologies, opening new pathways for high-efficiency space payload deployment and scientific research.

Giant Planet Lagrange Points L2 as Locations for Photon Sail Manufacturing Facilities	Gregory L Matloff	USA

Interstellar exploration or colonization ventures by humans will be major undertakings that will likely require utilization of solar system resources. If photon sailing by Sunlight using Sun-diving manoeuvers or propulsion by beamed lasers/masers is the preferred method of interstellar travel, it may be necessary to manufacture the required huge and hyper-thin sails in space. An ideal site for a sail manufacturing facility would be permanently shaded from the Sun. This paper investigates planet-Sun Lagrange 2 (L2) points as possible locations for such facilities. Using a simple geometric construction, it is demonstrated that Sun-Venus and Sun-Earth L2 are located in the shadow's penumbra and are therefore not suitable for this application. But giant planet Lagrange 2 points are all within the shadow umbra and are totally shaded from solar irradiation. The estimated diameters of the shaded regions at Sun-Jupiter and Sun-Saturn L2 are both greater than 50,000 km in diameter.

Volume 79 #4 April 2026 General issue

In Consideration of Artificial Nanoprobes Jet Ejection from the Interstellar Object 3I/ATLAS	Kelvin F Long	UK

The interstellar object 3I/ATLAS achieved perihelion, and then images indicated the presence of large jets in the direction of the Sun of order ~106 km in size. We consider the speculative hypothetical that within these jets may have contained ~5 billion tons of nanograin dust particles, where ~1033-1035 objects are distributed throughout the Solar System that had the function of artificial probes for the purpose of solar system surveillance. To examine this, we look at the likely mass required for such probes, which we consider to be either coupled to the solar magnetic field, <1 nm, ~10^{-23} kg, or drifting ballistic, 10s nm, ~10^{-21} kg. Although this is speculation, if there were nanoprobe ejections, due to the presence of nickel thermal emission and the suggestion of grain heating at large distance, any such probes would likely be nanoscale in size and guided by the solar magnetic field and solar wind outflow once released, fully departing the Solar System on a timescale of order 1 year. This paper is not intended to advocate for an artificial function behind the object 3I/ATLAS but instead should be seen as an exploration for scenario modelling, useful for future speculations with other visiting interstellar objects.

Catching 3I/ATLAS Using a Solar Oberth [1]	Adam Hibberd, Marshall Eubanks, Andreas M Hein	UK USA Luxembourg

The third interstellar object to be discovered, 3I/ATLAS, has a unique and continually unfolding story to tell of its nature and origin as it is monitored by telescopes on Earth and in space. Previous research into missions using chemical propulsion have addressed the direct case, where the opportunity to launch already expired before 3I/ATLAS's discovery. In contrast, investigations herein exploit 'Optimum Interplanetary Trajectory Software' to simulate an indirect option for chemical propulsion, namely the Solar Oberth Manoeuvre (SOM). Thus, a low perihelion burn provides maximum benefit from the Oberth Effect, accelerating the spacecraft rapidly towards the receding 3I/ATLAS. Though in principle feasible, results indicate this presents significant challenges. For launch years between 2031 and 2037 inclusive, a 2035 launch permits the most efficient transfer to 3I/ATLAS. The reference mission requires a SOM at 3.2 Solar Radii from the Sun's centre, with an intercept after 35-50 years. We find the SOM can leverage spacecraft masses up to ~500 kg. Two or three solid boosters could deliver the required SOM ΔV, whilst a refuelled Starship Block 3 in LEO has sufficient performance for such a mission. Also with a SOM, some of the payload mass would be needed for a heat shield to protect against the high solar flux at low perihelion.

[1] The pre-print of this paper was included in our lead feature *Interstellar Visitors to our Solar System,* Principium Issue 52 February 2026 page 6
https://i4is.org/wp-content/uploads/2026/03/Principium-52-Lead-Feature-0203261114.pdf

Acta Astronautica

Acta Astronautica papers are announced online before print. The relevant papers below have appeared since our last issue, Principium P52, which reported announced papers up to the in-progress Volume 238 January 2026, Part B. This issue reports announced papers up to Volume 246 September 2026.

Enrichment of the driving metanarratives shared between SETI and space sustainability through a multispecies lens	Volume 239 Feb 2026	George Profitiliotis

The fields of SETI and Space Sustainability appear to have significant conceptual common ground. This article argues that this cross-fertilization of ideas is the effect of socially-shared nonfictional narratives at work in each of the two fields, which are tacitly driven by the same cross-cutting metanarrative foundations. The article suggests that the scientific communities of SETI and SS utilize such narratives to enable sense-making, decision-making, and action-generation at the collective level, under conditions of radical uncertainty. It then posits that the distinct narratives at work in each of these two fields are implicitly framed and driven by a finite set of four shared metanarratives, whose assumptions are organized on the basis of the following combinations of descriptive and normative (non-)anthropocentrism:
a) descriptive anthropocentrism & normative anthropocentrism;
b) descriptive anthropocentrism & normative non-anthropocentrism;
c) descriptive non-anthropocentrism & normative anthropocentrism; and
d) descriptive non-anthropocentrism & normative non-anthropocentrism.
Despite being less intuitive than the first three, the nascent fourth one is argued to be accessible through a multispecies lens borrowed from adjacent academic bodies of work and is highlighted as very promising for stimulating fruitful dialogue between the two fields and for enriching the existing pool of competing narratives in each of them.

Exploring Fermi's Paradox using an intragalactic colonization model	Volume 240 Mar 2026	Gregory Roudenko, Yurrian Pierre-Boyer

We explore Fermi's Paradox via a system of differential equations and using simulations of dispersal and interactions between competing interplanetary civilizations. To quantify the resources and potentials of these worlds, three different state variables representing population, environment, and technology, are used. When encounters occur between two different civilizations, the deterministic Lanchester Battle Model is used to determine the outcome of the conflict. We use the Unity Game Engine to simulate the possible outcomes of colonization by different types of civilizations to further investigate Fermi's question. When growth rates of population, technology and nature are out of balance, planetary civilizations can collapse. If the balance is adequate, then some civilizations can develop into dominating ones; nevertheless, they leave large spatial gaps in the distribution of their colonies. The unexpected result is that small civilizations can be left in existence by dominating civilizations in a galaxy due to those large gaps. Our results provide some insights into the plausibility of various solutions to Fermi's Paradox.

Propellantless space exploration	Volume 242 May 2026	Roman Ya Kezerashvili

Propellantless propulsion refers to methods of space travel that do not require onboard propellant, instead relying on natural forces or external energy sources. In this paper, I review different approaches that have been explored and discuss Pros and Cons for each approach for interstellar space exploration.

Gravitational assist uses planetary gravity to change a spacecraft's speed and direction without fuel. It is effective but limited to specific alignments. Solar sails harness radiation pressure from sunlight for continuous, fuel-free acceleration. While effective over time, they require large, reflective materials that degrade in space. Speed can be enhanced by thermal desorption triggered by solar radiation. Magnetic sails generate thrust by interacting with the solar wind through superconducting loops that produce a magnetic field. They provide lower acceleration compared to solar sails, and their performance depends on the available power and the variability of solar wind conditions. Electric sails utilize charged tethers to repel solar wind protons, producing gradual acceleration. Their effectiveness depends on the successful deployment of very long, lightweight conductive wires. They can achieve higher acceleration than solar sails, and their performance is influenced by available power and solar wind conditions. Lastly, quantum effects, such as the Casimir force, offer a speculative but intriguing route to propellantless propulsion based on the vacuum energy of space.

Redshifted civilizations, galactic empires, and the Fermi paradox	Volume 246 Sep 2026	Chris Reiss, Justin C Feng

Given the vast distances between stars in the Milky Way and the long timescales required for interstellar travel, we consider how a civilization might overcome the constraints arising from finite lifespans and the speed of light without invoking exotic or novel physics. We consider several scenarios in which a civilization can migrate to a time-dilated frame within the scope of classical general relativity and without incurring a biologically intolerable level of acceleration. Remarkably, the power requirements are lower than one might expect; biologically tolerable orbits near the photon radius of Sgr A* can be maintained by a civilization well below the Type II threshold, and a single Type II civilization can establish a galaxy-spanning civilization with a time dilation factor of 104, enabling trips spanning the diameter of the Milky Way within a human lifetime in the civilizational reference frame. We also find that isotropic, monochromatic signals from orbits near the photon radius of a black hole exhibit a downward frequency drift. The vulnerability of ultrarelativistic vessels to destruction, combined with the relatively short timescales on which adversarial civilizations can arise, provides a strong motivating element for the "dark forest" hypothesis.