European Journal of Applied Sciences – Vol. 14, No. 01
Publication Date: January 31, 2026
DOI:10.14738/aivp.1401.19951.
Herndon, J. M. (2026). Comet 3I/Atlas: Divergent Insight and Explanation. *European Journal of Applied Sciences, Vol - 14(01).* 389-396.

Comet 3I/Atlas: Divergent Insight and Explanation

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ABSTRACT

The "*various anomalous characteristics determined from photometric and astrometric observations*" that inspired thoughts that comet 3I/Atlas might represent alien other-world technology, when viewed from a perspicacious perspective, are not necessarily un-natural at all. The "anomalous characteristic" of nickel observed with little or no iron evokes a divergent insight and explanation that 3I/Atlas contains a mass of nickel silicide analogous to Earth's nickel silicide inner core. The "anomalous characteristic" of 3I/Atlas' collimated jet pointing directly at the sun begs the question of both energy source and collimating mechanism. The divergent insight and explanation for 3I/Atlas' internal energy source may be an accumulation of uranium and radioactive waste products with a collimating mechanism that may have been produced in a manner analogous to the formation of kimberlite pipes. The anomalous characteristic of the unusual density of 3I/Atlas may be the consequence of the comet trapping material it encountered on its long sojourn through space. The main implication is that 3I/Atlas may represent part of a small-planet's nickel silicide inner core, perhaps along with a portion of its nuclear fission georeactor assembly. From a pedagogical standpoint, the wide-spread media debate suggests that scientific understanding might be better served by wider diversification in scientific education curriculae.

INTRODUCTION

The idea that comet 3I/Atlas might represent alien other-world technology was first suggested by Avi Loeb and colleagues based upon its display of "*various anomalous characteristics determined from photometric and astrometric observations*" [1]. Here I address a few of those anomalous characteristics from a more perspicacious point of view.

In a recent publication, entitled *Celestial Science: Highest Tier of Knowledge Related to Planets, Stars, Galaxies, Dark Matter and More*, I made the point that historical divisions of the physical sciences limit the sharing of knowledge [2]. For examples, an understanding of geophysical processes within the Earth led to a new potential explanation as to (1) why the far-side of the Moon is practically devoid of massive basalt lava flows (maria), whereas maria are prominent features of the Earth-facing side [3-5] and (2) a potential means for collimating galactic jets [6].

Here I provide some insights as to the possible nature of comet 3I/Atlas from the perspective of celestial science.

Figure 1 is a December 12, 2025 deep image of interstellar Comet 3I/ATLAS captured by the Gemini Multi-Object Spectrograph (GMOS) on Gemini North on Maunakea in Hawaii, one half

of the International Gemini Observatory, partly funded by the U.S. National Science Foundation (NSF) and operated by NSF NOIRLab. This image shows the dust and ices of the comet's coma in the vicinity of the sun.

Figure 1: Comet 3I/Atlas.

DIVERGENT INSIGHTS AND EXPLANATIONS

Anomalous Characteristic 1: Presence of Nickel with Little or No Iron.

Iron in the solar photosphere and in chondritic meteorites is more than 10 times more abundant than nickel [7, 8]. Spectroscopic observation of essentially iron-free nickel in 3I/Atlas has elicited speculation that the comet has "an industrial signature" or is a relic of near-surface small-body chemical processes [9] or reflects some unrecognized chemical process in nature, for example, analogous to the carbonyl process [10].

In the 1970s, while investigating enstatite chondrite meteorites which had been discovered to contain the nickel silicide mineral perryite [11, 12], I realized that, if Earth's core contained silicon, nickel would precipitate as nickel silicide forming a mass almost identical to Earth's inner core [13]. Hans Suess and I discovered that condensation from solar matter at high pressures, high temperatures leads to the state of reduction (oxygen fugacity) observed in enstatite chondrites [14]. Subsequently, I demonstrated by mass ratios that the interior portions of Earth match the components of an enstatite chondrite, as shown in Table 1 (for details, see [15]). The identities shown in Table 1 thus verify Earth's nickel silicide inner core composition [13, 16] and refute the partially crystallized nickel-iron metal inner-core composition previously assumed [17].

Table 1. Comparison of fundamental Earth mass ratios with corresponding ratios for the Abee enstatite chondrite

Fundamental Earth Ratio	Earth Ratio Value	Abee e.c. Ratio Value
Lower Mantle Mass to Total Core Mass	1.49	1.43
Inner Core Mass to Total Core Mass	0.052	theoretical 0.052 if Ni_3Si 0.057 if Ni_2Si
Inner Core Mass to Lower Mantle + Total Core Mass	0.021	0.021
D'' CaS + MgS Mass to Total Core Mass	0.09	.011
ULVZ of D'' CaS Mass to Total Core Mass	0.012	0.012

Thus, a divergent insight and explanation for 3I/Atlas' essentially iron-free nickel content presented here is that a portion of 3I/Atlas consists of a mass of nickel silicide analogous to Earth's nickel silicide inner core.

Anomalous Characteristic 2: Prominent Collimated Jet Pointing Directly at the Sun.
When near the sun, comets' tails point away from the sun due to solar radiation pressure and the solar wind. In striking contrast, 3I/Atlas was observed to have a seemingly inexplicable prominent collimated jet pointing directly at the sun [18, 19]. That "antitail" observation begs the question of energy source and means for collimation.

In 1982, I pointed out the importance of determining in which minerals uranium resides in the Abee enstatite chondrite [20]. Serendipitously, in the same year Murrell and Burnett [21] discovered that most, if not all, of the uranium in the Abee enstatite chondrite occurs in the portion corresponding to Earth's core.

In 1993, I demonstrated the feasibility that uranium at Earth's center functions as a nuclear fission breeder reactor, called the georeactor [22]. Subsequent investigations provided further georeactor understanding, including two independent lines of evidence based upon helium isotope ratios [23-25] and geoneutrinos [26, 27], the basis for georeactor generation of the geomagnetic field [28-37], the cause of geomagnetic reversals and excursions [36, 37], its role in geodynamics [5, 29, 38-42], the broader implications bearing on central nuclear fission reactors in planets and large moons [30, 43-45], its implications on stellar thermonuclear ignition [46], the nature of dark matter [2, 6, 46], thermonuclear ignition of dark galaxies [2, 6, 47], the origin of elements heavier than hydrogen and helium [6], and the origin of galactic cosmic rays [48].

Thus, a divergent insight and explanation for 3I/Atlas' internal energy source may be an accumulation of uranium and radioactive waste products.

Earth's complete primordial condensation and aggregation resulted in the formation of a gas giant planet whose rocky interior was surrounded by 300 Earth-masses of ices and gases, a planet similar in mass to Jupiter [29, 49]. At the center, the rocky planetary interior with its fluid core was compressed to about two-thirds Earth's present diameter by the weight of overlying ices and gases. The T-Tauri solar winds, presumably during thermonuclear ignition of the sun, stripped away the ices and gases.

As pressures built within the Earth, occasionally there would be a "blow out". Pressure would force a column of matter from a depth of about 150 km to puncture a narrow hole a few meters in diameter through all of the overlying rock and explode at the surface in a funnel shape as wide as 200 meters (Figure 2) [50]. The eruptions of these diamond-bearing kimberlite pipes, however, were just sporadic events. Major catastrophic geological violence would occur again and again, as whole-Earth decompression split the continental crust, created new ocean basins [5, 38, 44], produced mountain ranges characterized by folding [51], and caused widespread species extinctions [52].

Figure 2: Former diamond mine in the Far Eastern Federal District, Russia. Courtesy of Staselnik.

By analogy one might expect heat generated deep within 3I/Atlas to cause an eruption from deep within the cometary core in a pipe-like manner opening a collimating pathway for subsequent eruptions.

Thus, a divergent insight and explanation for 3I/Atlas' collimating jet is that it may have been caused in a manner analogous to the formation of kimberlite pipes.

Anomalous Characteristic 3: Unusual density of 3I/Atlas

Preliminary estimates of the density of 3I/Atlas, although subject to large uncertainties, appear inconsistent with density estimates of usual comets.

NASA's Stardust Mission was designed to intercept a comet, acquire samples, and then return them safely to Earth for laboratory investigation. The expectation of the Stardust mission was that these samples would consist of *"ancient pre-solar interstellar grains and nebula condensates that were incorporated into comets at the birth of the Solar System…."* The target chosen was Wild 2, a comet discovered in 1978. This comet was thought to have spent most of its life at a greater distance from the sun, but whose orbit, shown in Figure 3, and orbital period of about six years was believed to have resulted from a 1974 gravitational interaction with Jupiter. At least since its discovery in 1978, Comet Wild 2 has repeatedly traversed the asteroid belt which lies between the orbits of Mars and Jupiter.

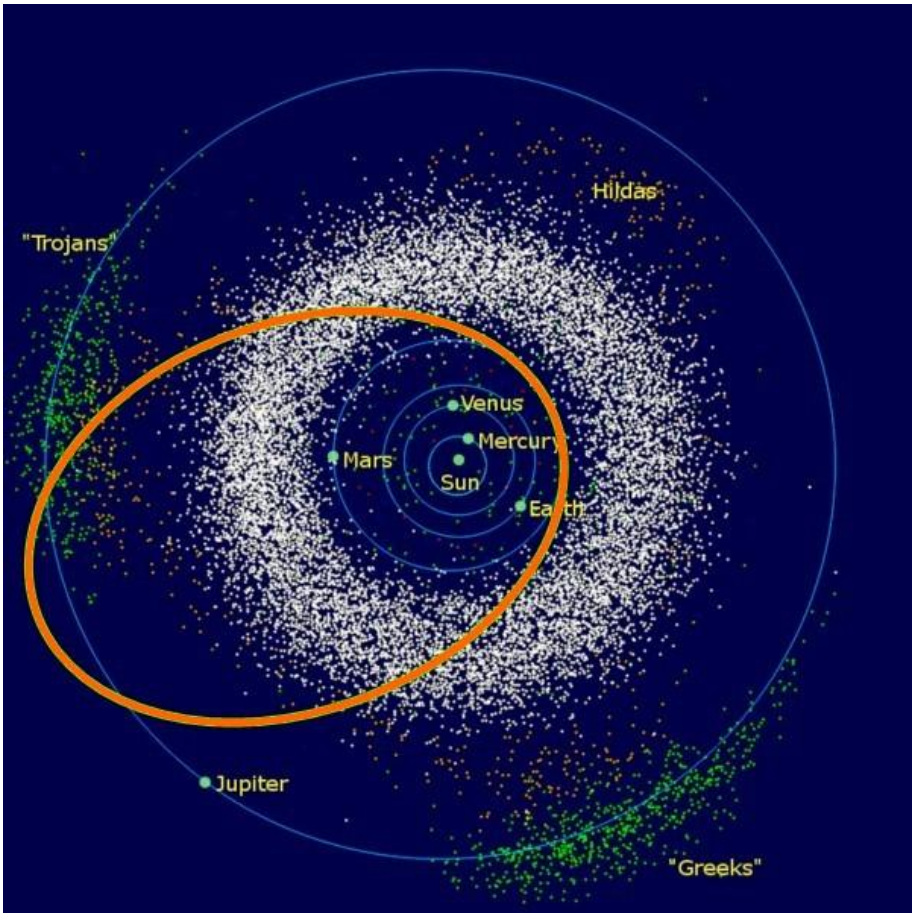

Figure 3: The orbit of Comet Wild 2 in April 2000 (orange) is shown for comparison to the orbits of Jupiter and the terrestrial planets. Asteroids of the main asteroid belt are shown in white.

NASA scientists have had experience trapping interstellar particles on silica gel in previous rocket and space shuttle flights. A similar technique was used to trap released particles from the comet's coma. The Stardust spacecraft was launched February 7, 1999 and flew by comet Wild 2 on January 2, 2004. The sample-return canister landed back on Earth on January 15, 2006.

Rather than bringing back *"ancient pre-solar interstellar grains and nebula condensates,"* the Stardust sample-return canister contained crystalline particles. These crystalline particles,

trapped by the comet [53], for example minerals such as olivine, are similar to the minerals of ordinary chondrites and the re-melted/re-evaporated carbonaceous chondrites. In making repeated orbital revolutions almost entirely within the asteroid belt, the comet itself acted like a massive silica gel particle-trap, sampling and collecting particles it encountered in its sojourn through the asteroid belt.

Thus, a divergent insight and explanation for 3I/Atlas' anomalous density may be the consequence of the comet trapping material it encountered on its long sojourn through space.

CONCLUSIONS

The "*various anomalous characteristics determined from photometric and astrometric observations*" that inspired thoughts that comet 3I/Atlas might represent alien other-world technology, when viewed from a perspicacious perspective, are not necessarily un-natural at all. The "anomalous characteristic" of nickel observed with little or no iron evokes a divergent insight and explanation that 3I/Atlas contains a mass of nickel silicide analogous to Earth's nickel silicide inner core. The "anomalous characteristic" of 3I/Atlas' collimated jet pointing directly at the sun begs the question of both energy source and collimating mechanism. The divergent insight and explanation for 3I/Atlas' internal energy source may be an accumulation of uranium and radioactive waste products with a collimating mechanism that may have been produced in a manner analogous to the formation of kimberlite pipes. The anomalous characteristic of the unusual density of 3I/Atlas may be the consequence of the comet trapping material it encountered on its long sojourn through space. The main implication is that 3I/Atlas may represent part of a small-planet's nickel silicide inner core, perhaps along with a portion of its nuclear fission georeactor assembly. From a pedagogical standpoint, the wide-spread media debate suggests that scientific understanding might be better served by wider diversification in scientific education curriculae.

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