

The Extraterrestrial Hypothesis: A Case for Scientific Openness to an Interstellar Explanation for Unidentified Anomalous Phenomena

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Over the past several years the question of unidentified anomalous phenomena (UAP) has commanded increasing interest. Attention has generally focused on two main classes of hypotheses: a conventional terrestrial explanation (e.g., human technology), and a more extraordinary extraterrestrial explanation (i.e., an intelligent civilization from elsewhere in the cosmos). However, while some authorities seem open to the latter (e.g., elements of the military and intelligence communities), on the whole scientists appear reluctant to consider it. This may be because such ideas have long been relegated to the “paranormal” and dismissed as a legitimate focus of enquiry. However, work has nevertheless flourished on adjacent ideas, such as the possibility of extraterrestrial life per se and the viability of interstellar space travel. As such, given these adjacent ideas, together with new evidence concerning UAP that seems to elude conventional understanding, this paper argues that the scientific community should engage with the extraterrestrial hypothesis as a real and genuine possibility.

Keywords: extraterrestrial, intelligence, UAP, interstellar

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Introduction

In the modern era, UAP have been a topic of public interest since at least the 1940s. However, for the most part, authorities have tended to downplay their significance, at least in public, with the general message from various institutions – including scientific, political, military, intelligence, and media communities – being that UAP have a conventional prosaic explanation. As such, any suggestions otherwise, e.g., an extraterrestrial origin, have tended to be dismissed. Over the past few years though, various developments have meant some

authorities have begun to visibly take the topic more seriously, including being more open to an extraterrestrial explanation. However, overall, this openness has not yet permeated the scientific community. As such, this paper argues the community should engage more seriously with this possibility.

The paper begins with a brief overview of the UAP topic, then looks at how scientists have tended to default to a prosaic explanation for UAP, and how this skepticism still dominates even today. These sections mostly focus on the US context, partly because this region arguably has historically had the most UAP activity, and also because this is the author's own context and area of familiarity. However, it should also be emphasized that, contrary to misconceptions, this is a genuinely worldwide phenomenon. In Latin America, for instance, The Washington Post reports that at least four countries (Uruguay, Argentina, Chile, and Peru) have dedicated government programs that for decades have assessed UAP activity (McCoy, 2023), while others such as Brazil likewise have an extensive history of sightings and investigations (Vernet, 2023). There are variations in how countries have approached the issue; authorities in Latin America appear to have historically been more open compared to counterparts in the US. Nevertheless, in terms of the *scientific* response, many of the reactions discussed here seem relatively widespread. Having articulated this background context, the paper then makes the case for openness to an extraterrestrial hypothesis based on work around, (a) the likelihood of extraterrestrial intelligence existing per se, and (b) the viability of interstellar travel.

The UAP Issue

For centuries, people worldwide have observed aerial phenomena that seemed “anomalous” in some way, some of which crucially we now – with our more advanced technologies and scientific understanding – might still regard as extraordinary even today (Vallée, 2008; Lomas & Case, 2023). In recent decades these have attracted the label Unidentified Flying Object (UFO), and more recently UAP, with the latter expanding even further lately to denote unidentified *anomalous* phenomena (with a realization that some UAP travel underwater and are not only aerial). Indeed, there have been many sightings over the years: the Mutual UFO Network for instance has collected over 200,000 public reports since its founding in 1969 (Mellon, 2022). However, these have generally not been taken seriously by authorities, tending to be dismissed as perceptual or cognitive error, hallucination, delusion, or fraud. As such, the topic has generally been downplayed by authorities, in public at least. Private concern may be another matter. Indeed, Rear Admiral Hillenkoetter – the first Director of the CIA, from 1947 to 1950 – admitted as such, with an article in The New York Times (1960) quoting him as saying “Behind the scenes, high-ranking Air Force officers are soberly concerned about the UFO’s. But through official secrecy and ridicule, many citizens are led to believe the unknown flying objects are nonsense.” Similarly, he was reported by Griffen (1960) as having “recently declared ... about the flying saucers” that: “the unknown objects are under intelligent control. It is imperative that we learn where the UFO’s (Unidentified Flying Objects) come from and what their purpose is.” Griffen further notes that, regarding “the years of World War II and the years immediately following,” Hillenkoetter said, “I know that neither Russia nor this country had anything even approaching such high speeds and maneuvers.”

However, at least in public, any evidence and concern authorities may have had about UAP has tended to be denied or at least downplayed. But this began to change in 2017 in the US, when footage of three military encounters with UAP was published online, bringing

the topic to wider attention, especially following a New York Times article, “Glowing Auras and ‘Black Money’: The Pentagon’s Mysterious U.F.O. Program” (Cooper et al., 2017). The military angle was especially significant, since reports emanating from the military are more credible for many reasons: they involve observers who have excelled in occupations that require the highest skill and training in visual perception and processing, meaning they are regarded as high quality witnesses; moreover, their testimony is often triangulated with other information sources (e.g., radar). As a result, authorities began to take a more public and open stance. In April 2020 the Department of Defense (2020) confirmed the footage was genuine. Soon after, the US established a UAP Task Force to investigate such incidents (Office of the Director of National Intelligence, 2021, 2023a, 2023b), which since November 2021 has been known as the All-domain Anomaly Resolution Office (AARO). Even though it has very limited scope – mostly restricted to events since 2019 and focusing on military encounters in US airspace and littoral waters – its findings are notable.

In its initial 2021 report, of 144 events studied – spanning 2004 to 2021, but mostly from 2019 onwards – in 143 cases it determined that we “lack sufficient information in our dataset to attribute incidents to specific explanations.” Its 2022 report (released in January 2023) considered a further 366 events, of which 177 similarly eluded definitive conclusions, and “demonstrated unusual flight characteristics or performance capabilities, and require further analysis.” Its most recent report in October 2023 – focusing on events up until April 2023 – added a further 291 cases, bringing the total to 801, noting “many reports from military witnesses do present safety of flight concerns, and there are some cases where reported UAP have potentially exhibited one or more concerning performance characteristics such as high-speed travel or unusual maneuverability.” Furthermore, the report suggests these cannot be attributed to the US (“AARO has de-conflicted these cases with potential US programs”) or its adversaries (“none of these UAP reports have been positively attributed to foreign activities”). Speaking about the cases under review in May 2023, Dr Sean Kirkpatrick, the Director of AARO, said that he suspected most *did* have conventional explanations, and only remained unidentified through lack of good data. However, around two to five percent – roughly 15-40 – were “possibly really anomalous” (Wendling, 2023). Moreover, it is worth noting that critics believe AARO may be deliberately downplaying or obscuring the significance of the topic and the extraordinary nature of some evidence, following a trend with comparable previous investigations, such as Projects Sign and Grudge, as discussed below. Journalist Josh Boswell (2022), for instance, reported that a source in the Office of the Director of National Intelligence had told him, “They’re patting themselves on the back that they’ve resolved over half of them... But we don’t give a crap about the ones they’ve resolved. Yeah, there’s balloons up there, and balloons are sometimes mistaken for UAP. But there are s***loads of classified videos that are pretty profound and pretty clear. They don’t want to talk about this stuff, because they really, really don’t know what the hell they are. That’s the truth.”

Nevertheless, even if such claims have validity, the reports still contain many intriguing details. The latest for example includes a glossary featuring phrases which seem significant but oddly are not used in the unclassified report – such as “UAP engagement,” defined as “Bringing UAP under kinetic or non-kinetic fire, to deny, disrupt, or destroy the phenomenon and/or its object(s)” – which makes one wonder if they *are* discussed in the classified version. Also notable is that the most populous category of identifiable sightings is small “orbs” (25% of reports), compared to irregular shapes (6%), ambiguous sensor contact (5%), oval (4%), rectangle (2%), disk (2%), oval (1%) and triangle (1%), with 53% not reported. These orbs

are usually either, white, silver, metallic, or translucent (with the latter frequently featuring a dark cube inside), and despite lacking wings, apparent forms of propulsion, or thermal exhaust, are seemingly capable of unusual manoeuvres and flying at velocities up to twice the speed of sound. Indeed, similar orbs have been observed for decades (Hanks, 2023). A New York Times article in 1944, for example, titled “Floating mystery ball is new Nazi air weapon,” told how “Airmen of the American Air Force report that they are encountering silver colored spheres in the air over German territory,” and that “The spheres are encountered either singly or in clusters. Sometimes they are semi-translucent.” At night, the spherical objects appeared as red or orange spheres that flew around, or directly alongside, military aircraft. American aviators described these as “foo fighters” – with “foo” thought to be an adaptation of the French *feu* (meaning fire) that came to prominence in a US context in a cartoon about a mishap-prone firefighter (Joseph, 2018). An article in The Indianapolis Star, for instance, reported how “these balls of fire appear suddenly and accompany the plane for miles,” keeping up at 300 mph, and yet – contrary to initial military fears of these being a new Nazi weapon – one pilot noted how “they don’t explode or attack us. They just seem to follow us like will-o-the-wisps” (Wilson, 1945).

There has been much speculation as to the nature of such UAP, ranging from the mysterious and little-understood phenomenon of “ball lightning” (Canan, 2023) to “stealth-driven extraterrestrial probes imbued with artificial intelligence... and a complex camouflage system” (Bower & Redmond, 2023). Significantly, while much of the Task Force’s work is still classified, comments from key figures indicate the possibility of some UAP being truly extraordinary – rather than having a conventional human explanation – is being taken seriously. Barack Obama, for example, said in 2021, “There’s footage and records of objects in the skies that we don’t know exactly what they are. We can’t explain how they moved, their trajectory. They did not have an easily explainable pattern” (Von Rennenkampff, 2023a). Similarly, John Ratcliffe, former Director of National Intelligence, said “we are talking about objects that have been seen by Navy or Air Force pilots, or have been picked up by satellite imagery, that frankly engage in actions that are difficult to explain, movements that are hard to replicate, that we don’t have the technology for” (Lewis-Kraus, 2021). Indeed, even more concerningly from a security perspective, he suggested these UAP demonstrate technologies “frankly, that we are not capable of defending against.” Moreover, despite recent efforts to investigate such phenomena, some are still perplexing authorities. Speaking in August 2023, General Mark Milley, Chairman of the Joint Chiefs of Staff, said the military “can explain a lot of it [i.e., UAP], but there is some that’s really kind of weird and unexplainable” (Wolfgang, 2023). To that point, commentators read significance into the news in August that Deputy Defense Secretary Kathleen Hicks had moved to personally oversee AARO, implying the issue was being taken increasingly seriously (Vincent, 2023).

Importantly, following decades of denial, obfuscation, and derision, the official discourse regarding UAP has undergone a striking evolution in recent years, with many senior figures talking openly about an extraterrestrial hypothesis (ETH). NASA Administrator Bill Nelson, who received UAP briefings from naval aviators while serving as a senator, was asked to speculate about the nature of UAP, and said obliquely but significantly, “Who am I to say that planet Earth is the only location of a life form that is civilized and organized like ours?” (Von Rennenkampff, 2021b). Likewise, ex-CIA director John Brennan called it “presumptuous and arrogant for us to believe that there’s no other form of life anywhere in the entire universe,” adding cryptically, “I think some of the phenomena we’re going to be seeing continues to be unexplained and might, in fact, be some type of phenomenon that is the

result of something that we don't yet understand and that could involve some type of activity that some might say constitutes a different form of life" (Ciaccia, 2020). Similarly, when asked about UAP, former presidents Obama and Clinton no longer reflexively dismiss such questions with humour: questioned about the phenomenon in 2021 on Live Kelly and Ryan (2021), Clinton spoke about the vastness of the cosmos and the probability of life existing elsewhere in the universe, while interviewed by Ezra Klein (2021) Obama expressed interest in learning more about UAP and speculated about the implications of the ETH. Perhaps even more significantly, Avril Haines, current Director of National Intelligence, refused to rule out an ETH, which is unprecedented for a sitting high-level national security official and exemplifies the remarkable shift in tone and substance of UAP-related discussions by senior government officials (Von Rennenkampff, 2021a).

Evidently, authorities are perplexed and moreover concerned about UAP. These phenomena therefore constitute a real empirical mystery. In that respect, an extraterrestrial hypothesis (ETH) is very much on the table, as noted above, and as articulated by Christopher Mellon (2023), former Deputy Assistant Secretary of Defense for Intelligence in the Clinton and George W. Bush administrations, who is closely connected to the UAP topic. Interviewed in October by Chris Cuomo, he said the UAP are "doing things that are way beyond anything that we could do, even in our most cutting edge programs," such as "descending in a vertical line in a couple of seconds from 80,000 feet to 20,000 feet, hovering, then instantly accelerating to hypervelocity, to hypersonic speeds, without friction, without plasma, without breaking the sound barrier." Crucially, he states these abilities far exceed the most advanced technology possessed by the government or aerospace companies: "I have friends who worked at the Lockheed Martin Skunk Works for decades... and they're like, 'There's no way, you know, we could do one or two of those things ... [but there's] a lot of stuff that is utterly baffling and so far beyond what we're capable of.'" Although this doesn't necessarily mean an extraterrestrial explanation, Mellon urges us to be open to this possibility: "I've not taken a position that any of these ... specific cases are necessarily of extraterrestrial origin, but there are cases like the Nimitz where I don't know how else to explain it, and my main point is that we need to keep an open mind and not rule that out." Indeed, he notes that "Of course there's a possibility that somebody else's space program has found us in an infinite universe. This universe is so strange and so bizarre and so immense, why would we be surprised if we encountered intelligent machines from somewhere else." However, for the most part, mainstream science has not been characterized by this kind of open-minded curiosity, and instead has generally assumed that UAP must have a conventional origin, as we consider next.

The "Prosaic" Turn

In the modern era, UAP have been a topic of interest and concern ever since the orb and foo fighter encounters in World War II noted above. Initially, authorities mainly feared these represented new technologies developed by their international adversaries. However, by the late 1940s there was already serious consideration of a yet more extraordinary ETH, especially after UAP sightings began occurring across the mainland US, beginning in June 24th 1947, when pilot Kenneth Arnold saw what he famously called nine "saucer-like things... flying like geese in a diagonal chainlike line" at speeds exceeding 1,000 mph. near Mount Rainier in Washington State (Roos, 2020). The authorities appear to have swiftly concluded such sightings could not merely be dismissed as misidentification of prosaic objects, as articulated in a famous memo in September 1947 by Lieutenant General Nathan Twining (1947), the

Army Chief of Staff, who stated, “the phenomenon reported is of something real and not visionary or fictitious,” that the objects appeared to be disc-shaped, “as large as man-made aircraft,” and “controlled either manually, automatically or remotely” (Zabel, 2021). As such, at his urging, in early 1948 the Air Force established Project Sign, an intelligence operation based at Wright-Patterson Air Force Base in Dayton, Ohio, to examine the issue. It was subsequently reported – initially by Air Force UFO investigator Edward Ruppelt (1956) – that later in 1948 the project submitted an Estimate of the Situation, classified Top Secret, that UAP were extraterrestrial in origin. However, the report was reportedly rejected by the Air Force Chief of Staff, General Hoyt Vandenberg, ostensibly for lack of proof. However, Swords (2000) also suggests that “elements of very high rank in the Pentagon” would not actually *accept* an ETH for UAP. Whatever the motives and reasons, Project Sign was wound up that very same year.

In its place, the Air Force launched Project Grudge in 1949. Its ethos was later revealed by astronomer J. Allen Hynek (1977), who was consultant to both Sign and Grudge, and who recalls there being two schools of thought in the Air Force regarding UAP. Although one school believed UAP were genuinely extraordinary and most likely extraterrestrial, the second, which constituted a majority at the Pentagon, regarded the topic as “nonsense,” as Swords (2000) puts it (p.43). Crucially, the Air Force’s elite Scientific Advisory Board sided with the latter, as did Hynek himself at that point, who said, “It may be that my interim reports helped the transformation of Project Sign into the extremely negative Project Grudge, which took as its premise that UFOs simply *could not be*. I tried hard to find astronomical explanations for as many cases as I could, and in those that I couldn’t I reached to draw out as many natural explanations as possible. Sometimes, I stretched too far. Clearly, I, too, thought at the time that UFOs were just a lot of nonsense. I enjoyed the role of debunker” (p.17, italics in original). Thus, Project Grudge appears to have been designed, as Haines (1999) puts it, “to alleviate public anxiety over UFOs via a public relations campaign designed to persuade the public that UFOs constituted nothing unusual or extraordinary.” Similarly, although the CIA noted that “since there is a remote possibility that they may be interplanetary aircraft, it is necessary to investigate each sighting,” it recommended it conceal its interest from the public and the media “in view of their probable alarmist tendencies.” Comparable reactions occurred in the UK; in documents released by the National Archives in 2010, a wartime report claimed that Winston Churchill ordered that a significant UAP sighting witnessed by an RAF crew be kept secret because he believed “it would cause mass panic and it would shatter people’s religious views” (BBC, 2010). Thus, from the early-1950s onwards, as far as the public was concerned, political and military authorities had declared the UAP question a non-issue.

Most relevantly here, such conclusions permeated the scientific community too, especially following the Condon report in the late 1960s. Following a wave of UAP sightings in the early-mid 1960s, the Air Force commissioned an authoritative panel to thoroughly assess the situation, led by physicist Edward Condon (1969). Intriguingly, a substantial minority of sightings resisted prosaic explanations, and the report actually leaned towards an ETH for some UAP. One of its detailed case studies, for instance, was the “Lakenheath-Bentwaters” incident, involving a series of radar and visual contacts with UAP over airbases in eastern England on the night of 13-14 August 1956. Of this, the report concludes, “although conventional or natural explanations certainly cannot be ruled out, the probability of such seems low in this case and the probability that at least one genuine UFO was involved appears to be fairly high.” Crucially though, despite such anomalies, the report’s overall conclusion

implied that UAP were prosaic in origin and moreover were of no scientific interest: “Our general conclusion is that nothing has come from the study of UFOs in the past 21 years that has added to scientific knowledge.” Most relevantly here, this message was embraced by the scientific establishment. The National Academy of Sciences noted that, although “there remain UFO sightings that are not easily explained,” there are “so many reasonable and possible directions in which an explanation may eventually be found, that there seems to be no reason to attribute them to an extraterrestrial source without evidence that is much more convincing (Clemence et al., 1969, p.6). Similarly, an article in *Science* was entitled, “Condon group finds no evidence of visits from outer space” (Boffey, 1969), while a *Nature* (1969) editorial was particularly scornful, declaring it “a monumental achievement, but one of perhaps misapplied ingenuity. It would doubtless be inapt to compare it with earlier centuries’ attempts to calculate how many angels could balance on the point of a pin; it is more like taking a sledgehammer to crack a nut, except that the nuts will be quite immune to its impact.”

Critics of course took issue with the report’s dismissive conclusions, with Hynek (1972) deriding its summary as “singularly slanted,” not least in that it “avoided mentioning... that the committee had been unable to furnish adequate explanations for more than a quarter of the cases examined.” Nevertheless, it essentially shelved the topic from serious scientific consideration. As Hynek put it, Condon “was the coup de grace to the UFO era. Science had spoken. UFOs didn’t exist, and the thousands of people who had reported strange sightings ... could all be discounted as deluded, hoaxers, or mentally unbalanced” (cited in Coulthart, 2021, p.66). Of course, science is not a monolith, and scientists differ on many topics. Even so, it is certainly permissible to speak of a scientific *consensus* regarding a given phenomenon. In that respect, “normal” is whatever the consensus has established is real, and “paranormal” is whatever falls outside that demarcation. Most relevantly here, since Condon, UAP have generally been placed in the paranormal camp, alongside all manner of unusual phenomena similarly dismissed with ridicule. This attitude is encapsulated, for example, by figures who have embraced the role of “debunker,” as exemplified in a New York Times obituary for James Randi, headlined the “magician who debunked paranormal claims,” in which he is eulogized as turning his “formidable savvy to investigating claims of spoon bending, mind reading, fortunetelling, ghost whispering, water dowsing, faith healing, U.F.O. spotting and sundry varieties of bamboozlement” (Fox, 2020). This quote neatly encapsulates the status of UAP over recent decades: placed amongst a host of extraordinary phenomena likewise dismissed as unreal by the scientific consensus and relegated out of bounds.

Contemporary Skepticism

Significantly, the UAP topic generally remains off limits for the scientific community today, most of whom still appear to situate it in the discreditable paranormal category. This was evident for example in responses to a dramatic Congressional hearing into UAP on July 26, 2023 (available at C-Span, 2023). There were three witnesses testifying under oath, including two former Navy pilots who have been vocal about UAP encounters they and their colleagues have experienced, as well as David Grusch, an intelligence community whistleblower who alleges that authorities and private aerospace companies have for decades actually maintained a secret UAP “crash retrieval” and “reverse engineering” program (Kean & Blumenthal, 2023). At the time of writing there is no way of knowing the validity of his claims. However, Shellenberger et al. (2023) reported in September that over the recent months “at least 30 other whistleblowers working for the federal government or government

contractors have given testimony” to the Office of the Intelligence Community Inspector General, the Defense Department Inspector General, or to Congress, while a further 30-50 have offered similar testimony to AARO. Indeed, in October, James Lacatski – who between 2008 and 2010 headed a prior US government investigation into UAP – published a book, which was significantly cleared for release by the Pentagon, in which he stated “the United States was in possession of a craft of unknown origin” (Lacatski et al., 2023). Asked about this on the *Weaponized* (2023) podcast, Jeremy Corbell queried, “You told us, because you were *allowed* to tell, us that our government has a UFO in its possession and has been able to access the inside of it, right?,” and Lacatski responded: “Yes, I was allowed to tell you.” Commenting on these disclosures, Sharp (2023b) highlighted the significance of the phrase “unknown origin,” noting that this same phrase features in proposed new government legislation that appears to be taking these kinds of claims seriously.

That is, in July 2023, Chuck Schumer, Majority Leader of the Senate, introduced bipartisan proposals for an “Unidentified Anomalous Phenomena Disclosure Act” (U.S.C. S.2226, 2023). As reported in *The New York Times*, this would create “a commission with broad authority to declassify government documents about U.F.O.s and extraterrestrial matters, in an attempt to force the government to share all that it knows about unidentified phenomena” (Barnes, 2023). Importantly, the legislation essentially reiterates Grusch’s allegations, including defining “legacy program” (i.e., efforts to “collect, exploit, or reverse engineer technologies of unknown origin”), describing “biological evidence of non-human intelligence,” and mandating government seizure of UAP materials held by private entities. It is a near-impossibility that the Senate Majority Leader would propose such remarkable legislation absent highly credible corroborating evidence or testimony. Indeed, a press release from the Senate Democrats (2023) announcing the legislation describes how a sweeping congressional investigation “uncovered a vast web individuals and groups with stories to share” about UFOs. According to Schumer, “The American public has a right to learn about technologies of unknown origins, non-human intelligence, and unexplainable phenomena.”

However, despite such developments, many scientists have been vocal on social media in their disdain for the topic. While not everyone has been dismissive, well-known figures appear to be not merely skeptical but outright scornful, even – perhaps especially – those with expertise in the very fields related to the phenomenon. These include Brian Cox (2023), Neil DeGrasse Tyson (2023), and perhaps most strikingly Seth Shostak (2023), senior astronomer at the SETI Institute, who wrote an article mocking the Congressional hearing, wondering, “Where is the evidence?” This of course is a reasonable question. However, he simply said, “It’s MIA. Neither Grusch nor anyone else claiming to have knowledge of secret government UAP programs has ever been able to publicly produce convincing photos showing alien hardware splayed across the landscape... For reasons that are always unclear, the critical evidence that would convince anyone of alien presence in our ‘hood is classified. It can’t be made public.” This reasoning overlooks the basic context of Grusch’s allegations, including that this evidence is classified, for reasons surely even skeptics should appreciate. Moreover, he reportedly *has* given details to the Inspector General of the Intelligence Community, and in the hearing explicitly said he could also give details to committee members in a “SCIF” (Sensitive Compartmented Information Facility). When asked by Rep. Ocasio-Cortez, “If you were me, where would you look [i.e., for evidence regarding UAP] – titles, programs, departments, regions...?,” he replied, “I’d be happy to give you that in a closed environment. I could tell you specifically.” Given this exchange, either Shostak did not watch the whole hearing or did not appreciate the significance of this moment. Nevertheless, he maintained

his scornful tone in other forums, including an interview with the LA Times, in which he joked about interstellar travel (Petri, 2023): “‘It’s very expensive to do that ... And aliens probably don’t have “unlimited amounts of alien money,” he added with a chuckle.”

It is perhaps one thing for the public to have these kinds of dismissive reactions. Indeed, several articles highlighted the extent to which many people seemed uninterested in the hearing, such as a Forbes piece titled “Nobody cares about David’s Grusch’s revelations” (Di Placido, 2023). However, coming from figures like Shostak, such dismissals are striking. To be clear, skepticism regarding the hearing, and the topic generally, is not only reasonable but essential from a scientific perspective. However, these responses go beyond skepticism into dismissal and disinterest, which is arguably *anti*-scientific. Perhaps the most charitable explanation for such reactions is that extraterrestrial explanations for UAP are still firmly situated in the paranormal box in which they have been confined since the Condon report, and so people like Shostak have long been accustomed to disregarding the kinds of sensational claims aired at the hearing. However, the key question now is whether such ideas *still* deserve to be dismissed as paranormal, or conversely whether, in light of the developments above, they should be taken seriously. Indeed, numerous eminent figures have argued just that, like Harvard’s Avi Loeb (discussed below). Moreover, although the UAP topic itself has long been dismissed, there is a long, reputable tradition of more open and legitimised scientific interest in topics that are UAP-*adjacent*. Crucially, such work suggests it may well be feasible for UAP to be extraterrestrial in origin.

Before considering this, we should note this is not the *only* hypothesis on offer besides a conventional prosaic explanation. Indeed, the linguistic nuance around this topic is intriguing, particularly the emphasis on “non-human intelligence” (NHI) in the Disclosure Act, where it appears 22 times and is defined as “any sentient intelligent non-human lifeform regardless of nature or ultimate origin that may be presumed responsible for unidentified anomalous phenomena or of which the Federal Government has become aware” (p.6). This wording implies that if UAP genuinely are extraordinary, the ETH is not the only possible explanation. In fact, key figures have made this very point. For example, Grusch was interviewed by Ross Coulthart on News Nation (2023), and when asked if the government had been “concealing the existence on this planet of alien life,” clarified, “I would couch it as “non-human intelligence”... [because] I don’t necessarily want to denote origin. I don’t think we have all the data to say, “Oh, they’re coming from a certain location.”” As such, there is an emerging debate around other possibilities, which can be grouped together under the label of “ultraterrestrial” hypotheses (Lomas, 2023). This is a broad category of conjecture involving the idea that UAP may represent the activities of NHIs *already* present in the Earth’s environment in some sense, hence *ultra*-terrestrial. In that respect, Puthoff (2022) offers a taxonomy of such hypotheses, including “extradimensional, crypto-terrestrial, demonic/djinn, proto/ancient human, [and] time-travelers” (p. 20001), which he defines as “sequestered terrestrial cultures... existing alongside us in distinct stealth.”

Clearly, these are extraordinary hypotheses that scientists may struggle to seriously consider. However, such is the deeply strange nature of UAP that people seem compelled to consider these alternatives. Take for instance Garry Nolan, an immunologist with an endowed chair at Stanford, who has for the past decade been involved in UAP research (Nolan et al., 2022). In a recent interview on Spotlight (2022) with Nolan, Coulthart posed a similar question to the one he asked Grusch, and received a comparably ambiguous answer: “You believe, on the evidence, that there is a non-human intelligence, of advanced technology, on this planet?” Nolan replied: “Advanced capabilities. No, I don’t know whether it’s a technology per se,

because I'm leaving open the idea that it's some form of consciousness that is non-material. And I know, say to my colleagues out there, this sounds absolutely crazy. But if you've seen the things that I've seen, you would only be able to come to a similar conclusion." Thus, some UAP are seemingly so extraordinary that people are forced to think outside the box and consider ultraterrestrial possibilities. One such theory, which Nolan was perhaps alluding to, is the "interdimensional" hypothesis, which suggests UAP may involve beings from dimensions that coexist alongside the four dimensions of spacetime we usually perceive (Lomas, 2023). Another is time-travellers, which is now being given serious consideration by scholars, most notably Masters (2019, 2022). However, when it comes to "extraordinary" explanations for UAP, the main hypothesis on the table is the extraterrestrial one, which is our focus here. In that respect, the first consideration in assessing this possibility is the likelihood of there being forms of extraterrestrial intelligence per se.

Extraterrestrial Intelligence

Before considering the possibility that extraterrestrial NHI could have actually engaged with Earth – hence being responsible for UAP – the first question is whether such NHI might exist at all. This question itself has two parts, namely, the possibility of (a) extraterrestrial *life*, and (b) such life being intelligent. Interestingly, before the 20th Century, the scientific consensus arguably leaned towards both being true, before swinging the other way as understanding developed, only for it subsequently to revert to its original position in recent years. In the 19th Century, the existence not merely of life elsewhere but intelligent forms held sway, as exemplified by an 1831 astronomy textbook, *The Young Astronomer*, which explained, "To the people who live on Mars, this earth probably appears larger than Mars does to us" (cited in Library of Congress, 2023). This view was solidified by the apparent observations of "canals" on Mars, a network of long straight lines in the equatorial regions (Laskow, 2016). These were first described by Italian astronomer Giovanni Schiaparelli in 1877, though significantly he called these simply *canali* ("channels"), which was mis-translated as "canals," with the latter implying technological craftsmanship. Nevertheless, the idea was embraced by scientists, perhaps most notably renowned astronomer Percival Lowell, who published three books on the topic: *Mars* (1895), *Mars and its Canals* (1906), and *Mars as the Abode of Life* (1908). However, by the early 20th century, the consensus had turned against the idea of constructed canals, instead regarding these as merely optical illusions. The issue was then completely settled in 1965 when photographs taken by NASA's Mariner IV found no canals at all, not even something that could be misinterpreted as such.

Given such findings, by this point the scientific community had come to regard both (a) and (b) as highly improbable, not least because planetary systems were thought to be very rare. Indeed, only in 1995 was the first extrasolar planet – orbiting 51 Pegasi, about 50 light-years away – discovered by Mayor and Queloz (1995). However, as technologies continued to develop, endowing the field with better data and knowledge, the consensus began shifting again, with both (a) and even (b) now regarded as not only possible but a near *certainty* by most experts. This epistemological evolution is captured, for instance, in the fact that The Royal Society (2010) in the UK – the world's oldest and arguably most prestigious scientific academy – convened a meeting in 2010 on "The detection of extraterrestrial life and the consequences for science and society." As its abstract stated, "Astronomers are now able to detect planets orbiting stars other than the Sun where life may exist, and living generations could see the signatures of extraterrestrial life being detected. Should it turn out that we are not alone in the Universe, it will fundamentally affect how humanity understands itself – and

we need to be prepared for the consequences.” Here we shall consider (a) and (b) in turn, but both essentially are founded on the sheer unfathomable size of the universe, and especially on the near infinity – in practical terms – of stars. Although estimates vary, NASA (2023) calculates our Milky Way contains at least 100 billion stars and the observable universe at least 2 trillion galaxies (NASA, 2016). This means – if galaxies are all roughly similar size – there may be 200 sextillion (200 billion trillion) stars in the observable universe. The next question is planets. Although the number of confirmed exoplanets in our galaxy is now above 5,000, NASA has suggested that *every* star could potentially host an exoplanet – with some stars, like our own, having more than one – meaning the actual number could be far higher than 100 billion (Waichulis, 2023). Extrapolating across the whole cosmos, the number of planets may well thus exceed the 200 sextillion stars.

Not all exoplanets may be *habitable* of course. This has traditionally been thought to require highly specific conditions, first in terms of the planet itself (e.g., rocky terrain capable of supporting liquid water on its surface), and moreover in its relationship with its star, being in a “Goldilocks’ zone” where conditions are “just right” (e.g., neither too near or far from the star, thus being neither too hot nor cold). Even accounting for these parameters though, such planets are thought relatively common, with estimates just for our galaxy ranging from 300 million (Bryson et al., 2020) to 6 billion (Westby & Conselice, 2020) up to possible even *every* star, which could mean up to 100 billion (Ojha et al., 2022). Then, in terms of proximity, Madau (2023) has calculated there may be as many as 11,000 “temperate terrestrial planets” – Earth-size planets in the habitable zone – within 100 parsecs of our Sun (with 1 parsec being 3.26 light-years, and our galaxy 30,000 parsecs across). Fundamentally, whichever calculation one adopts, if galaxies potentially run into the *trillions*, the number of habitable planets is incalculably large. Furthermore, even these expansive calculations are now being recalibrated to be even more generous in light of research such as analyses of “extremophiles,” which shows that terrestrial life can grow and reproduce in intensely inhospitable conditions, including temperatures as low as -15 °C and as high as 122°C (McKay, 2014). Moreover, in terms of atmospheric biosignature gases necessary for life, the oxygen-rich environment of Earth may not be essential, and a hydrogen-dominated atmosphere – as for instance found on Jupiter, Saturn, Uranus, and Neptune – can potentially support life (Seager et al., 2020). Such discoveries suggest the parameters of the Goldilocks zone may be wider than hitherto suspected.

However, just because a planet is habitable, this doesn’t mean it *does* actually have life. Here we run into deep questions around how and why life emerged on Earth, which are themselves still unresolved and much debated. Arguably the current dominant view is that life emerged out of self-replicating RNA (ribonucleic acid) molecules (Bernhardt, 2012). However, they are themselves complex, so the question arises of how *they* emerged, with suggestions that very specific conditions needed to be in place (Le Vay & Mutschler, 2019), such as prebiotic polymers (Guseva et al., 2017). Details aside, the key point is that even if a planet is in a Goldilocks zone, this may only be a necessary but not sufficient condition for life to arise, and highly particular conditions may have been required to allow life to emerge on Earth. The question then becomes whether Earth is *singular* in that way, or whether such conditions obtain elsewhere. Although currently unanswerable regarding habitable planets outside our own solar system, based simply on the sheer number of planets, many observers consider it unlikely that Earth *is* singular (Bean et al., 2017). Moreover, emboldened by research on extremophiles, scholars are increasingly confident that life may be relatively tenacious, prolific, and widespread. Madau (2023) for example suggests that at least 1% of

habitable planets may give rise to microbial life. Indeed, researchers have found potential signatures of organic life just within our own solar system, including Venus (Lea, 2023), Mars (Sharma et al., 2023), and Enceladus (one of Saturn's 146 moons) (Postberg et al., 2023). Relatedly, the recent NASA mission to collect and study samples from the 4.5-billion-year-old asteroid Bennu indicates that it may contain "building blocks of life on Earth," including "high-carbon content and water" (Donaldson, 2023).

Moreover, even more striking findings may await discovery. For example, analysing "official NASA Mars photographs" from the Curiosity Rover, Joseph and Schild (2023) published images of what they interpret as "the wreckage and debris from extraterrestrial spacecraft, partially buried bones, the body of a "humanoid" stretched out on a "cushion;" the head of a "humanoid" still wearing a metal device on the front of its "face" adjacent to a *cratered* debris field, two "humanoid" skulls including one that is atop what may be a raised elongated burial mound, UAPs/UFOs photographed in the skies of Mars and a silver-saucer shaped structure upon the ground" (p.54). Caution is needed in interpreting such data of course, particularly given our cognitive habit of "pareidolia": the tendency to perceive a specific, often meaningful, image in a random or ambiguous visual pattern. This is the prevailing scientific interpretation of the famous "Face on Mars," a mile-wide facial likeness obtained by NASA's Viking 1 in 1976 (Martinez-Conde & Macknik, 2012). However, we must also be wary of simply *assuming* any apparently anomalous object is pareidolia, especially in cases like Joseph and Schild's paper, given these strange objects are situated in close proximity, and moreover – if they do potentially represent a UAP crash – have a plausible theory linking them together. Moreover, we should note that even if we cannot *currently* find life on places like Mars, it could still have been there in the past, with evidence subsequently lost to time. As Avi Loeb (2022) put it, "Planets like Mars or Earth could have given multiple births to technological civilizations that were a billion years apart and hence were not aware of each other. Like stable parents, the planets recovered from the environmental impact of these civilizations over time."

Furthermore, through developments like the James Webb telescope we may also be near to finding life outside the solar system too. For instance, NASA (2023) reported that K2-18 b – an exoplanet 8.6 times as massive as Earth, situated in a habitable zone of the cool dwarf star K2-18, about 20 light-years from Earth in the constellation Leo – appears to have carbon-bearing molecules, including methane and carbon dioxide, suggesting it "could be a Hycean exoplanet, one which has the potential to possess a hydrogen-rich atmosphere and a water ocean-covered surface." Moreover, NASA suggests these findings may be indicative of life, noting the "possible detection of a molecule called dimethyl sulfide (DMS)," of which they state that "On Earth, this is only produced by life." Indeed, it is worth emphasizing just how rapidly our understanding of the cosmos is being challenged and revised by new technologies; for instance, just in October came evidence from the Keck Cosmic Web Imager of a "cosmic web" of "filaments connecting galaxies across vast distances" (Physics-Astronomy.com, 2023), from James Webb indications of free-floating Jupiter-sized "planets" unconnected to any star (Amos, 2023), as well as a study suggesting that a massive seismic tremor detected on Mars last year by NASA's Insight Mars lander was caused by plate tectonics, contradicting the assumption that it is geologically a "dead planet" (Fernando et al., 2023).

Of course, even if life may be widespread, the question of intelligent forms is another matter entirely. Calculating its likelihood is difficult, as attested to by years of debates around the Drake Equation – regarding the number of detectable/contactable civilizations in the

Milky Way (Drake et al., 2015) – and estimates vary wildly, depending on assumptions (Sandberg et al., 2018). Snyder-Beattie et al. (2021), for example, suggest intelligent life on Earth required a “series of evolutionary transitions” – including abiogenesis, eukaryogenesis, sexual reproduction, multicellularity, and intelligence itself – which may be “extraordinarily improbable, even in conducive environments” (p.265). However, their verdict is that intelligent life elsewhere is “rare” rather than non-existent. That said, some scholars still question this assumption, given that, apparent UAP sightings aside, we officially have not *detected* any signs of such life. This seeming lack of contact has been called the Fermi paradox, after the physicist Enrico Fermi queried in 1950 why, if there are so many potential habitable planets, we have received no signs of intelligent life. However, scholars have pointed out this is only a paradox if one should *expect* to see such signs if intelligent life does exist elsewhere, and there are reasons why we should not necessarily expect that. Renowned science fiction writer Ciuxin Liu (2015), for example, has proposed a theory called the “Dark Forest” which theorists have found persuasive (Yu, 2015). It echoes the philosophy expressed by Thomas Hobbes (1651) in *Leviathan*, where nature is characterised by “continuell feare, and danger of violent death” (p.62). On this view, the assumption at the heart of Liu’s novels is that the universe is indeed teeming with intelligent civilizations, but everyone is *hiding*, given that to reveal themselves is to invite attack and destruction: “Every civilization is a hunter with gun in hand and he sneaks in the forest. He must be careful enough as there are other hunters in the forest. If he discovered other lives, he can only do one thing: shoot it. In this forest, other lives are hell and constant threats. Any life that will expose his existence will be killed soon. This is the picture of universe civilizations.”

Moreover, even if another civilization *were* broadcasting their whereabouts, we are unlikely to have found it. Wright et al. (2018) calculated that only a miniscule fraction of the radio parameter space has so far been covered by SETI, and compared any dismissals of the possibility of intelligent life on that basis to searching unsuccessfully for dolphins in a small pool’s worth of ocean water and then concluding the ocean was dolphin-free. Thus, based on the probabilities, most experts have concluded there most likely are intelligent civilizations elsewhere. As noted above, Bill Nelson, for example, said in 2021, “My personal opinion is that the universe is so big, and now, there are even theories that there might be other universes. If that’s the case, who am I to say that planet Earth is the only location of a life form that is civilized and organized like ours?” (Todd, 2021). Moreover, many observers suggest there are likely to be numerous instances even just within our own galaxy: Westby and Conselice (2020) estimated the number of “Communicating Extraterrestrial Intelligent” civilizations in the Milky Way according to various assumptions, and even under the strictest criteria suggest there may well be dozens. Even if so though, this does not mean such civilizations could actually visit Earth. Yet this possibility too is regarded as increasingly feasible, as we consider next.

Interstellar Travel

Even if extraterrestrial civilizations exist, the scientific consensus is that it would still be exceedingly difficult for them to travel to Earth – hence being responsible for UAP – given the vast size of the universe. However, recent advances in science and technology are making scholars revisit these assumptions. Let’s use our nearest stars, Alpha Centauri A and B, 4.35 light years away, as an example. Our current fastest means of travel is Gravity Assist, which uses the relative movement and gravity of planets to alter a craft’s path and speed, this being the method by which Voyager 1 used Saturn and Jupiter for gravitational slingshots to attain its current velocity of 60,000 km/hr. At this rate, it would take 76,000 years (over

2,500 generations) to reach these stars (Williams, 2016). However, these calculations are only based on *current* technological capacities and knowledge, which will likely be radically revised in future. Indeed, even now at the frontiers of science are proposals for exponentially faster methods, some of which have already begun to receive experimental testing. For example, an aerospace company (Pulsar Fusion) has begun construction of a nuclear fusion rocket engine – due for completion in 2027 – predicted to create exhaust speeds of over 500,000 MPH (Sampson, 2023). Moreover, even faster methods are being developed. For example, NASA suggests a “laser sail” – ultrathin mirrors driven by focused energy beams – measuring 965 km in diameter could accelerate to half the speed of light in less than a decade. Work on this idea is already underway, including Project Starshot, which plans to use it to send a small sensory package to Alpha Centauri at 1/5 the speed of light (Parkin, 2018).

Moreover, these are just endeavours of which information is known publicly. There have long been suspicions that authorities have been secretly working on far faster methods, possibly – though this is of course unproven – through reverse engineering UAP, as alleged by Grusch. Scientists have wondered, for example, about the viability of breakthrough technologies such as an Alcubierre warp drive that could allow faster-than-light travel by effectively “stretching the fabric of spacetime” (Williams, 2017, paragraph 5). As Lue Elizondo, an intelligence veteran with close connections to the UAP topic, explains, “a significant amount of mass or energy warps space-time... It’s a scientific fact, not fiction. The question now is how we can manipulate this physics for technological advancement. Potentially, we could warp space-time in a way that allows us to travel from point A to point B more quickly” (Verma, 2023). Strikingly, scientists are allegedly already working on such craft, with numerous rumours surrounding Salvatore Pais for instance, an aerospace engineer at the Naval Air Warfare Center Aircraft Division. Leaked documents disclosed by The War Zone (Tingley, 2020) suggested he has not only obtained numerous patents for highly advanced forms of technology – including a “hybrid aerospace-underwater craft” (Pais, 2019) that would apparently be capable of “altering the fabric of time and space” – but the Navy had actually conducted experiments on some of these.

Needless to say, this work remains highly secretive. However, what little is publicly available is very intriguing. Ross Coulthart’s (2021) book, *In Plain Sight: An Investigation into UFOs and Impossible Science*, for example, devotes an entire chapter to “Dr. Salvatore Pais’s Puzzling Patents.” It begins by noting the momentous detection of gravitational waves in 2015, a discovery – almost a century after these had been predicted by Einstein as part of his theory of relativity in 1916 – that earned the scientists involved a Nobel Prize in 2017. He notes that “within just eight weeks of the announcement of this momentous breakthrough, in April 2016, an unknown US Navy aerospace engineer named Dr Salvatore Pais filed a patent for a revolutionary spacecraft driven by gravity waves that was straight out of *Star Trek*.” Moreover, he notes that “Oddly, he still got his patent, largely because the Navy vouched for his discovery,” and that “most incredibly of all, his navy boss alleged that the gravity wave propulsion system in Pais’s invention would soon become a *reality*” (*italics in original*). Indeed, although rather elusive, Pais has given several interviews, including one in which he explained the thorough process required to receive his patents (Pais, 2022). Thus, even with the secrecy surrounding his work, it appears that cutting edge research is at least suggestive of the feasibility of interstellar travel.

Furthermore, even if such technologies are currently beyond *our* capacity, they may not be beyond more advanced NHI civilizations. After all, we have reached the point of such possibilities being in our grasp after mere centuries of scientific development. Imagine what

a civilization could achieve after several thousand years of scientific progress, let alone longer. Indeed, such possibilities may exceed even the extraordinary ideas above, including exploiting “traversable wormholes” – speculative structures, predicted by the theory of general relativity, that link disparate points in spacetime – to take a “short-cut” through spacetime (Frolov et al., 2023). Moreover, even if an interstellar voyage did take thousands of years, while impossible for biological organisms as we understand them, it would most certainly be feasible if craft were piloted instead by AI. To that point, Avi Loeb – director of the Galileo Project, which is systematically searching for “extraterrestrial technological artifacts” – suggests this would be the most likely scenario if some UAP really were extraterrestrial (Loeb & Kirkpatrick, 2023). A related idea also gaining currency is the possibility of UAP being piloted by “biological robots” that are wholly or partially synthetic, as suggested for example by Garry Nolan, who argued that such entities might be designed to act as an “intermediary” between their creators and humans (Verma, 2023a). This is why, he speculated, reports of alien encounters usually involve entities with surprisingly similar physiognomy to humans, which one might not necessarily expect given the myriad of evolutionary pathways that intelligent life might take in the cosmos. Indeed, Grusch (2023) made a similar point, suggesting that an NHI could be “engineering beings to look like us for ease of contact.” On a similar note, philosopher Bernard Kastrup (2023) argued it was “plausible that a more technologically advanced alien civilisation would have vast control of their own genotypes and phenotypes, thereby designing themselves” for their various purposes, including space travel, “which could benefit greatly from DNA manipulation.” Indeed, it has been pointed out – for example by investigative journalist Annie Jacobsen (2016, 2019) – that we have already made progress along these lines, with organizations like the Defense Advanced Research Projects Agency (DARPA) having created numerous “biohybrids” that are functional combinations of “animal and machine.”

Intriguingly, allegations along the lines of Nolan’s and Grusch’s ideas surfaced recently on social media, causing a stir among UAP commentators, when an anonymous Reddit user called “EBOscientistA” (2023) filed an incredibly detailed post claiming that from the late 2000s to the mid-2010s he/she “worked as a molecular biologist for a national security contractor in a program to study Exo-Biospheric-Organisms (EBO)” at the Battelle National Biodefense Institute. The post claimed the institute actually possessed four EBO bodies (with other EBO entities held elsewhere), and that the program aimed to “elucidate the genome and proteome basis of these organisms.” Most relevantly here, their account aligned with Nolan’s suppositions: “we’ve discovered that the EBO genome is a chimera of genomes from our biosphere and from an unknown one. They are artificial, ephemeral and disposable organisms created for a purpose that still partially eludes us.” There is no way to know the validity of these claims at present of course. However, most commentators leaned towards these at least being plausible and worth investigating, including Nolan (2023) himself, who wrote, “This is a challenge to the [UAP] community to determine if they can come together and analyze this logically.” Moreover, their plausibility was lent further credibility by the UAP Disclosure Act, which specifically refers to the possibility that authorities actually have EBOs in their possession, referring to “biological evidence of living or deceased non-human intelligence” (p.6). Furthermore, in terms of the suggestion of synthetic biological entities, it may be significant that in Grusch’s testimony to the Congressional UAP hearing he used the specific and unusual term “biologics” to refer to EBOs in the government’s possession. In subsequent speculation as to the precise meaning of this term, some commentators pointed to Pasulka’s (2018) chapter on “The spectrum of human techno-hybridity,” where she writes that “Biologics is a category of bioengineered living tissue” (p.182).

Moreover, aside from dramatic claims about secret UAP “crash retrievals,” even in the public domain are tentative indications that some UAP may be extraterrestrial in origin. Avi Loeb for instance has studied two such potential artifacts. One is an object dubbed Oumuamua – a Hawaiian term meaning “scout” – that passed through our galaxy in 2017 (Bialy & Loeb, 2018). This seemed to have various properties that “defied easy natural explanation” (Billings, 2021), including being shaped like a 100-meter-long cigar, being at least 10 times more reflective than typical space rocks and, after passing by the sun, accelerating faster than could be explained by the star’s waning gravitational grip alone. To Loeb, the most likely hypothesis is that this was a laser sail, perhaps “a derelict from some long-expired galactic culture,” although others have disputed his conclusions (Wright et al., 2023). Moreover, Loeb made headlines recently regarding a second potential interstellar artifact, with his Galileo Project embarking on an expedition to recover the remains of an unusual meteor which fell into the Pacific Ocean in 2014. Based on its speed and other apparent properties (e.g., toughness), it was formally recognized as having an interstellar origin at “the 99.999% confidence [level] in an official letter from the US Space Command under DoD to NASA” (Loeb, 2023c). Their search was seemingly successful (Loeb et al., 2023), retrieving more than 700 “sphericals” from the object’s apparent crash-landing path. As summarized by Loeb (2023d), his team are confident that some of these sphericles have a “composition pattern of elements from outside the solar system, never seen before,” specifically being “heavily enriched by factors of hundreds in Beryllium (Be), Lanthanum (La), and Uranium (U), relative to the solar-system standard composition of CI chondrites.” Somewhat similarly, Garry Nolan has analysed pieces of “molten metal” that appear to have been “dropped off” by UAP, and has concluded that these appear to be technological creations (as shown in Yes Theory, 2023); for example, one had “magnesium ratios that were so far off Earth normal [that] the only way you could interpret them, frankly, is that they were engineered, or they were part of an industrial process.”

As to the origin of the sphericles retrieved by Loeb, there are various hypotheses. One is they came from a “highly differentiated crust of an exoplanet with an iron core.” Another more “exotic possibility” is that they “may reflect an extraterrestrial technological origin” – produced by an extraterrestrial civilization – though establishing this would require finding the intact object itself (rather than the sphericles, which are thought to be molten droplets from its surface), which he hopes to recover in a future mission. If they are indeed technological artefacts, Loeb has offered various suggestions for their engagement with Earth, from probes being deliberately sent here (e.g., piloted by AI), to discarded “space trash” from other civilizations. Regarding the first theory, Loeb recently wrote a paper – significantly co-authored with Dr Kirkpatrick, director of AARO – that aimed to articulate a set of “physical constraints” based on “standard physics and known forms of matter and radiation” that would help in identifying genuinely anomalous UAP (Loeb & Kirkpatrick, 2023, p.1). Kirkpatrick’s mere involvement in this paper is itself significant: given he is leading the UAP investigation for the US government, the very fact he hypothesizing extraterrestrial origins for UAP is an extraordinary development. Specifically, they suggest that Oumuamua – or any large artificial interstellar object – might function as a “parent craft that releases small probes during its close passage to Earth” akin to “dandelion seeds.” Although the entity recovered by Loeb in 2023 preceded Oumuamua, six months prior to the latter’s closest approach to Earth, a meter-sized object also recognized as interstellar collided with Earth, which Loeb and Kirkpatrick suggested could be one such “seed.”

Another idea proposed by Loeb (2023a) is that such artefacts may constitute “space trash”: “Over the past ten billion years, other technological civilizations could have littered the volume of the Milky Way disk with numerous dysfunctional devices. This trash may have accumulated in interstellar space like plastics in the ocean.” On that note, returning to the statistical likelihood of intelligent civilizations elsewhere, Loeb suggested that while “many scientists regard an encounter with a relic from another technological civilization as extraordinarily unlikely,” he regards it as “common sense to search for space trash of the type that we produce since there are *billions of Earth-like planets in the Milky-Way*” (my italics). On that note, Freitas Jr. (1983) has argued for a systematic Search for Extraterrestrial Artifacts – SETA, modelled after SETI – and has proposed various likely candidate regions in our solar system for such a search. In any case, while scholars may not necessarily endorse all Loeb’s or Nolan’s findings and conclusions, it is nevertheless significant to see figures of their stature talking openly about interstellar travel.

A final point to note regarding potential UAP “crash retrievals” is the observation – made by skeptics like DeGrasse Tyson (1996) – that it seems implausible for an NHI to be capable of interstellar travel only to “bungle their arrival by crash-landing on Earth.” On first glance, this is a reasonable question. However, some commentators suggest that one potential explanation involves our use of nuclear weapons; indeed, there has been a close connection between UAP and nuclear activity and installations over the decades (Hastings, 2015) – as for example shown in documents recently released by the Department of Energy about UAP incidents near their facilities between 2018 and 2021 (Hanks, 2023) – with strong indications that UAP have a particular “interest” in our use of this technology. This interest could extend to the possibility that such weapons may have the ability to interfere with UAP themselves, especially in the way a detonation can create an electromagnetic pulse (EMP) – a brief but extremely powerful magnetic field – that could somehow destabilise a UAP, as discussed by the likes of NASA Mission Specialist Bob Oechsler (2014), and more recently DeLonge (2017), Elizondo (2021a), and Coulthart (2023). Thus, even if an NHI and their technology were exponentially further advanced than us human beings, we could still cause them trouble with our more primitive capabilities, just as a pre-historic caveman could bring down an aeroplane by throwing a rock into its engine.

Attention has focused for example on a series of high-altitude nuclear tests conducted over the Pacific in 1962, known as the “Fishbowl” series (Department of Energy, 2000). The first weapon was “Bluegill,” a sub-megaton nuclear warhead with an estimated nuclear yield of 400 kilotons, which had four attempts: Bluegill (June 2), Bluegill Prime (July 26), Bluegill Double Prime (October 16), and Bluegill Triple Prime (October 26). Of these, the fourth was successful, detonating at just over 48 kilometres. Most relevantly, footage of this test seems to show an object tumbling out of the nuclear fireball, as analysed on the Reddit r/UFOB forum (e.g., by Harry_is_white_hot, 2023), which some observers have suggested is a UAP. Likewise, there are rumours that something similar happened with the more powerful Starfish Prime test on July 9, 1962, a 1.4 megaton nuclear warhead that detonated roughly 240 miles above the Pacific (Plait, 2012). Elizondo (2021a) for example was asked about Starfish Prime, and said, “there may be some truth that an electromagnetic pulse of energy can interfere with whatever this technology is and its propulsion. Like a bubble. And if it interferes with it, you [have] ... a very interesting scenario where whatever is keeping these things up in the sky no longer does that.” Moreover, Oechsler, DeLonge, and Coulthart have suggested this may not simply have been an accident, but could have been a reason *for* these tests. As Coulthart put it, “I’m increasingly led to the view by sources that the United States

has been involved in targeted kinetic engagements with UAPs using EMP weaponry to try and bring them down, and they've done so successfully."

While we of course cannot know the veracity of such allegations and explanations, they do give one pause in immediately dismissing the possibility of extraterrestrial UAP based on objections around the apparent unlikelihood of such craft "crashing." Moreover, this is not the only viable interpretation of any such crashes, with various other potentials discussed for example by Jesse Mischel (2023), creator and host of the American Alchemy podcast (who over the summer was granted an exclusive interview by David Grusch). One idea, raised by the likes of Vallée, is that retrieved UAP could be some kind of "gift" from a NHI, perhaps because they want us to develop technologically and prosper. Another option could simply be that UAP are expendable, in the same way humans fly drones into volcanoes. Ultimately though, any motives and actions of such NHI are likely to be fundamentally inscrutable: such might be the cognitive chasm between us and them that Mischel likens us to "an ant colony ... wondering why humans do certain things, we're just so epistemologically limited." Nevertheless, such speculations at least open several avenues of plausibility for how authorities may potentially have come to acquire interstellar UAP.

Conclusion

The starting point for this paper was the observation that although UAP have been a topic of public interest and concern for over 75 years, authorities have tended to downplay their significance, at least in public. However, recent developments have meant some institutions – notably military, intelligence, and political communities – have begun to take the topic more seriously, including being open to an ETH. Significantly though, this openness has generally not yet permeated the scientific community, which still tends to dismiss extraterrestrial explanations for UAP as "paranormal." However, this paper has argued for taking such hypotheses seriously, particularly given work around, (a) the likelihood of extraterrestrial intelligent civilizations existing *per se*, and (b) the viability of interstellar travel. As such, hopefully we shall see greater scientific engagement with this important and mysterious topic over the years ahead. Indeed, we may find that scientists will be called on soon to help with this task. When Grusch (2023b) was asked in July what would happen next in relation to his allegations, he replied that first "some intel officers and other people in and out of government ... are about to file complaints similar to what I did," including people who actually worked on crash retrieval programs themselves ("literally the dudes touching the stuff"). Then, he said, by "February of 2024 we should have a presidential panel on UAP disclosure, looking at the crash retrieval issue and everything. And then within 300 days of the enactment of the [Disclosure] Act, we're going to get some kind of, I think, government statement next year on this topic. The tsunami wave is building, and I don't think we're going to totally backpedal anymore... I think 2024 is going to be, knock on wood, potentially wild, in a good way." Of course, these events and consequences may yet still not come to pass. Reporting by the likes of Sharp (2023a) and Shellenberger et al. (2023) suggest some powerful senior officials within the intelligence and military communities are actively working to prevent or at least stall this kind of "disclosure," possibly because some also have conflicts of interests in their connections to private aerospace companies. However, if Grusch's predictions are even remotely accurate, the scientific community will soon need to play its part in helping to explore this existentially important topic, which may include the revelation that humans are – as many people have long wondered, feared, hoped, or believed – not alone in the universe.

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