

SAGITTARIUS EYE

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ISSUE

37



FEATURING IN THIS ISSUE:

THE HESPERUS ■ APOLLO 15 EXPEDITION ■ SOONTIL RELICS
COLOURS OF ATMOSPHERES ■ GRENADES ■ XIHE COMPANIONS

SAGITTARIUS EYE

ISSUE 37

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EDITORIAL

Mack Winston



Many of us found ourselves bored — and indeed this writer found himself switching off altogether — during history lessons in our juvenile years. The ancient quote “Those who do not learn history are doomed to repeat it”, usually attributed to the philosopher George Santayana, may seem like fluff to the teenage mind

but as we age and gain wisdom, we realise its truth. Our history certainly seems to have a habit of showing up when we least expect it.

Take the fate of the *Hesperus*, recently discovered along with the *Adamastor*. Did the crew feel the portents of this name — taken from the poem *The Wreck of the Hesperus* — as a sign of the disaster that was to come? Mariners and now spacefarers have often had superstitious feelings over a ship's name, and it seems rather odd that the builders of the *Hesperus* would have chosen a name taken from a poem about a schooner that ran aground in a storm, wrecking the ship and killing the skipper and his daughter.

Soontill is another name that often brings up feelings in the superstitious. A lot has been spoken about Soontill and its relics, but, as our article explains this month, the location of the mystery planet of that name (and indeed, the origin of the relics) continues to be elusive. Despite the capabilities of our discovery scanners and the speed of the modern frame shift drive, making headway can sometimes be difficult.

One thing that puts the historical perspective into sharp relief are today's exploration missions. In July, an expedition will be launched celebrating the early Apollo 15 expedition, which took place in 1971 and was considered a great success, pushing the state of the art. In those days, merely reaching the Moon from the Earth took enormous preparation and resources. Today, though, the Apollo 15 Anniversary Expedition, a fine first expedition for a new explorer, covers nearly 19,300 light years of discovery in this new Odyssey era. In the here and now, we also consider this month what the thin atmospheres we can now fly through may bring us on this expedition and others. Not to mention the grenades we can lob at our rivals once we get down to the surface. 🪐



Photo: pSyren Farseer

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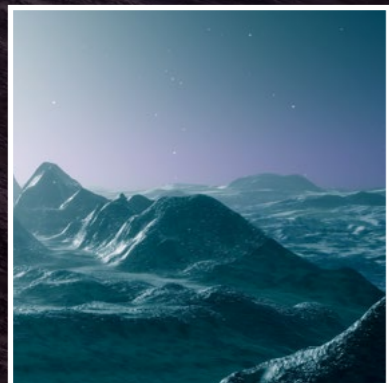
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death and salvation

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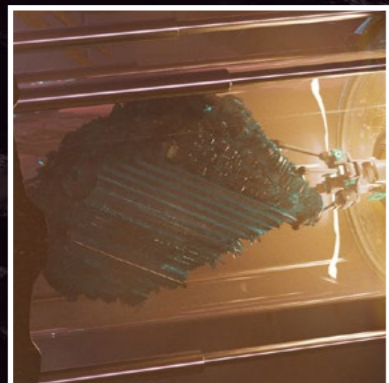
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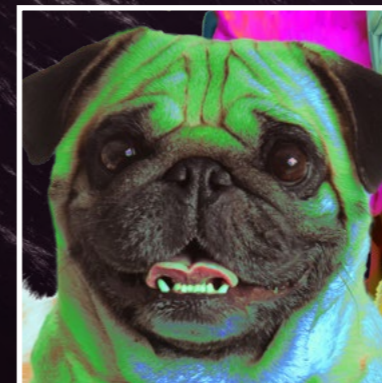
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THE HESPERUS

DEATH & SALVATION


**“THERE IS NO SAFETY THIS
SIDE OF THE GRAVE.”**

Robert A. Heinlein, 20th century North American writer

Space is dangerous. No matter how many successful flights a pilot makes, how well-constructed a ship is, or how solidly a starfaring yacht is in the top one percent of all yachts, the fact will always remain that trusting one's life to a sealed vessel with thrusters, life support, and a hyperdrive will never be a totally safe venture. The universe is a cold, cruel arbiter of fortune. It doesn't need humanity's help to become an even more perilous place.

Nevertheless, it has it.

The *Hesperus* was built as a symbol of progress and peace. A Lowell-class science megaship owned by Azimuth Biochemicals, it launched in the early 32nd century alongside its sister ship, the *Adamastor*. Yet its fate was sealed from the moment it took on crew. Because the *Hesperus* — mighty against the elements of nature — succumbed to human weakness within.



Sleeper agents, insidiously placed by a corporate rival by the name of Pharmasapien, activated soon after its launch. The crew was nearly wiped out; betrayed and murdered by those they thought were their teammates. Yet there was a small group of survivors, hidden away in the bowels of the ship, spared the butchery suffered by their peers.

This alone is enough to tell the tale of tragedy, but the story of the *Hesperus* wasn't complete. Rather than abandon their mission, the remaining crew used the shorter-range shuttles aboard the megaship to press forward with it. One crewmate, a Private Velasco, opted to remain aboard the ship, releasing toxic gas in an act of revenge against the Pharmasapien agents. Junior Engineer O'Neal, one of Pharmasapien's agents, had been performing maintenance on the ship's external comms array. He re-entered the ship to discover that he was the only one left alive, and he himself expired some time after. For the next two centuries the *Hesperus* drifted through space, deserted and abandoned.

The next significant event in the history of the *Hesperus* was even more ignominious.

The Scriveners Clan, a nomadic 'dredger clan' (a community of spacefaring scavengers), tracked down the emergency signal from the derelict megaship and set to work stripping it for parts. All that remains of the once-proud ship is its hull and bulkheads — a carcass more than a proper spacefaring vessel.

Such would have been the fate of most megaships, but even then the story of the *Hesperus* wasn't yet complete — for there is a final layer of intrigue to the story. Starting on April 8th, an encrypted long-range transmission from a source known only as 'Salvation' proved the key, in both a metaphorical and literal sense. Those independent commanders

who investigated the *Adamastor* received a unique decryption code, originating from an undeployed comms beacon within the megaship itself. This code directed them to a trio of beacons in other systems. When the data from those beacons was combined, the location of the *Hesperus* was revealed. At the time of publishing, the identity of whoever left the message — the person or persons calling themselves 'Salvation' — remains a mystery. What is known is that they appear to be recruiting commanders for a mysterious future purpose.

One cannot help but speculate as to what the stakes of the megaship's mission were, and what the cost of failure might have been.

Though the story of the *Hesperus* seems to have concluded, certain details remain inexplicable. Foremost is the almost fanatical dedication of its crew to completing their mission. Mass murder and sabotage are reason enough to call off nearly any excursion, yet decrypted logs are clear that certain among their scientific detachment wanted to continue with the mission, as they were confident that nearby systems contained alien artifacts. This by itself is remarkable. One cannot help but speculate as to what the stakes of the megaship's mission were, and what the cost of failure might have been. Were these



The universe fights hard to keep its secrets, but it fights fair.

alien artifacts a hitherto undocumented contact with a Thargoid hive or Guardian ruins? Or were they something else, something worth killing to conceal or hoard? As it is, the fate of the departed crew remains unknown. Perhaps this is the next discovery to which Salvation alludes?

Another missing link is the dredger clan itself. The Scriveners Clan maintains strict isolation from the universe beyond its megaship's hull, but one can only speculate what they might know about the *Hesperus*'s fate. As of yet no power has moved to seize their dredger by force, as such an operation would no doubt be costly in terms of ships and manpower — to say nothing of the

ethical implications of such a move.

The nomads are also fascinating from a sociological perspective, insights into which were recently offered by Erik Gunnarson of the Wallglass Investigations Agency.

Their culture is a fusion of militarism and academia, two aspects of human society that do not typically coincide. Yet both are clearly held in high regard, as evidenced by their formal titles 'research-sergeants' and 'lector-generals'. Is it possible that the dredger clan tracked down the departed scientists from the *Hesperus*, integrated them into their society, and grew to revere their methodology and hunger for knowledge? Or did the scientists leverage what they had learned and acquired from the alien ruins to place themselves in a position of power within the clan itself? It is easy for one to speculate to no end; and indeed, in the absence of further evidence of their fate, speculation is the only tool we have.

We ought not be surprised that the forces of treachery and greed sometimes prove stronger than the spirit of cooperation and discovery.

Yet in the case of the resurfacing of the *Hesperus* and her sister ship the *Adamastor*, it is the spirit of cooperation that shone the light upon a centuries-old mystery.

That mystery is by no means solved — Salvation has seen fit to keep us in suspense — but it is one that will be revealed to us.

The universe fights hard to keep its secrets, but it fights fair.

The same cannot be said of humankind.





With the ability to travel faster than light at the push of a button, we commanders can often forget just how the photons that illuminate our universe work... at least how much we understand of it. This month, we take a look at what exactly this type of electromagnetic radiation is and how it behaves in the tenuous atmospheres we admire on our glide towards a surface settlement.

THE LIGHT FANTASTIC

ATMOSPHERIC
COMPOSITION
AND
ATMOSPHERE
COLOURS

What is light?

Light, scientifically defined, is electromagnetic radiation that can be detected by the human eye; a small slice of the entire electromagnetic spectrum which our brain perceives as the many colours of all the celestial beauties that we love to admire. There is a much wider spectrum of radiation that we cannot see, emitted from almost everywhere in the universe; with wavelengths ranging from kilometers (radio waves) down to picometres (gamma rays) – but let's not dwell on what we can't see. The wavelength of visible light is between 400 and 700 nanometres (billionths of a metre). For scale, that's about 1% of the width of a human hair.

However, the behaviour of light isn't quite so crystal clear. As both a particle and wave, some aspects of it fall under the jurisdiction of quantum physics, and are beyond the scope of what we need to discuss today. We'll use 'light' and 'photon' interchangeably, but the latter typically refers to when that light energy is detected, as the Heisenberg uncertainty principle applies.


What are atmospheres?

A planetary atmosphere is a layer of gas around the surface of a body. Depending on the temperature range and gravitational force of said body, atmospheres on terrestrial planets can range from as thin as Mercury's to as thick as Venus's – which is over 90 times Earth's atmospheric pressure. Some planets can have atmospheres thick enough to have differing weather between layers.

Atmospheres can be extreme, especially when considering a Sudarsky-class gas giant. Saturn, for example, has over one hundred megapascals of pressure on its interior solid surface. This is over 1,000 times Earth's atmospheric pressure at sea level. In the top layers of Saturn's atmosphere, it's between -173°C and -113°C , cold enough to freeze ammonia; while approximately 320 kilometres below, it can get as warm as 57°C . Winds at the equator can exceed 1,800 km/h, and this atmosphere has storms large enough to fit one or two Earths inside.

On the other end, Mars's atmosphere before it was terraformed was, at 610 pascals, about 100 times thinner than Earth's, and composed of 95% carbon dioxide along with nitrogen and oxygen. Although Earth had the same gases, the very different proportions made a night-and-day difference upon how those planets looked and developed.

The wavelength of visible light is between 400 and 700 nanometres (billionths of a metre).



Some compounds may even be ionized, resulting in a glow.

The 'Red Planet', as it was then called, has just over a third of Earth's gravity, and the lighter molecules it may once have had millions of years ago were lost to space because the lack of a planetary magnetic field allowed the solar wind to strip them away. This process selectively removed the more energetic molecules, cooling the atmosphere, and together with Mars's lower average temperature due to its greater distance from Sol, caused the layers of gases to shrink together as they lost the energy needed to stay higher above the surface over time.

As is well documented in historical records, Mars's striking red hue as seen from space came from reflection by the iron oxide on the surface and in atmospheric dust. Once on the surface however, the removal of red light made things look yellow-brown, closer to butterscotch; a good example of how reflection of light by a planet's atmosphere can make things look very different once you are within it. Mars's atmosphere was just thick enough to support some weather, though, as it had clouds and dust storms; but was still thin enough that much of the surface's colour came through.

Despite how relatively thin Mars's atmosphere was, that is still much thicker than what is considered 'tenuous' by the scientific community (the Pilots' Federation, on the other hand, consider atmospheres of less than about ten kilopascals to be 'tenuous', and our ships may now fly into atmospheres of up to this pressure). The thicker the atmosphere, the greater the light scattering, and a difference can clearly be seen between 'scientifically tenuous' atmospheres and the 10 kPa limit for our ships.

What are tenuous atmospheres? How do we see them?

Unlike the planets Mars and Earth, moons or dwarf planets like Pluto have atmospheres that are thin enough to be considered tenuous, as the gas molecules in a given unit area are unlikely to collide with each other. For the number-crunchers, that's under 100 Pa, or one-sixth of pre-terraformed Mars's atmosphere.

The light haze seen on the horizon as one approaches a planet can take on a variety of colours, depending primarily upon the volcanism, pressure, and mineral composition of the planet. These variables are mutually dependent to some degree.

Volcanism

Although many explorable bodies have moderate amounts of volcanic (and tectonic) activity, the greatest effects on an atmosphere's colour come from exhaust gases that have been released over time from geysers, volcanoes or other geological features. For example, depending on the reactions that take place: soot can trap light in the air, decrease reflectivity from the surface, and heat a planet's surface causing the atmosphere composition to change as some molecules react or escape from lower levels.

Snow or ice from volcanic ash – whether that be from exhaust gas directly, or from chemical reactions with multiple gases already in the atmosphere using the exhaust as a reactant or catalyst – can do exactly the opposite, cooling a planet's surface and reducing its overall air pressure, scattering the light travelling through it to a greater degree.

Pressure

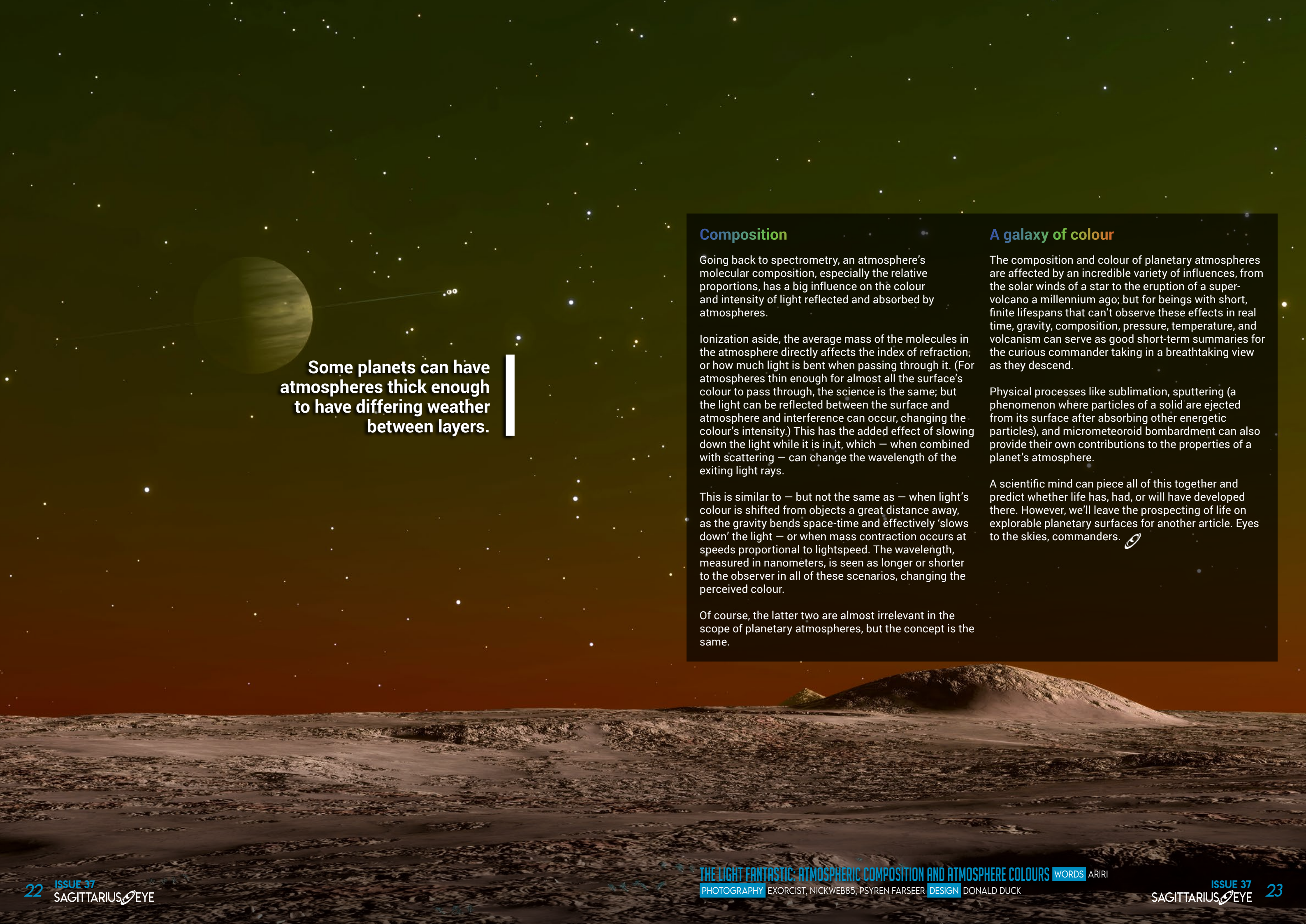
The pressure of an atmosphere is related to the average density of the gases that make it up, which are related to composition and gravity. Tenuous atmospheres look more translucent than their thicker counterparts, but under the right conditions they can look vividly vibrant and colourful, as there are enough gas molecules to scatter the incoming light.

Some compounds may even be ionized, resulting in a glow. The colour of this glow, and the haze of an atmosphere in general, is dependent on the compound itself, which can be determined through spectrometry – an analysis technique involving the identification of molecules via the bands of visible light they emit or absorb when ionized.

Those of us who have lived on an outdoor world planet are well acquainted with Rayleigh scattering: the scattering of shorter wavelengths of light by very much smaller particles than the wavelength, which results in most of these worlds having a blue sky. By contrast, in a tenuous atmosphere there is very little Rayleigh scattering. Instead, something called 'Mie scattering', after 19th-to-20th-century physicist Gustav Mie, tends to dominate, whereby light is scattered by much larger particles such as dust. This can result in reddish hues during the daytime, but blue hues during the sunsets as the longer wavelength red light is scattered away from the observer. This colour change is a consequence of the light taking a long, shallow path through the atmosphere at this time in a planet's cycle.

The composition and colour of planetary atmospheres are affected by an incredible variety of influences.





Some planets can have atmospheres thick enough to have differing weather between layers.

Composition

Going back to spectrometry, an atmosphere's molecular composition, especially the relative proportions, has a big influence on the colour and intensity of light reflected and absorbed by atmospheres.

Ionization aside, the average mass of the molecules in the atmosphere directly affects the index of refraction, or how much light is bent when passing through it. (For atmospheres thin enough for almost all the surface's colour to pass through, the science is the same; but the light can be reflected between the surface and atmosphere and interference can occur, changing the colour's intensity.) This has the added effect of slowing down the light while it is in it, which — when combined with scattering — can change the wavelength of the exiting light rays.


This is similar to — but not the same as — when light's colour is shifted from objects a great distance away, as the gravity bends space-time and effectively 'slows down' the light — or when mass contraction occurs at speeds proportional to lightspeed. The wavelength, measured in nanometers, is seen as longer or shorter to the observer in all of these scenarios, changing the perceived colour.

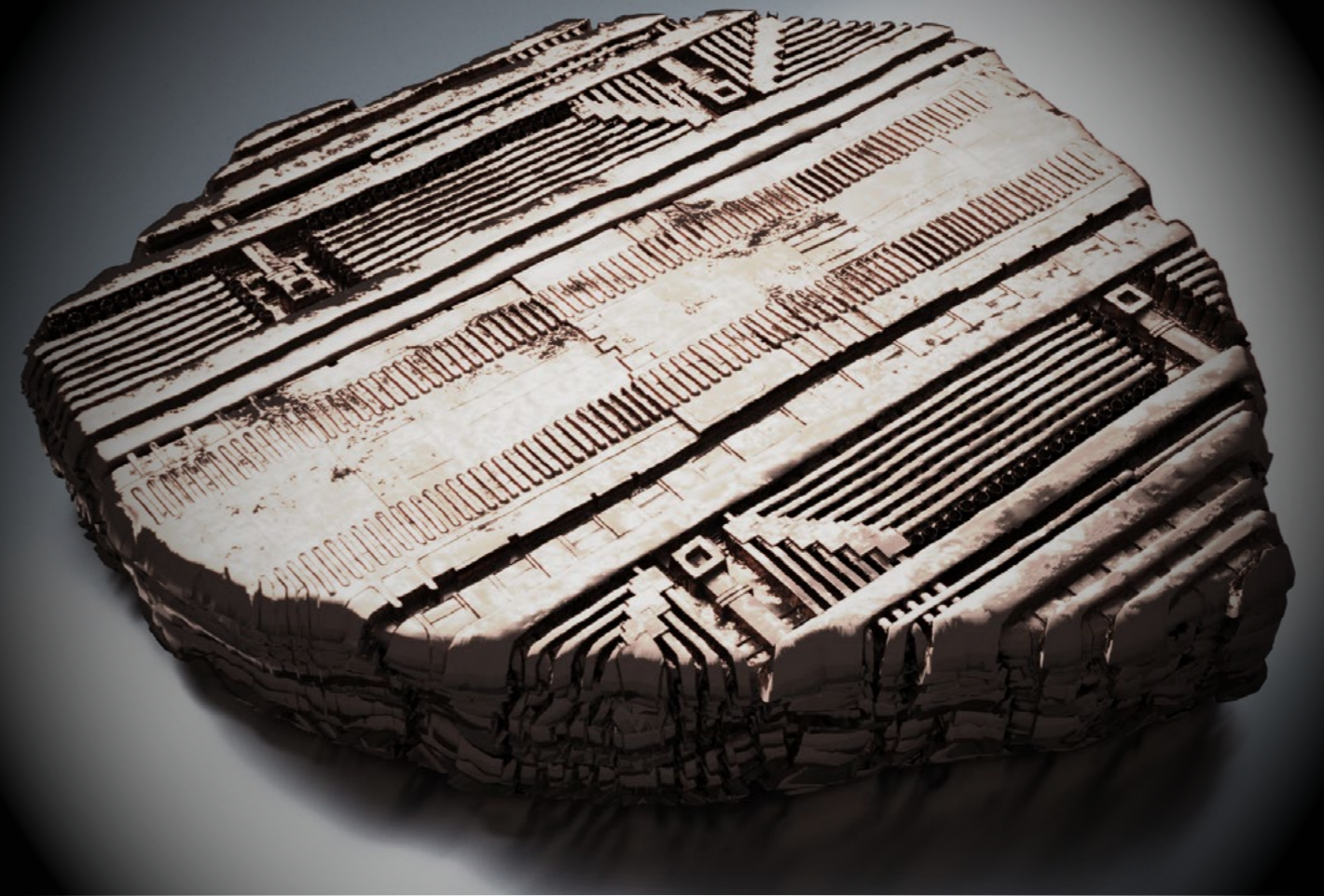
Of course, the latter two are almost irrelevant in the scope of planetary atmospheres, but the concept is the same.

A galaxy of colour

The composition and colour of planetary atmospheres are affected by an incredible variety of influences, from the solar winds of a star to the eruption of a super-volcano a millennium ago; but for beings with short, finite lifespans that can't observe these effects in real time, gravity, composition, pressure, temperature, and volcanism can serve as good short-term summaries for the curious commander taking in a breathtaking view as they descend.

Physical processes like sublimation, sputtering (a phenomenon where particles of a solid are ejected from its surface after absorbing other energetic particles), and micrometeoroid bombardment can also provide their own contributions to the properties of a planet's atmosphere.

A scientific mind can piece all of this together and predict whether life has, had, or will have developed there. However, we'll leave the prospecting of life on explorable planetary surfaces for another article. Eyes to the skies, commanders. 



THE SOONTILL RELICS

ANCIENT TREASURES OR MODERN FORGERIES?

Nearly 25 years after the disastrous first auction of the Soontill relics by Gallagher Restoration, the 'real' relics are freely available for purchase in the Ngurii system. The relics are

more likely to be authentic, for a number of reasons — but how sure can we be? And is Soontill on the galactic map even the same one as the legendary planet said to hold countless Thargoid treasures?



The first mention of Soontill

According to a GalNet report on the 18th of May 3301, the first time the planet Soontill was credibly mentioned was nearly 50 years ago. While the exact reference has been corrupted, there are plenty of other mentions of the mysterious planet, mostly in connection with the Dark Wheel (covered in Issue 36).

If there really is a secret planet Soontill, hidden from all of our best technology, we are in serious trouble.

According to Lyta Crane, the sons of Alex Ryder, the leaders of the Dark Wheel, disagreed over whether to focus on Soontill or Raxxla. The group eventually decided to focus on the location of the planet Soontill. Furthermore, Crane claims that they found it. Whether the planet they found is the same as the one you can see on your galactic map is a matter of contentious debate.

While Lyta Crane is probably the most high-profile researcher interested in the Dark Wheel, the reader should be cautious to take her at her word. She has had plenty of serious allegations levied against her, including creating false evidence to generate income. Perhaps the best evidence against her is the lack of real evidence. She presents detailed information that is impossible to verify, and information that would likely require more knowledge than she claims to possess. For example, she has stated that the Dark Wheel headquarters is a toroid station orbiting the eighth moon of a gas giant. But to know that, wouldn't she have had to see it? And if she has seen it, why hasn't she told us where it is?



The planet Soontill

Most contemporary sources agree that the planet Soontill, if it exists, is a world with untold treasures and a connection to the Thargoids – though nobody knows what this might be. When attempting to research Soontill, there is information clearly missing. For example, a GalNet report references the Thargoids mentioning Soontill, but no such entry exists. While many are hesitant to mention possible collusion between superpowers and secret organisations, some speculation is necessary.

It appears the superpowers are suppressing information related to Soontill. If you need any evidence that the superpowers are capable of conspiracy and keeping things out of the public domain that they would rather not be revealed, simply look at the extensive civilian surveillance conducted by the Federation, or the rampant killing of Marlinists by the Empire.

If the planet Soontill truly is in the system designated as 'Soontill' by the Pilots' Federation, it has long since been devastated. Extensive research has

been conducted in the system, including by several reporters at *Sagittarius Eye*, and no planet could be Soontill as described by Crane. Perhaps some sort of superweapon, orbital bombardment, or similar act of destruction could transform it from a paradise of Thargoid treasures into a desolate wasteland; but that seems unlikely, and would undoubtedly leave plenty of evidence.

There is also the possibility that the planet has not been found yet. While many would dismiss it, it could be that the artifacts are creating enough sensor interference that a scan would not detect the body. If it is far enough away, or a rogue planet heading out into interstellar space, visual scans might not notice the planet. Of course, this assumes that the Thargoids possess such advanced technology as to hide an entire planet, which is deeply concerning to this reporter. Imagine the kinds of secret weapons the Thargoids must hold if they are able to mask an entire planet, deep inside the Bubble! What if this planet is being used as a staging for a potential invasion?





The Soontill relics

The first time Soontill relics were offered for sale was by Gallagher Restoration in the 3280s, in the Phekda system. Many prominent figures were involved, including popular band Jjagged Bbanner. Unfortunately, the auction was quickly revealed to be a publicity stunt, shaking the public's faith in the Soontill legend. On the 10th of February 3301, new relics reappeared for sale in Ngurii. Unlike the first auction, this appears to be an organic appearance of artifacts for sale, listed by several different sources. This immediately lends it a certain credibility. If multiple independent pilots found relics separately, that could mean there was something to the myth. Perhaps there really are genuine relics out there.

On the 18th of May 3301, the results of extensive scientific tests were released to the public. Chief Xeno-Chemist Lyran Betar, the head of the research team, said that "[They] were looking for key markers. Elemental make up, crystalline structure, anything that indicates that it could have originated from a human hand." They were, to say the least, inconclusive. According to the studies, no known human technology is capable of creating structures like the Soontill relics. However, they also stated that it did not match any known Thargoid materials either. Even more confusing is the fact that isotopic dating revealed the relics to be tens of thousands of years old. If the dating is correct, and the relics are not simply made from ancient materials or other trickery, that could rule out both humans and Thargoids by itself. Humans, of course, were not a spacefaring species until only a few hundred years ago, and it would be shocking if Thargoids were active in human space in that timeframe.

Jean Molyneaux, a prominent historian from France, Earth, likened the disparities to human cultures: "Imagine an alien travelling back two thousand years into mankind's past. The varied culture, arts and building materials of the Aztecs, Greeks, the Shang dynasty, what have you, the alien could think they were all different species..." While this could be correct, even ancient humans did not vary quite that much in use of materials.

Explanations of the relics

The research leaves us with several different possibilities about the Soontill relics. First, they could be downright forgeries. By hiring different parties, using ancient materials, and spreading misinformation about the relics, it is possible that the researchers, and the public, could be tricked. However, the fact that they are dated as being tens of thousands of years old means that this would be a difficult task. One would also question its purpose, given that a ton of the relics costs less than twenty thousand credits. A massive sum for an ordinary citizen, sure, but a typical member of the Pilots' Federation has more than one hundred million credits in their account. This fraud seems hardly profitable.

The second possibility is that the relics are genuine Thargoid artifacts from the planet Soontill. The most likely scenario is that they were somehow transported off-world and found in a different location. Perhaps an ancient Thargoid wreck carried the relics and an explorer happened upon it. Maybe a shipment of the relics was found in one of the many Thargoid archeological sites and sold to a local trader.

Less likely, several explorers have independently found the planet Soontill, when no one else has, and

told no one about its location. This is unlikely, though. If multiple independent explorers have found the planet, there should be many people who know the location of Soontill; and if that's the case, why haven't they told anyone? Many commanders would offer well over a billion credits for the genuine location of Soontill.

It appears that the superpowers are suppressing information related to Soontill.

The third possibility is that these are neither human, Thargoid, nor Guardian artifacts, as all have been mostly disproved. This could be the only discovered evidence of a fourth spacefaring, sentient species. This of course is incredibly unlikely. Thargoids and Guardians have hundreds of discovered archeological sites, and since this species would have to be thousands of years old for the timeline to make sense, their sites should have been discovered. But no, nothing but a few relics according to this theory.




Implications of the relics

The fact that the relics exist at all creates a host of unanswered questions, as well as disturbing possibilities. This reporter cannot think of one potential scenario where the relics do not indicate a bad outcome. Out of all the possibilities discussed, outright fraud is perhaps the least of our concerns. All it costs is a few credits. The other possibilities, on the other hand, endanger the entire human race. If there really is a secret planet Soontill, hidden from all of our best technology, we are in serious trouble. Thargoids have attacked populated space in the past. There is no reason to discount the possibility of an invasion from this secret Thargoid planet near the cradle of civilization.

Perhaps even more dangerous is the existence of a civilization more ancient, more advanced, and more powerful than any other known alien race. The Thargoids are mostly understood at this point — at least enough to kill them. The Guardians destroyed themselves, and — except for the potential reawakening of dormant Guardian AI inside of our weapon systems, covered by a previous issue — they pose no real threat to us. An ancient civilization

actively hiding from us, as indicated by the fact that we have located no structures or energy signatures generated by them, is deeply concerning. Perhaps they simply have no interest in getting involved with the messy wars or politics of human space. Or maybe, just maybe, they are preparing for galactic conquest...

The relics could be downright forgeries.

Regardless of the truth behind the relics, whatever they are, one thing is certain: the superpowers are actively hiding it from us. Even if they do not know everything about the relics, they know enough that they have decided to block information from reaching the ears of their citizens. A missing GalNet news entry here, a corrupted archive there. Enough systematic eradication of knowledge to know that something isn't right. And it is to them that we should direct our questions. 



THE SOONTILL RELICS: ANCIENT TREASURES OR MODERN FORGERIES?

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STARSTRUCK CHAI

THE PREMIUM TEA



AVAILABLE AT ALL GOOD BEVERAGE OUTLETS



THE
APOLLO
15
EXPEDITION

Today, the historic Apollo expeditions of the late 20th century risk only being remembered by historians. In 3305, Commander Yanick headed an expedition to ensure that the pioneering Apollo 11 mission of 1969 was not forgotten, commemorating the extraordinary first landing on the Moon. He returns this year to commemorate the Apollo 15 mission and its momentous feats.

While the original missions in the 20th century may be best remembered only by historians, there remain parts of the Apollo missions in the public consciousness: famously, the Pilots' Federation spoke about "the Neil Armstrong moment", when referring to the new space suits that enable their members to step out of the ship and onto the surface of a planet. Neil Armstrong's historic footstep, when he set foot on the Earth's moon during the Apollo 11 expedition, was the defining moment in early space exploration. Apollo 13, a mission that almost ended in disaster, brought us the famous phrase "failure is not an option", spoken by Flight Director Gene Kranz as the serious nature of the problems with *Odyssey*, the Apollo 13 command and service module, became apparent.

Apollo 15 brought new elements to space exploration. It consisted of *Endeavour* (the command and service module, or CSM) and *Falcon* (the lunar module, the LM). This mission had a very significant first: that of the first manned vehicle to be driven on another celestial body. The lunar roving vehicle it carried, known as the LRV, filled a similar purpose to today's SRV. Cmdr Yanick, the organiser of the Apollo 15 expedition, told SAGI:

"Of those impressive first lunar missions, Apollo 15 stood out to me as being the most dramatic, bravest, and by far the most interesting. You could say that it was the high watermark of human exploration for the next 50 years or so. I mean it had so much... the mountains, ancient lava flows, an old school SRV-type vehicle, and science!"

In many ways our situation in 3307 mirrors that of 1971. After an initial technological surge which resulted in expeditions which resonated with the public at large — not just the Apollo 11 Expedition of 3305 with over 600 participants, but also Distant Worlds 2 with an incredible 14,000 sign-ups — the hype died down, and even many Pilots' Federation members became somewhat jaded. Similarly, in the 20th century, Apollo 11 of 1969 resonated greatly — but just two years later interest had waned. New developments brought new excitement, especially to the aerospace community of the time: the LRV and also the more ambitious goals of Apollo 15. In 3307, with our newly-available space suits and greater range of landable planets, our expeditions can also become more ambitious; and once again, interest in exploration is on the rise.



There were other motivations for the pioneers of the 20th century that thankfully we do not suffer from today. During the Apollo era Earth was in the grip of a cold war that terrified many. Humanity at the time had recently developed nuclear weapons and, limited to only one planet, it was quite possible that a conflict using these weapons could have damaged civilisation to such a degree that it may have been difficult for a new technology-based society to arise for centuries – or perhaps at all. The two sides facing off in this cold war – the United States of America and its allies versus the Soviet Union and allies – were keen to prove their technological prowess over the other. The people of Earth felt keenly the existential threat they faced, and technological competition was not just a way of showing your superiority to your opponents (and thus to discourage them from thoughts of military action), but also to boost the morale of your citizens. While we often talk about face-offs between the Federation and the Empire, none of these pose the existential threat that nuclear weapons did to a species confined to a single planet.

While the Soviet Union had won the race into space, launching not just the first artificial satellite but the first human into space, the United States subsequently won the race to land people on the Moon with Apollo 11. As the primary goal of this first mission was arguably to get there and plant the flag first, with the race now won, subsequent missions could be turned to ones of greater scientific discovery. Apollo 15 was the first of what was known as the 'Apollo J' missions, the goal of which was greater mobility (hence the LRV) and the ability to

remain longer on the Moon's surface, with the ultimate goal of learning more about the Moon.

The mission itself had a crew of three: David Scott, Jim Irwin and Al Worden. Worden would remain in lunar orbit in the CSM *Endeavour* while Scott and Irwin would fly the LM *Falcon* (which included the LRV as part of its payload) to the surface. Possibly the most challenging of the Apollo landings, the LM would approach over the Apennine Range – the highest mountains on Earth's moon – with a steep angle of 26 degrees. At 23:16 UTC on the 30th July, *Falcon* touched down safely within 500 metres of the designated landing site.

During the subsequent three days the crew of the *Falcon* would log over eighteen hours of surface exploration, including driving the LRV a total of 28 kilometers. With the help of this vehicle they collected almost 80 kilograms of rock samples, which were taken back to Earth for examination. The LRV itself proved to be a reliable vehicle, suffering no faults during any of the missions in which it was used, despite its rapid development time of just seventeen months. The scientist and Apollo 17 astronaut Harrison Schmitt said of the LRV:

"The Lunar Rover proved to be the reliable, safe and flexible lunar exploration vehicle we expected it to be. Without it, the major scientific discoveries of Apollo 15, 16, and 17 would not have been possible; and our current understanding of lunar evolution would not have been possible."

This expedition is feasible even if you've never met Felicity Farseer in Deciat; a plain unengineered A-rated Asp Explorer is more than adequate for the task.



In many ways our situation in 3307 mirrors that of 1971.



To get an idea of how much the first wheeled vehicle on the Moon differs from today's SRV, we can compare the two head to head.

It's difficult to draw an exact modern parallel to the cost of the lunar rover, as today's economy is so radically different to that of the late 20th century, so our estimate has been calculated by comparing a variety of basic goods available today that were also commonplace in that era to give a rough comparison. Given that only four of the LRVs were constructed and the SRV is a mass-produced item, it's not entirely surprising that the LRV was comparatively orders of magnitude more expensive — especially when considering it was pushing the boundaries of technology at the time.

	LRV	SRV
BUILDER	BOEING/GENERAL MOTORS	VODEL
MAXIMUM CREW	2	1
CABIN	OPEN, REQUIRING SPACE SUIT	ENCLOSED, PRESSURISED
PROPULSION	FOUR 190 WATT MOTORS, FOUR WHEELS ON TWO AXLES	SIX MOTORS, EIGHT WHEELS ON SIX ARMATURES, THRUSTERS
WHEELS	SPUN ALUMINIUM HUB WITH STEEL MESH TYRES, 81CM DIAMETER	ALLOY WHEELS WITH COMPOSITE OFF ROAD TYRES, 110CM DIAMETER
RANGE	92 KILOMETERS	200 KILOMETERS (ESTIMATE, DEPENDENT ON DRIVING TECHNIQUE)
MASS	210KG	4,000KG
TOP SPEED	5 M/S	38 M/S
COST	52 MILLION CREDITS	5,270 CREDITS

In another first for space exploration, a satellite was placed into orbit around the Moon; this was the first time a satellite had been launched by a crewed spacecraft. The Apollo 15 mission was also the most mass sent to the Moon at the time, at approximately 48.5 tonnes (slightly less than the mass of an unladen Viper Mk III). While Scott and Irwin had the incredible experience of not just walking on the Moon but driving on it too, Al Worden did not entirely miss out: during the return journey, he made the first ever deep space extra vehicular activity (EVA, or 'space walk'), retrieving photographic film cartridges from the rear of the service module. He had been given a one hour schedule for this work, but carried it out in just eighteen minutes.

Many parts of Apollo 15 remain on the Moon's surface today: the LM *Falcon*, the LRV and the ALSEP (Apollo Lunar Surface Experiments Package). These machines are long dead, but they remain as monuments to the very first steps out of the Earth's atmosphere.

Apollo 15 also has the dubious accolade of having the hardest landing on return to the Earth. The Endeavour was designed to be landed on water, being brought to a safe speed by three parachutes. Only two of the three inflated properly, resulting in the small space craft touching down about 1.25 metres per second faster than expected — at a speed of just under ten metres per second. Luckily the crew were unhurt. Yanick told us:

"The first attempts at anything significant are often precarious, and in the case of those early explorers... highly dangerous. I've always admired their powerful mindset to do those things in what were the most fragile of spacecraft. I mean, our modern BBQ containers have more strength than the first craft to land on another world!"

Celebrating the early explorers

Today's Apollo 15 Expedition (A15X) sets out from the T Tauri star system in the Hind Nebula, plotting a route through six intermediate waypoints, arriving at Qeajo CZ-N c20-15 (better known as 'David and Goliath') after a journey of some 19,000 light years. Each of the waypoints is significant in its own right, bringing sights that can be experienced in new ways now we have entered what the Pilots' Federation have named the Odyssey era (and it is not lost on this writer that this era shares its name with Apollo 13's command module — it is hoped that our Odyssey era is not beset with quite so many problems as Apollo's). Yanick told us:

"In a similar vein to the Apollo 11 Expedition, the A15X will be a celebration of the landmark spaceflight, and an opportunity for everyone from a total beginner in exploration to the most hardcore of veterans to explore with others and to have a great time doing so. As is the way with modern expeditions in our galaxy."

As such, the expedition has over 200 participants signed up at the time of writing and is likely to gain more in the run-up to the launch date of 10th July 3307. Unlike the lonely explorers of the 1971 Apollo 15 missions, the waypoints on this expedition will likely be a lot more social, with a weekly meetup at the waypoint system where the explorers will be able to gather and discuss their findings from the previous week.

This mission had a very significant first: that of the first manned vehicle to be driven on another celestial body.

"Unlike most previous expeditions we're going to... go beyond the use of SRVs and fighters for expedition meet-up events. By utilising recent breakthroughs in spacesuit technology we're going to do more on foot than ever before. Including giving commanders an opportunity to have their own 'Armstrong moment'... emulating the first step of a human upon another world. But this time hopefully with a lot more company!"

While the expedition itself doesn't go as far as some others, it does allow newer commanders with more modest spacecraft to get their first taste of exploration. This expedition is feasible even if you've never met Felicity Farseer in Deciat; a plain unengineered A-rated Asp Explorer is more than adequate for the task, having sufficient jump range as well as the room for an SRV and plenty of today's other tools, such as repair limpets and auto field maintenance units. Other less-expensive ships will also perform admirably on this expedition, such as the Hauler. Without engineering it's possible to give this humble ship a range of around 30 light years — all for less than half a million credits. Undoubtedly there will be support in the form of fleet carriers should any participant need to carry out repairs.

The intermediate waypoints themselves pass through some notable sites, which will surely gain a new

appreciation when viewed from a planet with a thin atmosphere or when stepping out from a spacecraft the first time. The most notable are the Autumn Nebula, a striking red and green hued planetary nebula; the Statue of Liberty Nebula, a small emission nebula of approximately 50 light years in diameter; the Guardian ruins in the Eta Carina sector, the remains having the backdrop of the spectacular Eta Carina Nebula; and the Three Worlds Nebula. Some mystery is attached to the latter, as the original discoverer claims to have seen majestic structures on the surface of some of the worlds here, but no evidence of this has come to light since the discovery (with the Galactic Mapping Project perhaps politely suggesting that the discoverer had spent too much time admiring the nebula. This writer would be more inclined to blame the free availability of onionhead).

Like the Apollo 11 Expedition of 3305, the Mercury 7 explorers are expecting this expedition to bring new and old explorers together; and perhaps a special event on the anniversary of the first drive of the LRV on the Moon, which coincides with the expedition's arrival at its final waypoint. We hope to see you there.

Sign up for the Apollo 15 Expedition here: <https://www.edsm.net/en/expeditions/summary/id/131/name/Apollo+15+Anniversary+Expedition>



SMALL ARMS: GRENADES

Grenades are a potent tool for surface warfare, and come in several varieties. This month, our correspondent Osashes delves into the history of these deadly weapons, the types available to Pilots' Federation members today, and how best to use them in combat.

History

Hand grenades have a long and storied history throughout human society. The earliest grenades recorded were Byzantine incendiary weapons from the 8th century CE back on Earth. They were known as 'greek fire', though the composition of these weapons, to this day, remains highly speculative. Some theorise that these early incendiaries could have been composed of any combination of sulfur, naphtha, nitre, pine resin, quicklime, or calcium phosphide. The Byzantines commonly used greek fire in naval battles to set enemy ships aflame. It was particularly suited to this task, as it could supposedly remain burning even while floating on water.

Over the following years this technology underwent a number of refinements, and slowly spread through the Middle East and into the far east of Earth. Early Chinese grenades incorporated a metal casing and gunpowder filling, with a consistently-timed fuse made of waxed candle sticks. The metal casing of these grenades would rupture upon detonation, sending deadly shrapnel in all directions.



■ 'Greek fire' grenade, circa 670 CE

In the 16th century, grenades came into widespread use in European military conflicts. These early grenades consisted of hand-forged hollow iron balls filled with gunpowder and were ignited with a slow-burning fuse which was doused with dampened gunpowder and then dried. These grenades could weigh anywhere from 2.5 to 6 pounds.

By the 17th century, military forces began to organise specialised divisions of soldiers whose sole task was to throw grenades. These special forces were known as 'grenadiers'. Their time as specialists to the craft would, however, be short-lived, as by the end of the 17th century, grenades had transitioned into use primarily for direct sieges alone.

By the 19th century, firearms had drastically improved. The popularity of grenades decreased and they largely fell out of use. At the onset of the 20th century, though, grenades rose once again into popularity. The many large-scale wars on Earth during the 20th century saw the use of countless localised varieties of hand grenade.

The first known 'safe' — meaning safe for the user to throw — hand grenade was known as the 'Mills bomb'. It was invented and developed by an English designer and engineer named William Mills in 1915. The Mills bomb incorporated some of the engineering elements of a Belgian self-igniting grenade; however, Mills added certain safety features (while simultaneously enhancing its lethality). The Mills bomb utterly revolutionised trench warfare, which was commonplace at the time. Great Britain manufactured millions of these Mills bombs during World War I. The device became so popular and widely-known that it remains one of the most iconic weapons of the 20th century on Earth.

Two other grenade designs from the first world war on Earth that should be mentioned are the German stick grenade, which consisted of a narrow explosive that included a troublesome pull cord prone to accidental detonation, and the Mk II 'pineapple' grenade which was designed for the United States of America's military in 1918. The pineapple grenade, with its unique aesthetics, became the primary design inspiration for future grenades all the way into present times.

Throughout the subsequent history of mankind, grenades have evolved to fill a variety of functions beyond simply explosive fragmentation devices. Although the timeless fragmentation grenade remains popular for its cheap construction and reliable lethality, other varieties of grenades provide auxiliary means of offence and defence. It is both interesting and commendable, however, that a simple weapon designed and used in ancient days on old Earth has so thoroughly withstood the test of time and continues to find common use (with relatively little technological development).



■ German stick grenade, circa 1915



■ Arbalast flamethrower, evolution of 'greek fire' grenades

Quite a handfull

Jumping now to 3307, Pioneer Supplies recently began opening countless storefronts in stations and planetary ports across the galaxy. As part of their offerings of suits, weapons, consumables, and upgrade services, Pioneer offer three different varieties of grenades for purchase: the frag grenade, the shield disruptor, and the shield projector. We at *Sagittarius Eye* felt it would be prudent to showcase these devices and cover proper usage and safety protocols. After all, a grenade is only as effective (and safe) as the user allows it to be.



FRAG GRENADE

Firstly, we have the tried and true frag grenade. This weapon has a number of quirks which make it not only potentially self-lethal, but also ineffective if used incorrectly.

Pioneer's frag grenade is a simple design consisting of an explosive spherical core surrounded by twenty hexagonal plates of three varying sizes. A bright orange safety lever and a hex-looped pin are located on the top of the device. The hexagonal plates that surround the grenade's core are designed to release easily upon detonation and thus be projected at high speeds toward nearby targets. Additional shrapnel from the core is also released upon detonation. This shrapnel can inflict severe damage on unshielded targets.

The frag grenade is armed by pressing in the safety lever and removing the pin. Once the pin is removed the detonation timer starts to tick down. This timer starts at a base of 15 seconds, and in this way a commander can hold the grenade, still armed, and allow it to 'cook', providing less time to detonation after the throw.

However, on its first collision with any surface, Pioneer's frag grenade also triggers a rapid detonation timer of 1.5 seconds. Thus, the most effective way (in most situations) to use the grenade is to bounce it off a surface in close proximity to your target. Typically, best use is to aim just short of the target — that way the grenade will bounce up near the target approximately 1.5 seconds after the first impact. We find that, especially on lower-gravity planets, this method is the most efficient and reliable way to detonate your grenades on target. A skilled commander can also use other things for an initial bounce, such as walkways, walls, or light posts. As in any combat situation, situational awareness is key.

Even though it should come as common sense, this reporter feels compelled to remind commanders to be wary when using grenades in high-gravity environments. If one is not paying close attention, it is very possible that a thrown grenade will, instead of soaring, simply drop at the user's feet.

Note that the frag grenade applies kinetic damage to targets within its blast radius. This makes it extremely deadly against suit armour, but suboptimal against targets with active shields. Best use is to work down an enemy's (or multiple enemies') shields before deploying a frag grenade to finish the job. Learn to master the throw and the bounce, and you'll soon be landing your grenades with precision.

Learn to master the throw and the bounce, and you'll soon be landing your grenades with precision.

EMP GRENADE

Next up in Pioneer's line we have the shield disruptor, or EMP grenade. This weapon operates similarly to a frag grenade, however instead of a detonation that propels hexagonal plates and shrapnel, the shield disruptor detonates to release a spherical electromagnetic pulse wave. This detonation will decimate the shields of an individual on foot but is also quite effective against SRV shields — and can even be somewhat effective against ship shields.

The shield disruptor has the same base fifteen second detonation timer of a frag grenade, and also triggers a shortened 1.5 second detonation timer on first impact. We recommend a near-identical strategy to that of the previously discussed frag grenade: aiming just short of the actual target, 'bouncing' the grenade to trigger the 1.5 second detonator before it rebounds near the target. As long as the enemy is within the blast wave, the target's shields will be severely damaged.

Keep in mind that the shield disruptor and the frag grenade can be used one after another to incredible effect, especially upon multiple targets. Throw a shield disruptor first to take down the enemies' shields, then immediately follow up with a frag grenade to destroy their armour. Be ready, of course, with either a kinetic or plasma weapon to clean up any remaining survivors.



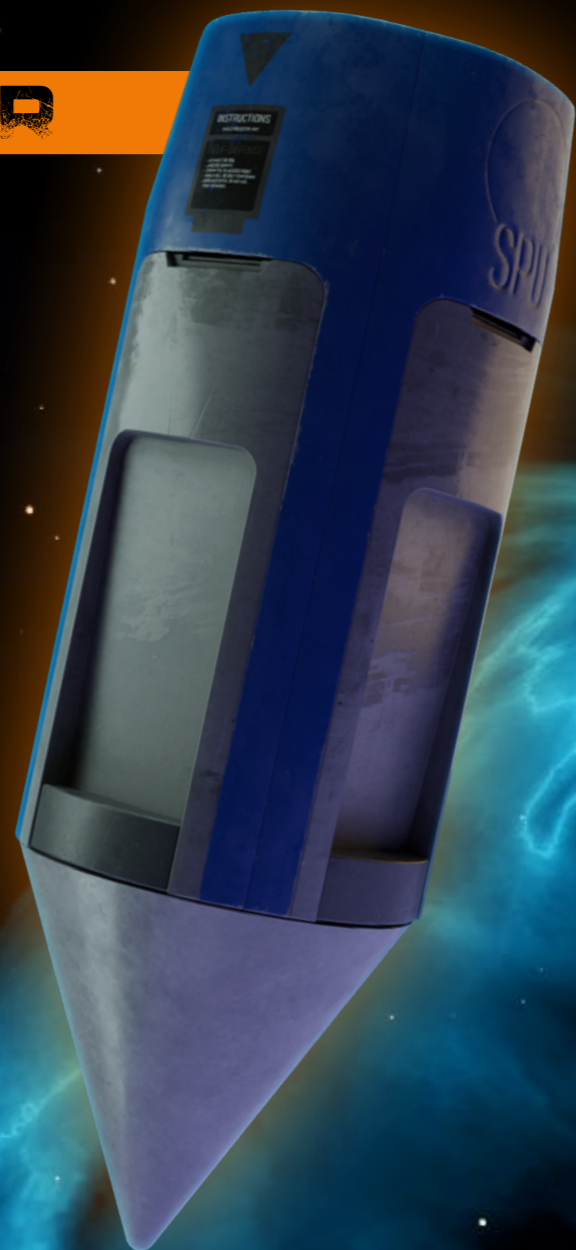
The shield disruptor and the frag grenade can be used one after another to incredible effect, especially upon multiple targets.




SHIELD PROJECTOR

The third and final 'grenade' offering from Pioneer Supplies is the shield projector. This device is a potent defensive tool that, if used properly, can completely turn the tide of a skirmish. It functions similarly to a sticky grenade, as it will mechanically attach itself to any surface it impacts. After a short delay a shield 'bubble' is projected from the device, directly above and around its projection tip.

The shield projector's bubble lasts for up to 15 seconds when deployed, but does lose energy when taking weapons fire. It's important for commanders to stay alert and pay close attention to when the shield has dropped. It is also important to note that that projector's shield only absorbs incoming fire — it has no effect on outgoing fire. This means that a commander inside the shield can freely fire out toward enemy targets. Be aware, though, that enemy combatants can pass through the shield projection without restriction to engage commanders within.



Each of these grenade variants can be purchased from any of the Pioneer Supplies storefronts across the galaxy for 2,000 credits. They are, naturally, single-use devices, which makes it wise to stock up in advance of a conflict. Capacity for carrying grenades varies per suit, with the Manticore Dominator suit able to hold the most. Commanders can replenish their suit's grenade stocks by entering a ship or an SRV, or by retrieving supplies from grenade cases (which can be found throughout most settlements and combat zones).

We're thrilled by this new offering from Pioneer Supplies and the tactical options these new devices will provide in the heat of combat. Mastering the art of the throw (and the bounce) will prove important for commanders everywhere. Even if one isn't seeking out combat, these grenades provide powerful defensive and counter-offensive options, and most certainly have the power to turn the tide of any engagement. Aim high, but throw low, commanders! 



RARE
COMMODITIES
SPOTLIGHT



XIHE BIOMORPHIC COMPANION

Space is lonely. Any man or woman who has lived among the stars can attest to this fact. Whether one is running data from Eravate to Lave, or in one's third month outside the Bubble, a ship can feel like a remote island if inhabited by only one person. Yet there is no reason to ever feel alone; at the port of Zhen Dock in the Xihe system, there exists an exotic solution: the Xihe Biomorphic Companion.

Imagine a cat: a small quadruped mammal, native to old Earth, that has managed to accompany humankind as we spread among the stars. It is loved by most and offers much in the way of companionship and emotional support, but it is as poorly evolved for space travel as, well, humans.

What if there was a way to replicate every quality that makes a cat a cat... without it actually being a cat?

Enter the Biomorphic Companions.

**There is no reason
to feel alone.**

The first time that one sees a Companion one is struck by how readily one accepts the product as the real thing. Holding the feline model, one cannot tell the difference between the real animal and fabricated product. It's soft, with individual hairs reacting in realtime to external stimuli. It is warm, but an organic warmth and not something turned off or on. It hardly ever stops moving, though its movement might be

subtle or dynamic, and it invariably reacts to its owner. It would be a bizarre interaction were it not already so familiar.

More bizarre still, the Xihe Biomorphic Companion is purchased as a newborn version of whatever animal is being replicated. To buy a cat is to buy a kitten. To buy a dog is to buy a puppy. The materials that compose the inner structure of the Companion are biofidelic polymers, programmed to grow into maturity in accordance with customer specifications. One might even, should one specify it, enjoy the company of a kitten or puppy that stays as such indefinitely.

Xihe Biomorphic Companions are available in hundreds of varieties, based on domesticated animals from a multitude of settled worlds. They are customisable to a fine degree, and the base product is tailored to the owner's specifications in the factory. They are, of course, too expensive for the budgets of most people — but then, commanders aren't most people. And it is in this fact that their appeal becomes obvious.

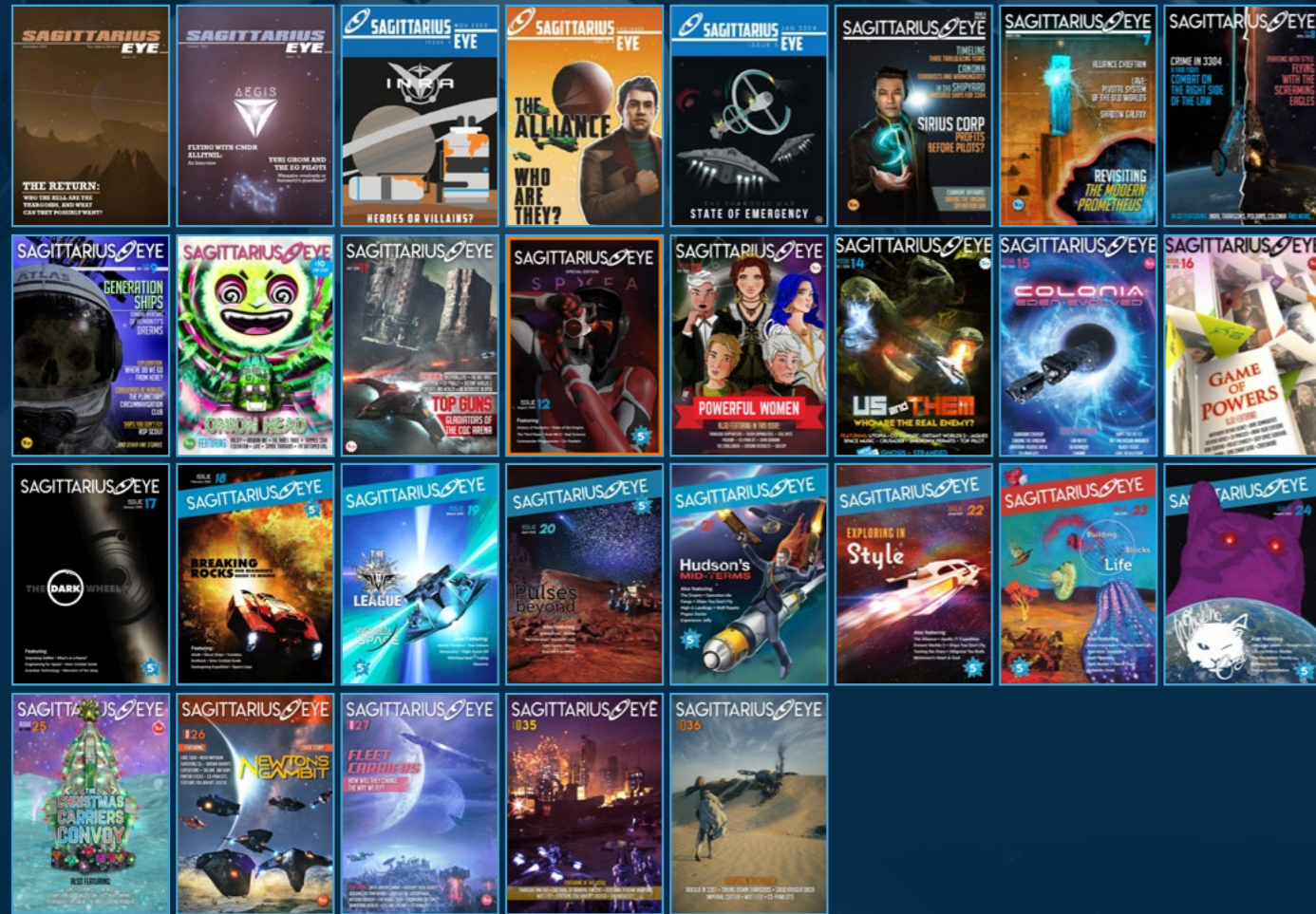
Humans require a vigorous program of engineered nutrients to maintain their health in deep space. To do the same for animals is a more complicated process, though in fairness it is unusual for animals to spend much time in spaceships as pets. The Biomorphic Companions have none of these drawbacks. It is arguable that they function far better in a vacuum and zero gravity than flesh-and-blood animals. The only question is one of philosophy rather than biology.

What, one might ask, is a friend? A companion? Is organic biology a necessary requirement?

It is tempting to answer 'yes' to the last question. But to stand by such an answer would be to negate the anecdotal experience of a multitude of pilots who have engaged in extended banter with their onboard computers. These pilots are sane. They understand that they are conversing with a datacore with voice response enabled, and not a self-aware lifeform based on silicon instead of carbon. Yet, the social and emotional rewards are the same. Feelings of loneliness are kept at bay, and the need for companionship is sated. As far as the person in question is concerned, there is no difference in terms of how a basic human need is met — only that it is. And that will keep a commander in space just as readily as a frameshift drive.



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