“Constellations in Ruins: GPS in the Anthropocene” by Dale Leorke and Christopher Wood

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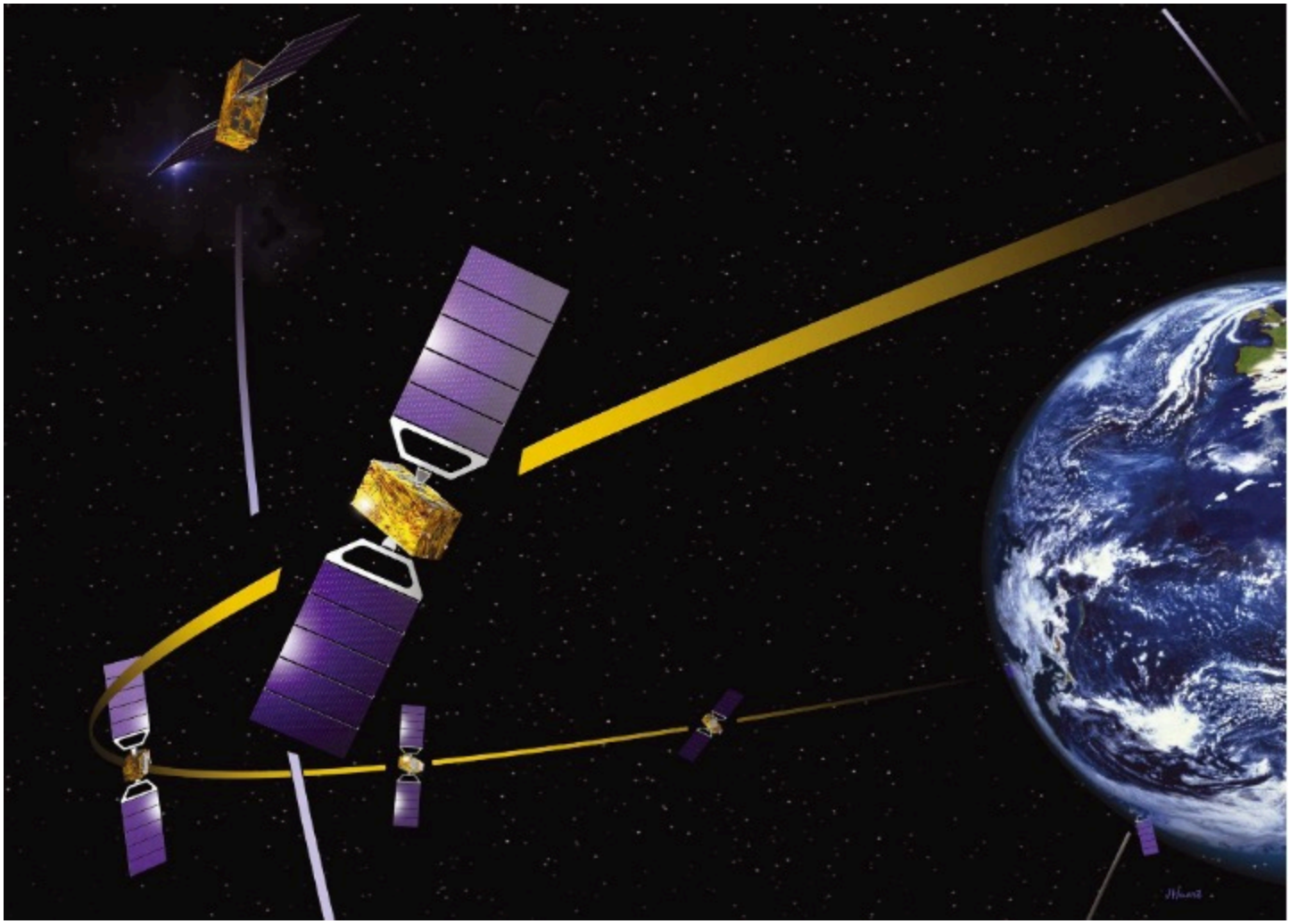

Figure 1: Artists' impression of Galileo constellation of satellites. Source: European Space Agency/ESA Standard Licence.

The Global Positioning System began as a military constellation, tracking movement with precision. Over time, GPS has become the invisible scaffolding of daily life, quietly steering navigation, trade, agriculture, and war. Billions now depend on its signals to move across land, sea, and air. If GPS were to collapse, critical services would fail and much of modern life would stall (Milner, 2016).

Yet this infrastructure – ageing satellites and tightly secured ground stations – remains mostly invisible and taken for granted, even as it grows more vulnerable to disruption and decay. In this photo-essay we trace how satellite constellations have become both increasingly indispensable and deeply entangled with today's technological, political, and ecological uncertainties.

Orbital Decay

Developed by the U.S. Department of Defense in the 1970s, GPS was meant to provide military navigation during the Cold War. Decades later, many satellites have exceeded their planned lifespans, kept functional by ongoing maintenance and replacement – raising new questions about their long-term reliability.

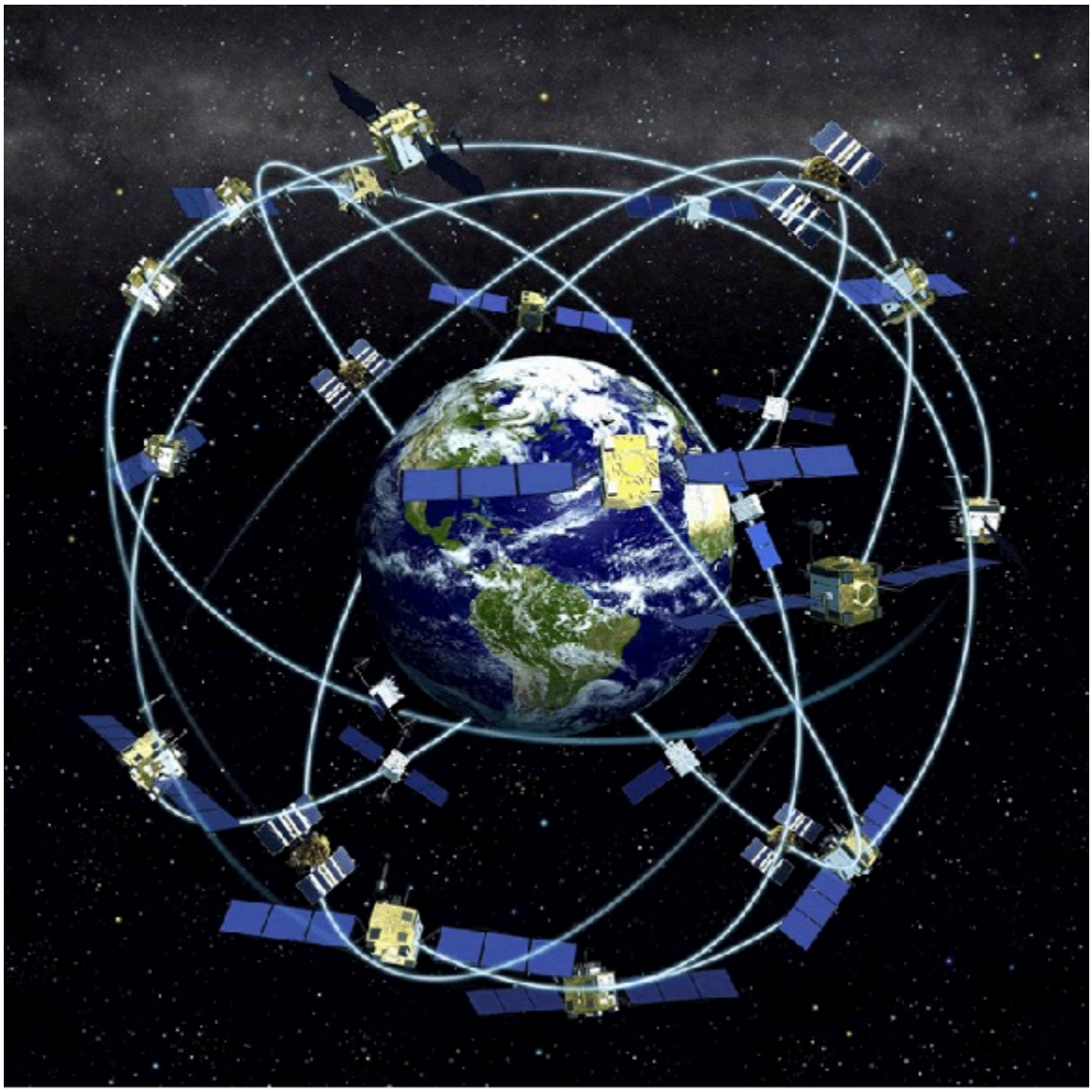

Figure 2: 3D Representation of the GPS Satellite Constellation. Source: National Oceanic and Atmospheric Administration/Public Domain.

As reported by *The New York Times* (Gebrekidan et al., 2024), many of the U.S.'s 32 GPS satellites are past their designated lifespan, and replacements lag. These systems now face jamming and spoofing in conflict zones, and are rapidly being superseded by Russia's GLONASS, China's Beidou, and the E.U.'s Galileo systems. Launched more recently, these systems offer built-in security and backup features, but have yet to match GPS's reach.

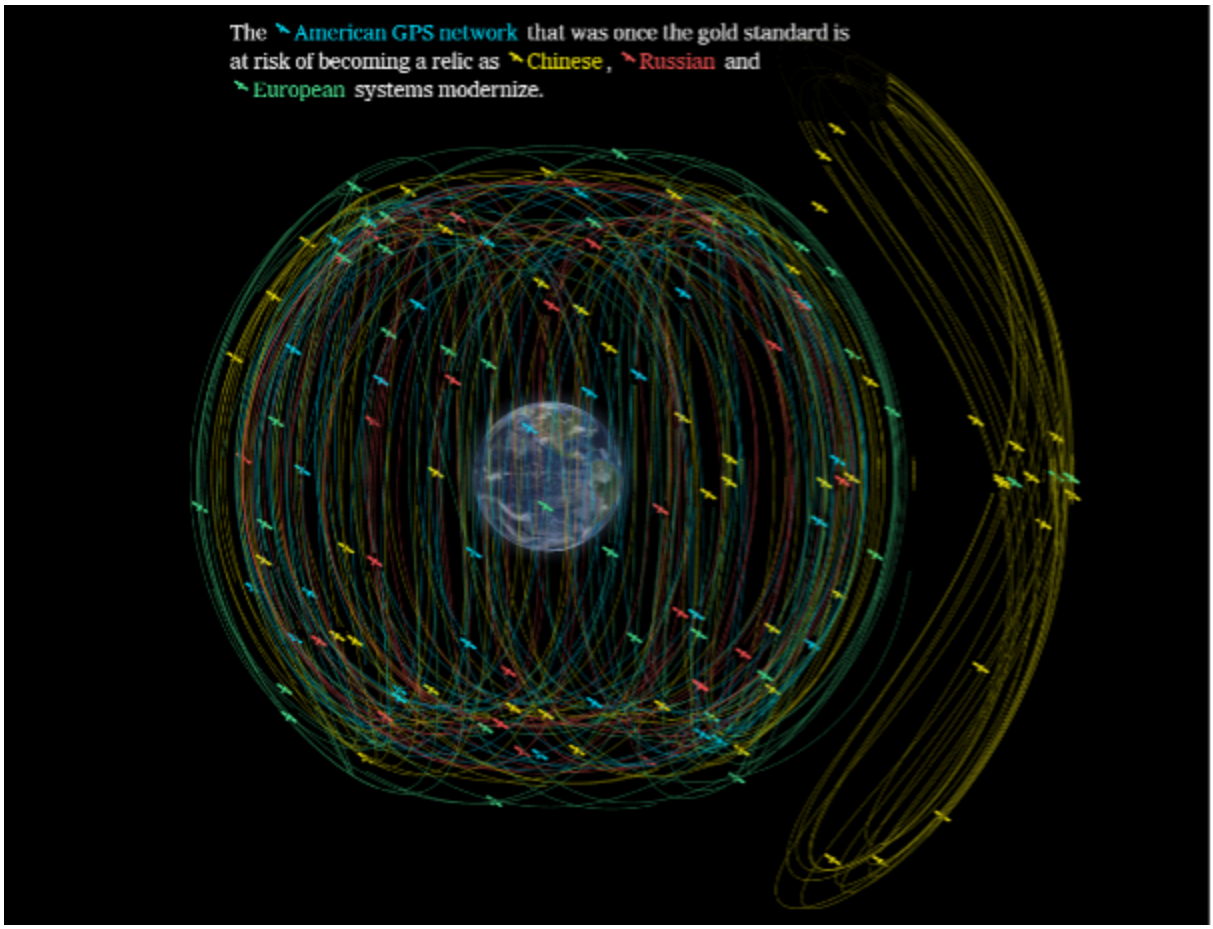

Figure 3: New York Times *graphic depicting the orbits of competing Global Navigation Satellite Systems.* Source: Gebrekidan et al., 2024/Fair use.

The American, Russian, Chinese and European systems orbit in clusters at 20,000 km above Earth. We can think of these older satellites as the "legacy" generation. Meanwhile, their rapidly proliferating "offspring" – such as SpaceX's 6,200-plus Starlink satellites and competing E.U. and Chinese systems (Bhattacharjee, et al. 2025; O'Carroll, 2024) – circulate much closer to Earth in low-orbital shells. These appear to the naked eye as a "string of pearls," "train," or "trail" of bright lights in the night sky, perplexing casual observers and "photobombing" (https://english.elpais.com/economy-and-business/2023-03-04/elon-musks-satellites-are-ruining-the-view-of-space-telescopes-its-getting-worse.html) long-exposure photos from space telescopes.

Figure 4: Trail of Starlink satellites over Carson National Forest, New Mexico. Photo: M. Lewinsky/Creative Commons.

These "mega-constellations" make once-speculative scenarios – Earth's atmosphere becoming a corridor of debris – uncomfortably plausible, echoing the disasters imagined in speculative fiction like *Gravity* (Alfonso Cuarón, 2013) and *Seveneves* (Neal Stephenson, 2015), and the comedic cyberpunk television series *Max Headroom (https://www.youtube.com/watch?v=8Cr6Qy8BdEM)* (1985–88).

The infamous "Blue Marble" image, photographed in 1972 from Apollo 17 with a hand-held analogue camera, captured a vision of Earth as whole, fragile, and singular – a self-contained biosphere adrift in space. In stark contrast, *Stuff in Space* – a real-time 3D map of objects in Earth's orbit created by James Yoder – reveals a different reality: a dense shell of satellites, debris, and abandoned technologies slowly encasing the planet.

Figure 5 (a): "The Blue Marble." Photo: NASA/Apollo 17 crew/Public Domain.

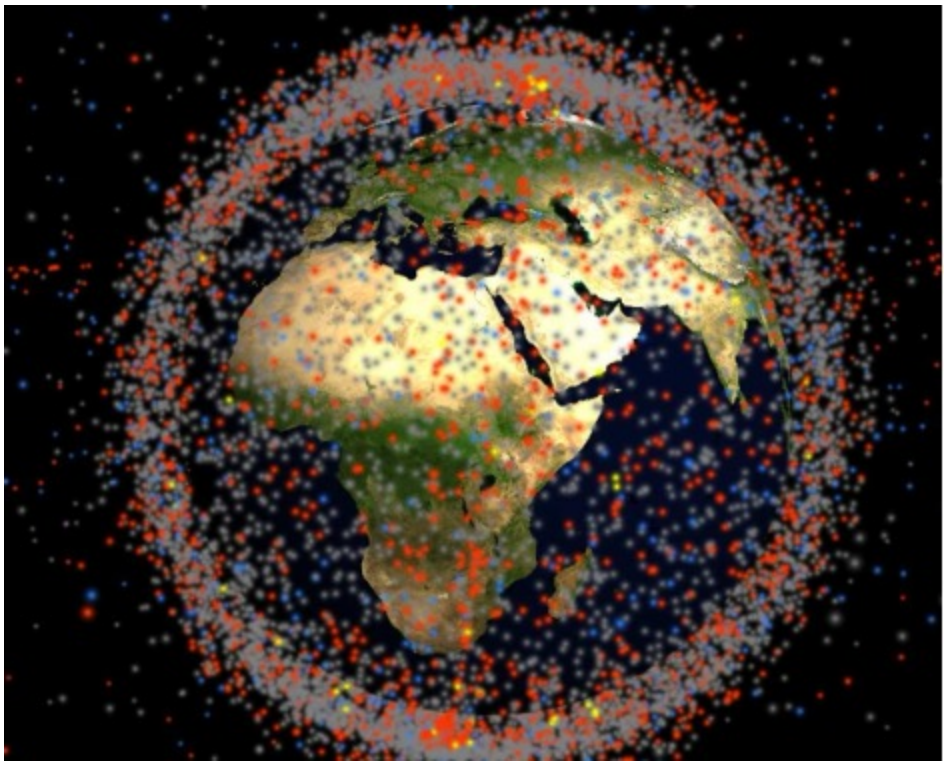

Figure 5 (b): Screen capture from Stuff in Space (https://stuffin.space/) *by James Yoder.* Source: Author Image.

Over time, this orbital infrastructure has thickened into an unintended atmosphere – one that no longer regulates life, but threatens it through collision, fragmentation, and the cascading failures of critical systems. The Earth imagined as a solitary organism

has been replaced by Earth as a hybrid artefact, increasingly entangled with its deteriorating technical remnants.

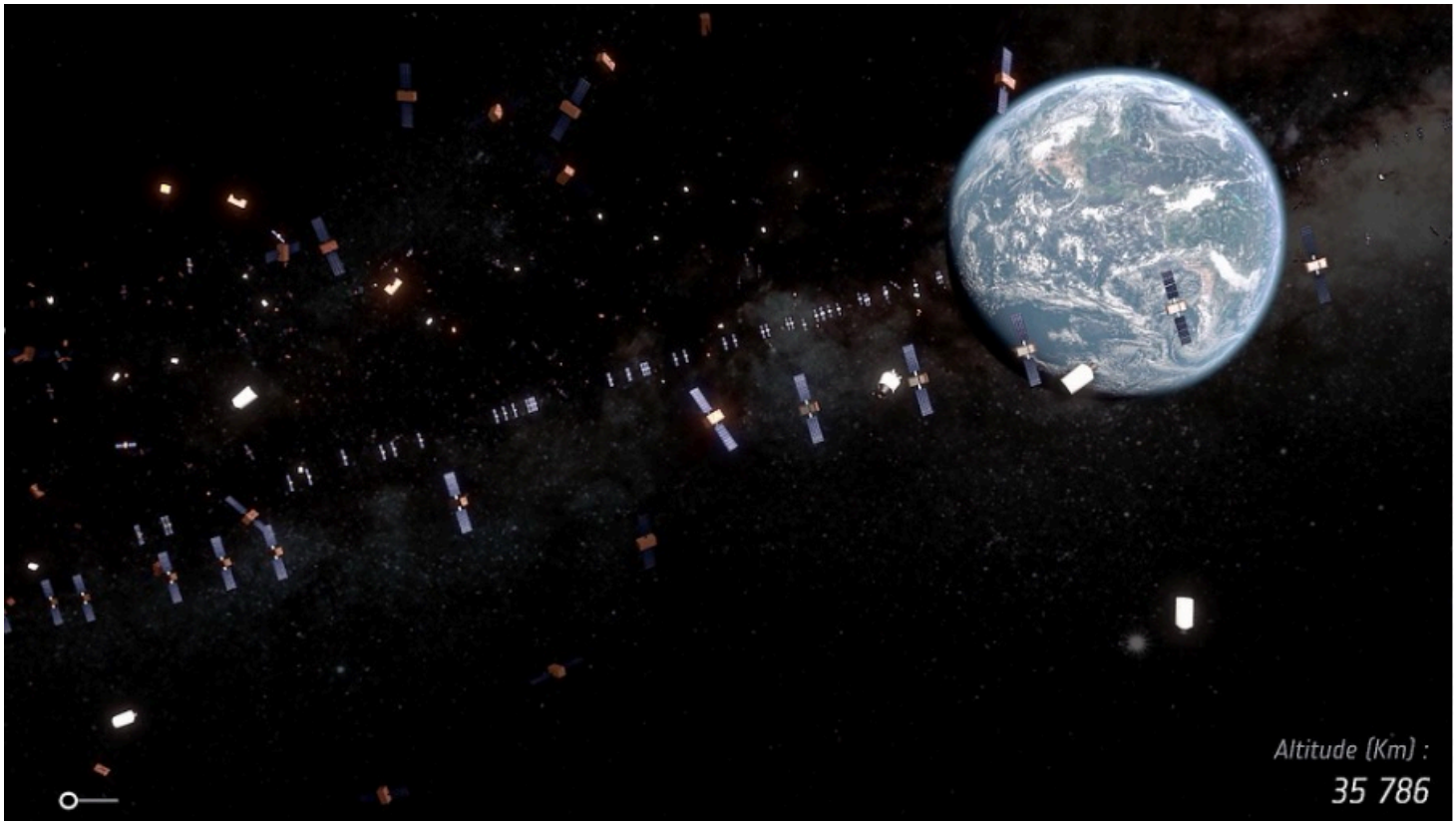

Figure 6: Debris and defunct launcher stages in the Geostationary ring. Photo: European Space Agency/ESA Standard Licence.

As satellite constellations multiply and fragment, the challenge is not just technical or geopolitical, but also one of perception and imagination. Morton (2016) calls this "the end of the world": not apocalypse, but the collapse of familiar narrative frames of meaning. The proliferation and opacity of satellite constellations both reveal and accelerate this crisis, demanding new ways of orientation and understanding amid systemic disarray.

To grasp planetary infrastructure in the Anthropocene, we need ways of seeing beyond the immediate and the human – attending to both the visible debris and the invisible signals that now structure life below.

Signal Worlds

What does it mean to live amid constellations we rarely see? Satellites, as Parks (2007) notes, operate “beyond the horizon of everyday visibility,” their signals weaving through daily life while their infrastructures remain distant and abstract. Yet, as Bowker & Star (1999) remind us, it is these hidden systems that shape our present and demand more-than-human attention.

Figure 7: Earth as seen from TPS LightSail 2. Photo: Kevin M. Gill/Creative Commons.

One way of achieving this reorientation is “infrastructural inversion” (Bowker & Star, 1999): asking not how satellites see us, but how the world appears from their perspective, foregrounding their agency. From the vantage point of a satellite, Earth’s familiar landscapes dissolve into a matrix of coordinates and signals. Sometimes, a satellite’s sensors register not the Earth below, but the distant horizons of the “dark universe” far beyond the Milky Way (European Space Agency, 2023).

Figure 8: View from the ESA space telescope Euclid's of the Perseus cluster of galaxies. Photo: European Space Agency/ ESA Standard Licence.

Still, this perspective is not enough. Following Hui (2016), truly grasping planetary infrastructure means recognising a multiplicity of "cosmotechnics" – different ways technical systems and cosmic imaginaries are woven together, each carrying distinct ethical, cultural, and geopolitical consequences. This invites us to think not just about what satellites do, but how they participate in world-making – how they might become agents of myth, speculation, or animism in planetary stories yet to be told.

Figure 9: The Roque de los Muchachos Observatory on La Palma. Photo: astroi_levi/Used with permission.

Recent debates in *Media+Environment* examine how planetary infrastructures – satellites, sensors, AI – reshape the aesthetics and politics of planetary perception. Our approach is in conversation with these calls to "decenter the human" and acknowledge the radical incompleteness of machinic vision (Lee-Morrison, 2023; Richardson & Munster, 2023; Rust, 2023). Yet, where others often focus on institutional and epistemic questions, we extend this conversation through situated, practice-based

engagement, combining theory, images, and participant responses as new forms of "worlding" (Haraway, 2016; Tsing, 2015; Wood et al., 2017). In doing so, we invite readers to imagine planetary infrastructure otherwise.

DIY Cultures in the Anthropocene

To explore these questions in practice, we turned to participatory methods, bringing together artists, technologists, and members of DIY and permaculture communities for workshops at a mostly abandoned Swedish paper mill. Participants used GPS visualisation apps to track satellites overhead, then responded through drawing and writing to prompts imagining how these infrastructures might persist, adapt, or acquire new meanings beyond their intended use. The project became a test site for thinking with planetary infrastructure – unsettling familiar narratives and opening space for speculative, more-than-human engagements with the satellite constellations that quietly shape everyday life.

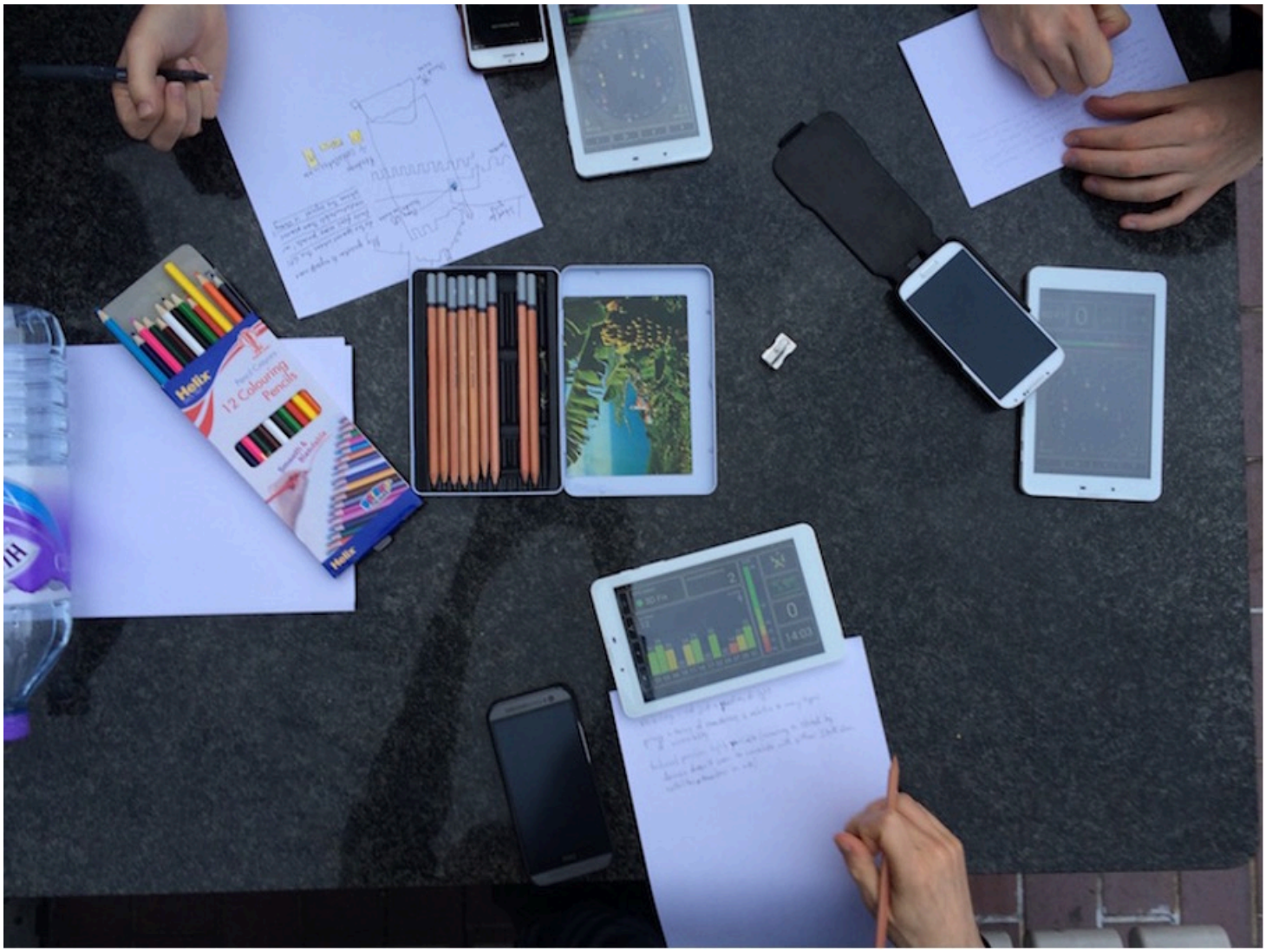

Figure 10: Materials used by participants of DIY Cultures. Source: Author Image.

During the workshop, participants walked the grounds with GPS visualisation apps, observing the shifting patterns of satellites above. They were asked: How might these satellites see the Earth? And how might they continue to operate if the society that built them had disappeared?

The abandoned paper mill offered a stark backdrop, evoking a radically altered – perhaps even post-human – world. Participants moved through forest and ruins, observing how GPS reception changed with the built and natural environment. This made the landscape itself an active part of their experience. The absence of others, and the prominence of non-human elements of the landscape like buildings and trees, shaped the participants' reflections and responses.

Figure 11: Participants of the DIY Cultures workshop in Fengersfors, Sweden. Source: Author Image.

The responses were diverse and often surprising. Some imagined satellites acquiring a mythic or religious presence in a post-apocalyptic world, with people sheltering from their signals or collecting them as if they were sacred. Others questioned whether satellites could "see" at all, emphasising the estrangement between machinic sensing and human meaning. Still others speculated on new forms of satellite agency – maintaining, adapting, or even collaborating independent of human guidance. These exercises made tangible the idea that infrastructure, far from being merely functional, is always open to reinvention and new relations.

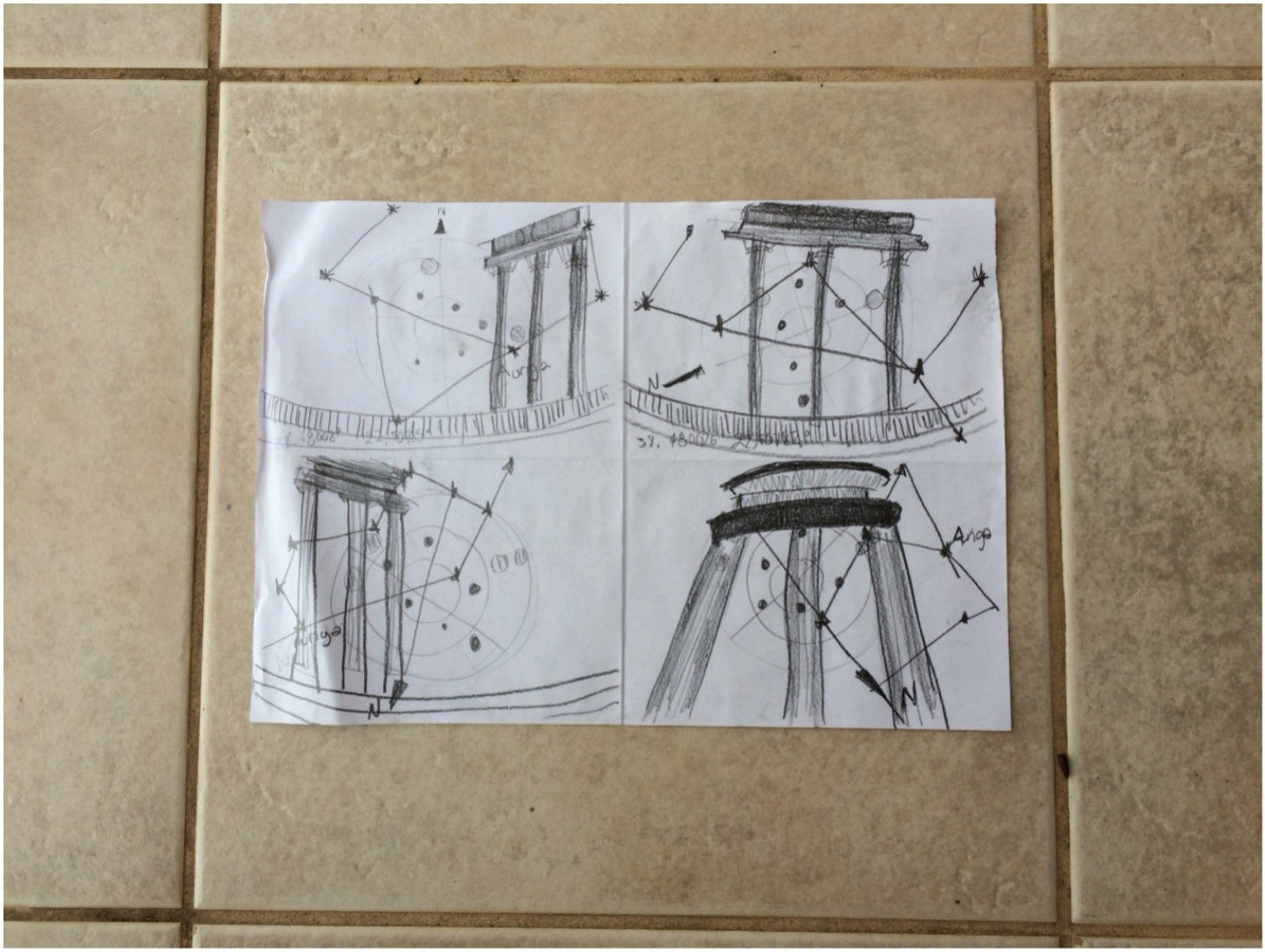

Figure 12: Sketch by a DIY Cultures participant. Source: Author Image.

One participant's response imagined a future in which the knowledge and language of contemporary civilisation had vanished – leaving behind only those infrastructures stable enough to persist without human maintenance. In this post-apocalyptic scenario, the GPS satellites continue to circle overhead, their original purpose

forgotten. Stripped of utility, they acquire a new, almost mythical presence: figures shelter from their signals, priests gather them in pyramids, and animals communicate with them in unknown tongues. The satellites become objects of ritual and speculation, woven into the fabric of daily life as sources of mystery and power.

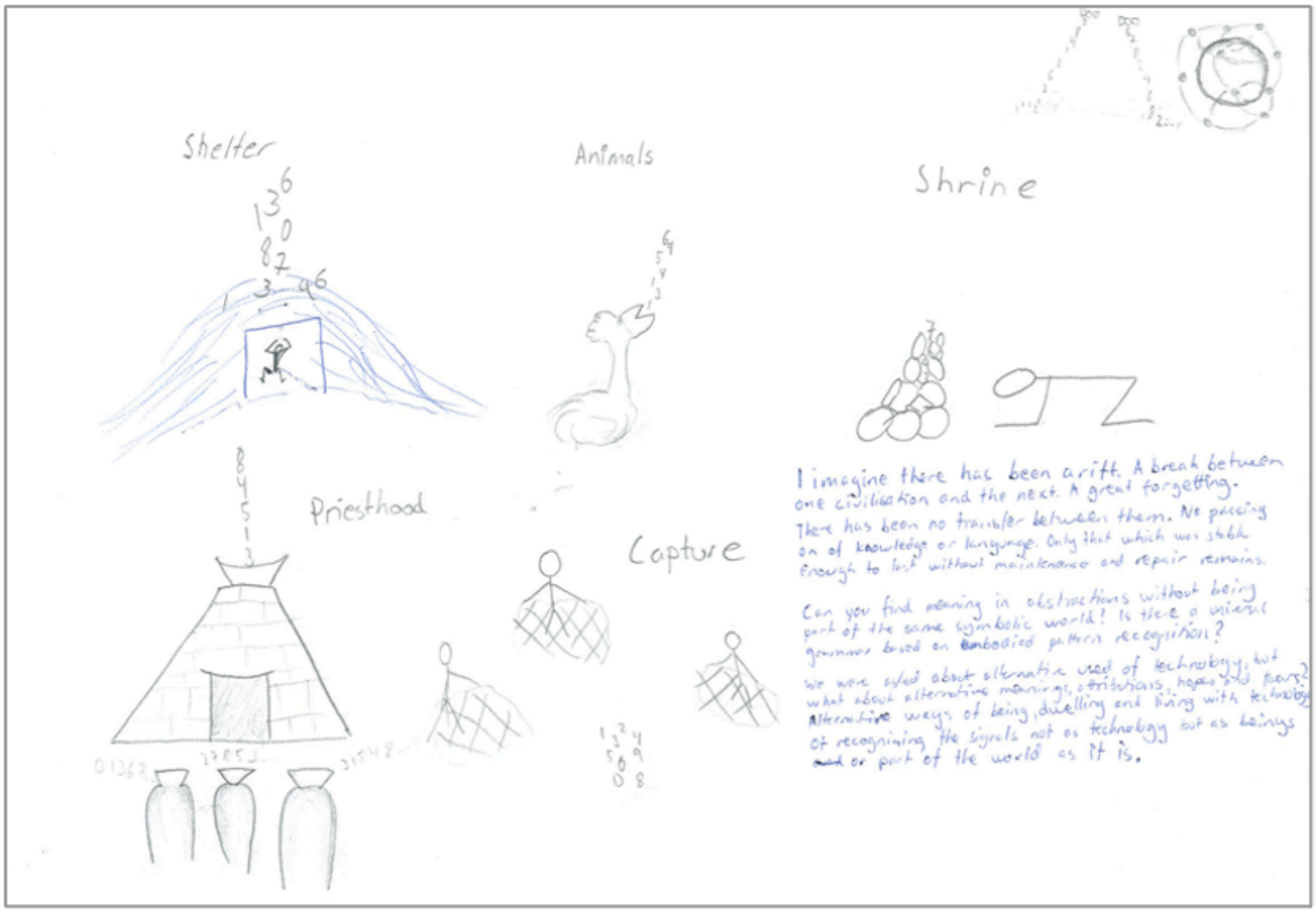

Figure 13: Sketch by a DIY Cultures participant. Source: Author Image.

This reimagining highlights both the fragility and endurance of technical systems – showing how, when infrastructures outlast their designers, they become raw material for new cosmologies, stories, and practices. Technological objects are never just functional; they are continually inscribed with meaning by humans, other species, and the more-than-human world.

While modest in scale and shaped by the contingencies of its moment, this workshop draws on a long lineage of locative media art and critical design interventions that seek to make planetary infrastructure perceptible, thinkable, and open to reinvention (see

Leorke & Wood, 2019). Rather than providing answers, these experiments reveal the many ways technical systems can be sensed, narrated, or inhabited – by humans, machines, or other beings.

As contemporary debates in media and environment studies make clear, machinic visions of the planetary are always partial and situated, entangled with broader histories, aesthetics, and politics. The *DIY Cultures* project was one early attempt among many at worlding – or perhaps what others have termed "reworlding," acknowledging the specific First Nations context in which this concept was developed (Rae & Coleman, 2023): ongoing, provisional acts of becoming that unsettle what is given and gesture toward the possibility of something otherwise. Such acts, as Tsing (2015, 21-2) notes, are rarely dramatic or world-historical; they take the form of small experiments in movement, attachment, and meaning, emerging from "practical activities of making lives" within the "ruins" of planetary transformation.

The challenge, then, is not just to develop new tools for visualising or mapping the planetary, nor to simply uncritically adopt animist or Indigenous perspectives. Instead, as Hui (2017, 6) urges, we must unsettle the very foundations of these visions: to "undo and redo" the inherited translations of technē, physis, and metaphysika and recognise that planetary infrastructure always elude complete technical mastery. We now require a radical openness to difference: the humility to encounter worlds, systems, and meanings that exceed our instruments and conceptual frames. Only in this way might we glimpse a truly common, if always provisional, task for philosophy, art, and planetary life.

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Chris Wood’s art practice and research work centres on the ways in which sensory technologies construct space, texture and rhythm, both on an individual, phenomenological level and across networks. He holds a PhD in Media and Arts Technology at Queen Mary, University of London, UK and has exhibited installations and workshops internationally.
