

Afterlives of Orbital
Infrastructures
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AFTERLIVES OF ORBITAL INFRASTRUCTURE

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Afterlives of Orbital Infrastructure
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"We live in an age in which extremely expensive machines are made and installed in orbit without public knowledge, only to be spectacularly blown away and become total losses before our eyes."

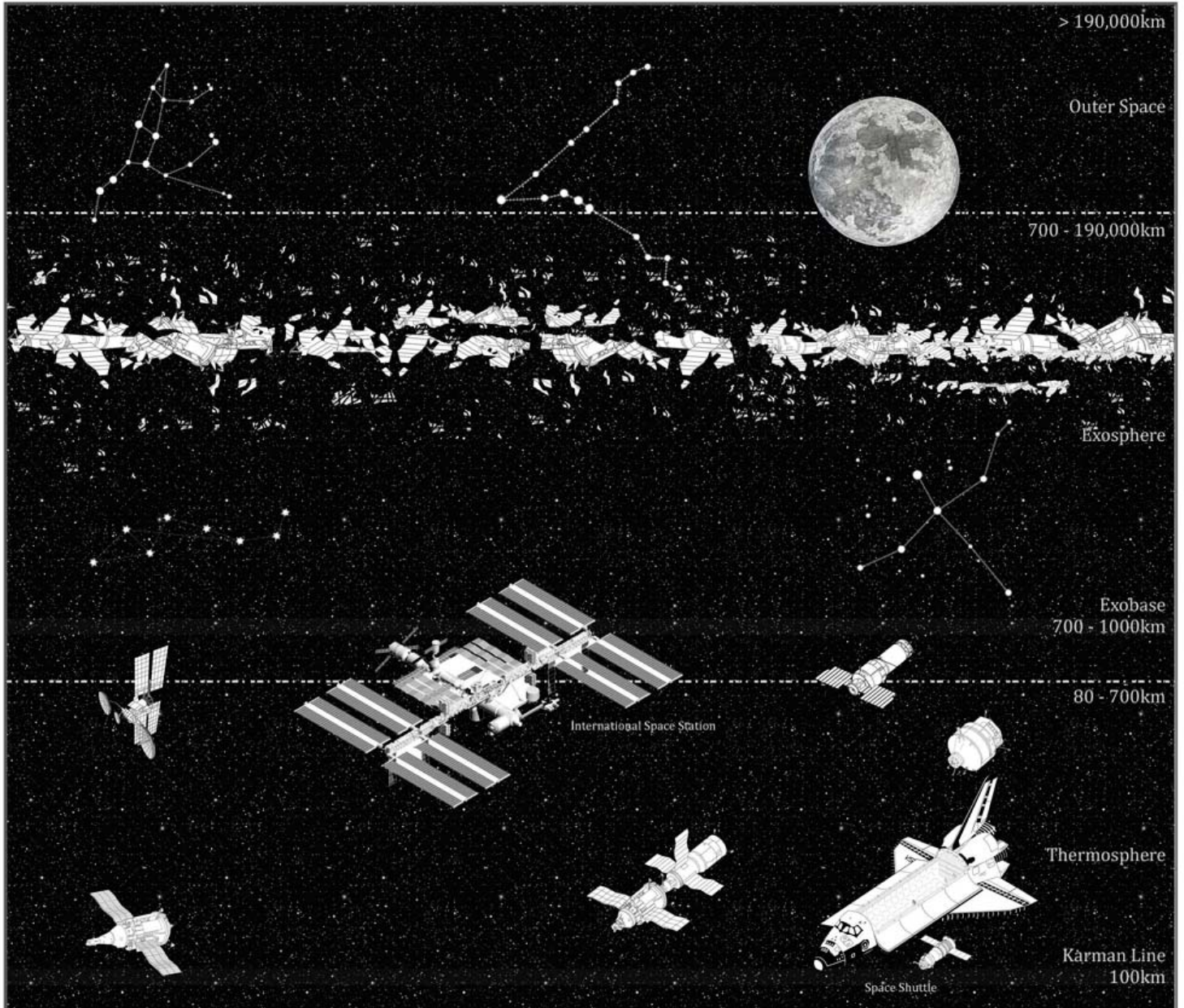
Lisa Parks, "Orbital Ruins" (2013)

As of 2019, the global space industry generates approximately 350 billion U.S. dollars in revenue and is estimated to become a 1.1 trillion-dollar industry by the year 2040, with over 500 satellites being launched into Earth's orbit every year. Until recently, national governments had a *de facto* monopoly on orbital space, using it to exercise military prowess and exert hegemonic dominance in the international political sphere. While such ways of looking at orbital space continue to be dominant within public consciousness, this way of understanding orbital space and its primary actors has become outmoded. More recently, extraterrestrial activities have taken on new, more commodified dimensions, with this decade's leading projects being spearheaded by corporate actors from the private sector.

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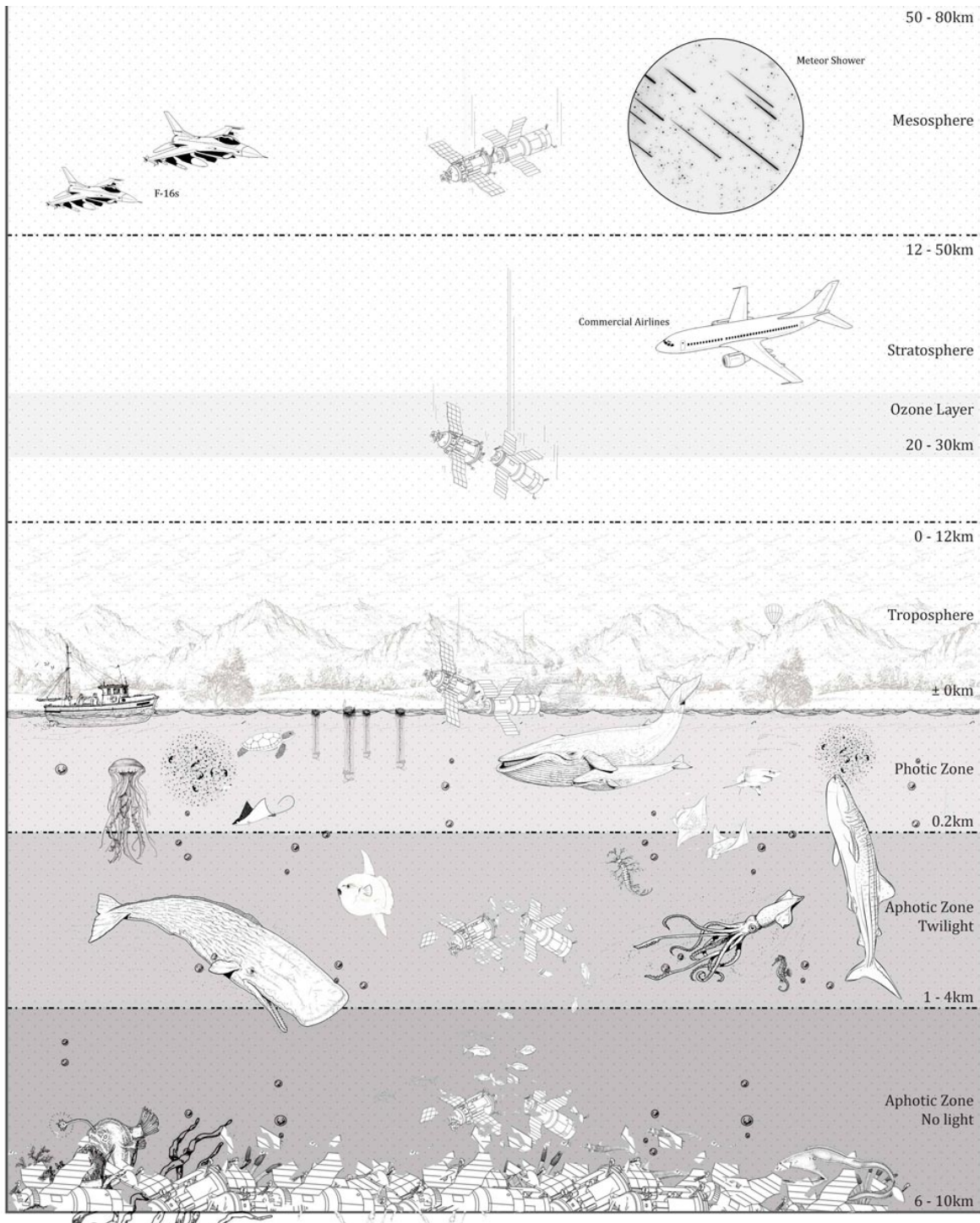
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Unlike the "Old Space" era's (late 1950s to 1990s) state-driven approach to orbital space, this "New Space" movement (post-1990s) is premised upon an historic shift in which orbital space is increasingly controlled by independent corporate institutions that are profit driven rather than security focused. Moreover, the "New Space" movement primarily involves the exteriorization and externalization of infrastructural systems into a much larger extraterrestrial, vertical domain – that of the hard vacuum of orbital space itself. As a result, Earth's orbital zone – a domain once restricted to the exclusive exercise of military operations in the service of nationalist statecraft – has slowly but steadily become a site for corporate commercialization.

There are a variety of projects that drive this form of commercialization. These include a vast array of privately owned, state-mediated orbital infrastructures that involve the application of satellite technologies to our everyday lives. These include using satellites for the purposes of delivering communication services to the public such as relaying data for cable and network television, rapid video conferencing and telephone connectivity, Global Positioning Systems (GPS), climate and environmental monitoring, and land and air stewardship across a multitude of scales. More today than ever, all spheres of our lives – material, social, political – are increasingly mediated by the myriad workings of these privately owned, technoscientific objects circling the Earth at different velocities and altitudes.

Despite our massive reliance on satellite infrastructures, we have almost no direct interaction with any of these objects – relatively few of us have ever seen, let alone touched, a satellite, and it is rare that we even acknowledge their presence above us. This is perhaps also unsurprising, since they occupy territories which "most of us will never visit – one that only astronauts have seen – and yet it is a place we cannot afford to overlook." Despite the many profound implications that this form of infrastructure has on our lives, satellite systems remain both elusive and peripheral in our understanding of the world. The consequence of this is that our capacity for democratic evaluation has been greatly inhibited, both as a matter for public debate as well as any general literacy regarding the actual operations of these satellite systems. This is perhaps because, even though orbital space is relatively proximate to us, it has long seemed to carry connotations of both "astonishment and anxiety" within the imagination of humanity's popular cultures and media, even

continuing to occupy an otherworldly, secluded position in our collective consciousness. It is likely that this is due to the nature of satellites as material objects and their operation in obscure locations. The result being that they have assumed a character that is at once, "visible yet invisible, evidentiary yet abstract." Additionally, the activities of satellites largely lie beyond human sense-perception, and therefore, in some sense, always have to be constructed by means of the human imagination. And yet, the seeming obscurity of these privatized satellite infrastructures nevertheless has consequences that are carried back to Earth.

The operation of these orbital objects in peripheral zones of invisibility is not only restricted to their life spans in orbital space, but this sense of invisibility is also maintained in their afterlives. Surprisingly, given the sheer number in orbit, satellites have a relatively short life span: around only 5 to 10 years. But what happens at the end of a given satellite's lifespan? What starts as a feat of complex engineering and precision craft eventually ends up being decommissioned in two principal ways, both of which are largely invisible. Once the life span of a satellite is nearing its end, one method of decommissioning is to discard the techno-object in a way that does not interfere with the circulation of global trade and travel routes and that presents a minimal risk to human beings. This first approach is known as the "Graveyard Orbit". It is located at about 22,000 miles above the Earth, near the outermost edge of orbital space. This site is routinely stocked with dead and decaying space artifacts, where several thousands of obsolete satellites in various stages of decay lie suspended above the Earth. The Graveyard Orbit, which occupies a band roughly 300 to 400 km in width, has exponentially transformed, from its beginning as a single orbital zone to an ever-expanding space burial region. So much so has the practice of sending dead space techno-objects there expanded it that it has become a "permanent fixture" around our planet: "unlike the rings of Saturn made out of dust and debris, the rings of the Earth are made out of dead machines."

The second method of decommissioning involves returning the techno-object to the Earth. In this approach, which is used by governments and private corporations, obsolete satellites are extricated from their operational orbits and dumped into the depths of the South Pacific Ocean. Located in a remote zone of the South Pacific Ocean, there is a zone known as the "Spacecraft Cemetery" that has been used as the re-entry location for several hundreds of decommissioned spacecraft, satellites, and even defunct space stations. Here, obsolete space objects eventually plummet to depths of about two miles below the ocean's surface, and their toxic residue has been accumulating

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there for roughly the past 40 years or so. Following the precedent of the orbital decommissioning zone, it is also in the South Pacific graveyard where one can find several thousands of defunct human-made space objects, with the bulk of them being remainders from the Space Race that began during the Cold War. During a brief span of about 45 years (c. 1971 to 2016), over 190 Russian space objects, 52 American objects, and several hundred more from Japan, China, and various European efforts, have all met their timed and untimed deaths in this uncharted watery horizon. Most significant among these oceanic "splashdowns" was the Russian space station "MIR" which, upon re-entering the atmosphere in 2001, left behind a debris trail about 1,500 kilometers (930 miles) long and 100 kilometers (62 miles) wide. Much like the MIR splashdown, several other defunct space objects have left behind an enormous trail of environmentally degrading pollutants that are not just sitting neatly on the ocean floor in one piece or even two pieces, but as fragmentary remains of once celebrated space missions that are now destroyed beyond recognition. Scattered, dispersed, and strewn across vast distances beneath the ocean's surface, this rapidly expanding oceanic waste field – despite geographically spanning about 3000 km from north to south, and about 5000 km west to east – remains minimally visible.

Originally operationalized sometime in the early 1970s, these extra-terrestrial and sub-terrestrial space graveyards have been used as a waste sink by some of the world's greatest space-faring nations. Salient in the waste exchange between these two extreme sites of waste externalization (i.e., the orbital and oceanic graveyards) has been the "movement of space junk continues to break down geographical boundaries, with waste from one extraterritorial region transforming upon arrival in other extraterritorial and sovereign spaces." In addition, "when satellites or meteorites fall back to earth they draw attention to the extraterritorial domains that extend up from the surface of the planet; through the atmosphere, stratosphere, and ionosphere, into the multiple orbital paths and out to the edges of the super-synchronous or 'parking' orbit, where satellites go to die." More specifically, their waste exchange is marked by the forced internalization of the embedded environmental and socioeconomic ramifications onto less-regulated international, shared spaces that are located beyond the national jurisdiction of any one nation-state.

A key principle that characterizes the present-day workings of satellite systems is that of "false externalization", because, despite their seeming status as purely external to the Earth, the forms of techno-waste generated by satellite networks are, in fact, still subject to a material dialectic

between externalization and internalization. Despite their operational lives transpiring in a place more or less external to the Earth, these ostensibly externalized toxic wastes are ultimately subject to important processes of (re-)internalization back here on Earth. Crucially, these processes have dire consequences for Earth's environments – whether built or unbuilt, human or non-human. Moreover, these so-called “externalizations” remain internal to the Earth's life-supporting and self-sustaining systems, the ramifications of which are profoundly destructive, both socially as well as environmentally. The reason these particular tactics are exploited is directly tied to our present context of the ongoing privatization of orbital space. These tactics of false externalization are advantageous to space corporations, businesses, and other profit-driven organizations like Elon Musk's SpaceX or Jeff Bezos' Blue Origin because they allow such groups to lower their operating costs – and thereby increase their profit margins – mainly by avoiding costly environmental and/or legal regulations. In other words, this is beneficial to the various powerful, economically and politically vested actors, not only because it allows them to circumvent their economic and environmental responsibilities – which should be part and parcel with the proper decommissioning and disposing of these hazardous forms of waste – but also by allowing them to evade the legal repercussions that would follow if the real effects of such activities came to light.

Central to the principle of “false externalization” is the “politics of visibility”. It helps bring to the forefront the paradoxical ways in which visual discernment helps both facilitate as well frustrate the representation and public knowledge of the sites of satellite operations, as well as the toxic realities that accompany them. More pointedly, it foregrounds the strained inter-relationship between scale, visibility and distance that helps bring to the forefront the unique trifecta of controlled (in)visibility, extreme geographical distance, and massive extraterritorial scales that is operationalized in the service of dissolving the legal and environmental accountability that inherently underpins these private orbital operations. In the first instance, let us consider scale. Because of and despite their massive scale, the sites of satellite operations in the Earth's near orbital space, as well as their sites of disposal in the orbital graveyard and the oceanic cemetery, remain negligibly visible. The result being these sites remain “out-there domains” whose sheer scale escapes our grasp. This unfathomable scale allows them to exist on an unlimited margin, or what is effectively a margin without scale. This is fundamental, since it reveals the phenomenological link between invisibility and infinity – or what is an indeterminate boundlessness, which makes hiding these multi-scalar operations not only possible but also difficult to discern, despite the highly potent nature of the destructive forms of waste they send away and back to Earth.

Second, concerning visibility, satellites operate in sites of very low visibility, practically obscured from public perception. This willful obscuring from public view means that these forms of infrastructure take on the quality of invisibility regarding most everyday activities of human life both inner- and outer-worldly. It is clear then that this form of invisibility not only helps to obscure, but to eventually drive into oblivion, the contested nature of these orbital operations, i.e., by facilitating ease in circumventing the legal responsibility of space agencies to decommission and dispose of these space vessels properly. This is remarkable given that many of the significant projects of orbital infrastructure are publicly touted to benefit everyone on Earth – a justification made in the visibility of the public eye. However, in reality, this visibility does not equate to access, insofar as many of these same projects are driven by an underlying profit motive, which seeks to regulate access to such benefits, granting access only to those who pay.

In addition to scale and visibility, the key to visual politics is the notion of extreme geographical distance and displacement. With respect to the afterlives of satellites, the sites of their disposal “represent places where humans can go, but only by using life-sustaining technologies, and only temporarily. In these places life either does not exist or exists only at the microbial level and at the margins.” This is due in large part to their location in “remote, uninhabited, and unruly natural places” whose extreme physical distance from everyday human life, makes the operations of satellite dumping invisible – not only physically but also culturally. That is to say, the farther satellites and their sites of operation and disposal are pushed away or “distanced”, the less visible and, consequently, less imperceptible they are within the public consciousness. This distancing benefits their owners in two primary ways: first, their limited visibility neutralizes and thus normalizes these operations; and, second, it depersonalizes their occurrence, since people think of these operations as occurring far enough away to be of no risk to them personally, hence diminishing or reducing the perceived magnitude or threat of these operations. The peripheral location and inaccessible character of these far-flung territories and in particular the “lack of other humans and even biota to resist or conquer has translated to a lack of urgency in examining the environmental histories of extreme environments” such as these.

Despite their seeming innocuousness, it is essential to bring into focus the obscure – and often

invisible – mechanisms through which the current paradigm of the privatization of orbital space immutably transforms transnational territories, such as those of the extra-terrestrial Graveyard Orbit and the sub-terrestrial Spacecraft Cemetery. In this regard, false externalization, when mobilized through the lens of the politics of visibility, is useful in two key ways. First, it allows us to recognize and problematize the increased undertaking of privatized orbital infrastructural endeavors, which, as we have seen, repeatedly externalize their toxic end-products and other forms of waste onto sites outside of their own visible spheres of responsibility. Second, if we recognize the phenomenon of false externalization, it can enable systems of public accountability and civic participation, the lack of which, at present, undermines democratic debate and decision making regarding such practices.

Finally, the concept of false externalization can aid spatial thinkers to comprehend the transformation of spaces that can and should belong to all of humankind. When understood in conjunction with the politics of visibility, false externalization can also serve as an all-encompassing tool that reveals the indexing logic of the contemporary space race – a race which fundamentally entails the transformation of nascent spaces into environmental sacrifice zones. Such sacrificial zones are ultimately internal to both the actual confines of our planet as well as the radically tiny region of space we are currently capable of operating in. Ultimately, this fact entails that the very idea of externalization is itself incoherent when applied to the effects of human infrastructures for any and all entities which remain tied to this planet.

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