INTERNATIONAL REVIEW OF MODERN SOCIOLOGY VOLUME 51, NUMBER 1-2, 2025

UNFATHOMABLE HARM: ABSURDIST SPACE CRIMINOLOGY, BLACK HOLE ENERGY EXTRACTION, AND REALITY HARMS

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This paper develops an absurdist space criminology of black holes as future sites of energy extraction with unfathomable harmful consequences. In doing so, it reacts to space criminology that has so far engaged mainly with harmful and criminal human activity in outer space resulting from space expansionism. I argue that space criminological thought must also grapple with harm by cosmic phenomena themselves (especially if amplified or caused by human interventions). Black holes, long a riddle in nature yet increasingly considered as speculative sources of limitless energy, will serve as an illustrative and speculative case. Their spacetime-bending qualities expose the human limits of space criminological (including zemiological) comprehension, especially because their potential exploitation for energy, as currently studied in astrophysics, could result in existential and structural harms that transcend currently conventional as well as critical criminological categories. Drawing on Camus' absurdism, this article situates black holes not only as destructive but as provocations to space criminology as an emergent field, challenging its task to rethink harm, risk, and responsibility at cosmic and often unfathomable scales. The analysis focuses on two forms of black hole (extraction) harms, introduced as reality harms: 1) spaghettification of entities and 2) harms to spacetime, entailing the destabilisation of physical laws and temporal experience. In doing so, the paper both critiques the anthropocentric fallacy residing within space criminology, while expanding its imagination into realms where meaning-making and harm collide with the unfathomable.

Introduction

When space criminology started to shape up as a specific field of criminological inquiry, the author immediately found himself struggling with the meaning of the word "space" in relation to criminology. Traditionally, "space" had been colonised by positivist frameworks such as Rational Choice Theory (RCT) and Routine Activity Theory (RAT), where it was treated as a rigid, static context in which offenders, targets, and guardians interacted in

"predictable" ways (Clarke & Cornish, 1985; Cohen & Felson, 1979; Cornish & Clarke, 2014; Felson & Clarke, 1998).

Outer space,[1] however, defies these assumptions both as criminological concepts and as everyday terms used to describe the terrestrial realms we inhabit; if only because outer space is an unfathomably vast, potentially eternal and hugely dynamic and unknown frontier, where human activity generates unprecedented forms of harm, legal ambiguity, and space-environmental vulnerability. First, space differs from Earth through microgravity, unfiltered radiation, and chemically distinct atmospheres (Atomi, 2015; Nelson, 2016; Strey, 2019). These hazards require confined, airtight living with limited nutrition (Williams et al., 2009), producing psychological stress, frustration, and interpersonal conflict (Dunn Rosenberg et al., 2022; Laham, 2023; Sucamele, 2021), potentially escalating into harmful disputes. With no clear national borders, and despite a large body of space law, questions still arise over jurisdiction and enforcement (Li, 2020). Arguably, space's borderless, potentially limitless nature amplifies legal uncertainty (Schladebach, 2018; Sutter, 2018), which could in and of itself be criminogenic, as seen in astromining claims that infinite resources justify unlimited exploitation (Lampkin & McClanahan, 2024). Moreover, spacetime is (socially) constructed differently. For instance, the International Space Station (ISS) orbits Earth every 90 minutes, giving 16 sunrises and sunsets daily (Raveendran, 2022), while Mars days are 39 minutes longer and years last 687 Earth days (The Planetary Society, n.d.).

Space criminology has the task to integrate these rather existential spatial-temporal divergences into its empirical, theoretical, and methodological frameworks, and therefore it cannot only (and simply) transpose terrestrial-focused theories onto the cosmos, especially critical ones on space expansionism (Deudney, 2020; Lampkin & White, 2023; Poss et al., 2024; Rothe & Collins, 2025). It must include fundamental reorientations around the very notion of "space" in relation to being human and "doing crime," or inflict other harm, out there. One way to do so is by expanding the space criminological imagination to encompass not only the scale, complexity, and consequences of human action off-Earth, but also the causes, awesome manifestations, and repercussions of celestial and cosmic phenomena themselves,

particularly when triggered or worsened by human activities in space.

This article will do so by examining black holes, which have been considered enigmas in nature and are increasingly researched in (speculative) theoretical astrophysics not only as destructive forces but also as potential sources of virtually limitless energy (Abramowicz & Fragile, 2013; Blandford & Znajek, 1977; Carr & Kühnel, 1975; Domcke et al., 2025; Dyson & Pereñiguez, 2023; Fabian, 2012, 2016; Fabian et al., 2015; Hay et al., 2025; Herman et al., 2021; Inoue & Yokoo, 2011b; Penrose, 1969; Shakura & Sunyaev, 1989). Given their spacetime-bending, mysterious nature, the disastrous destruction they can cause, and the space expansionist ambitions embedded in such astrophysics, this article focuses on the unfathomable harm that space criminology should consider when addressing black hole energy extraction. In doing so, dynamic cosmic phenomena may offer insights for space criminology, much like criminology has drawn from dynamic terrestrial forces such as sea, wind, or solar energy. They could then *prospectively* inform space criminology's theorisation of harm, risk, crime, and responsibility beyond Earth, which aligns with its future-oriented focus (Eski, 2025a; Rothe & Collins, 2025; Takemura, 2022).

One of the main reasons to do so is because, generally, our understanding of (physical) reality itself is continually challenged by outer space, quite literally: we see things differently when confronted with the existence of cosmic phenomena that do not fit our most fundamental comprehension of life. Put differently, outer space constantly defies or falsifies once taken for granted facts. To illustrate, being able to investigate outer space through telescopes and later going to outer space and experiencing it "out there," has had existential impact on how we see ourselves (in relation to the dark skies above us). The clearest example of such an impact is the experience astronauts have when they see planet Earth from spacecraft for the first time, causing what is called the overview effect. It provides a cognitive shift in awareness of our Earth as a fragile, interconnected, and borderless "blue marble." Having such an impact, the overview effect often result in feelings of awe, unity, and a renewed sense of responsibility for protecting the Earth (Yaden et al., 2016). For example, after having experienced the

overview effect, Dutch astronaut Wubbo Ockels claimed that 'We are all astronauts on spaceship Earth,' feeling responsible for the planet's well-being, and calling for shared stewardship to protect our planet by pioneering innovative and sustainable solutions (Dontje, 2022).

In fact, we are not merely on *a* spaceship Earth that encircles the Sun; it is the entire solar system that orbits at approximately 220 to 240 km/s as a coherent "fleet" of planets around the galaxy's centre (NASA, 2017). Even our Milky Way Galaxy itself moves at around 600 km/s within cosmic structures, in so-called galaxy clusters (Bland-Hawthorn & Gerhard, 2016; Reid et al., 2014; Tully et al., 2014). Viewed together, these layers of "travelling" through space imaginatively change our cosmic neighbourhood into what could be perceived as a vast galactic armada of star systems and galaxies, cruising together as seemingly coordinated, interconnected forces in which we as humanity are but a small group of travellers.

This cognitive shift in perception has implications for how space criminology studies create harm and responsibility beyond Earth. In fact, space and its awesomeness could change how we perceive ourselves and humanity's place in the universe. It challenges all-too-human Earthly thinking in and of itself due to mind-bending discoveries that force us to reconsider long-held assumptions and scientific "laws" once thought to be constants. Indeed, continuous astronomical and astrophysical discoveries reveal cosmic phenomena that challenge conventional classifications of what was regarded unchangeably normal, such as exoplanets with "burning ice," where seemingly contradictory physical conditions appear to be able to coexist (Gillon et al., 2007). It is indicative of how our current models and "laws" are merely provisional, serving as temporary frameworks rather than as absolute truths. Such findings can falsify prior assumptions even on an existential level, for example, when we encounter extraterrestrial life, illustrating how incomplete and tentative our grasp of cosmic reality remains. Space, effectively then, could rearrange our "established logics" of harm too, as this paper will show.

By obtaining seemingly illogical insights residing in the cosmic absurdity of black hole (energy extraction), it will be shown that space criminology can advance its understanding of Anthropogenic harm not only done to celestial bodies but also *by* cosmic phenomena

to humankind and outer space itself. As such, this article pushes the envelope further, going beyond relatively small, solid bodies like asteroids and massive, extractable celestial bodies (e.g. Lunar helium-3 exploitation), toward an absurdist approach (Camus, 1942, 1991, 2010, 2012). It situates black holes as extreme, high-energy phenomena whose exploitation might culminate in harms exceeding those posed by human activity to solid celestial bodies, reaching even into the fabric of reality itself, as section 4 will (pro)speculatively illustrate.

Before arriving there, however, I will elaborate on space criminology's struggle to gain recognition as a serious area of study within criminology, reflecting on its partially derivative scope and its own anthropocentric focus on celestial bodies. Section three then makes absurdism sensible for space, particularly by delivering an absurdist space criminology of black holes as dynamic celestial energy resources. In section four, black hole energy extraction and its potential harms, specifically spaghettification and harms to reality, are analysed. Finally, section five concludes by reflecting on space criminology as a meaning-making enterprise itself that can confront the meaninglessness of outer space in a Camusian fashion, fathoming the unfathomable of expansionist harms and harms caused by space.

Against space optimism and unoriginal space criminology

Space politics of hope and copycat space criminology

For a long time, space crime and harms resulting from human activities have been largely ignored, first and foremost, because they oppose space-optimistic narratives that let us imagine leaving Earth and they could expose the exploitation, inequality, and destruction that underpin our space optimism (Billings, 2007; Popper & Rakotoniaina, 2019). Acknowledging that crime could take place in space as well would directly challenge hope-induced, hyper-commercialised space ventures undertaken "for all humankind." However, in reality these endeavours enable billionaire-led flights for a highly exclusive group of people who suffer from narcissistic Earth-escapism and fear of ongoing ecological harm on our planet, while trying to evade accountability (Ormrod, 2007; Vdovychenko, 2021).

That confrontational element of space crime and harm has been acknowledged by and problematised in space criminology (Eski, 2023). More broadly, in the field of space criminology there is a focus on problematic systemic and structural issues in outer space that are themselves harmful and can generate crimes, as large corporate conglomerates at the helm of the New Space Race, expand, pollute, exploit, and exterminate outer space environments for neocapitalist (ad)ventures (Eski, 2023; Lampkin & White, 2023; Rothe & Collins, 2023; Takemura, 2019, 2022). These space criminologies of off-Earth human activity comprise predominantly critical observations on how outer space enables, sustains and amplifies expansionist tendencies and state-corporate crimes among the stars. In short, it critiques humanity's expansionist approach to space, mirroring thousands of years of unbridled resource extraction and the annihilation of anyone or anything inhabiting such territory, defining them as "the Other" (or quite literally othering them as "alien"), allowing capitalist mentality and destruction to thrive once more until we move onto the next planet or other type of celestial body (Deudney, 2020; Rothe & Collins, 2025).

That space criminological critique is, however, not that new. Although space criminology could be considered the first field within criminology to initiate some sort of sociological criminalisation of harmful off-Earth human activities (perhaps resulting in legal criminalisation at some point), the broader and deeper argument that we human beings will criminally and harmfully exploit outer space and others in outer space as well, is unoriginal. In fact, acknowledging the critique science fiction has imaginatively conceptualised space crimes and colonialism already (Lam et al., 2025), to put space harms and crime on the scientific agenda has been done extensively by other social sciences decades before space criminology did. It is in particular the *political sciences* (with a space historical focus) on the one hand analysing space warfare, international security and *Astropolitik*/astropolitics (Anderson, 1997; Dolman, 2002; Glassner, 1991; Gotlieb & Dalfen, 1970; *McDougall*, 1985; Peterson, 1997; I. L. White, 1969) and on the other hand, it has been *space anthropology* (Battaglia, 2005; Buchli, 2020; Klinger, 2018; Lebedev et al., 1990; Mellor, 2007; Messeri, 2016; Olson, 2010; Valentine, 2012; Vertesi, 2015), *space*

psychology (Kanas et al., 2007; Kanas & Manzey, 2008; Melton & Briggs, 1960; Yaden et al., 2016) and *space sociology* (Bluth, 1983; Casper & Moore, 1995; Castaño & Santana-Acuña, 2023; Dickens & Ormrod, 2007; Marino, 2023; Peters, 2017; Shukaitis, 2009) that have focused on astronaut biographies, (deviant) group and interpersonal behaviour, and space capitalist harms before. But especially *space legal scholarship* has studied in-depth criminal liability and policymaking in space law most extensively, in some instances before the Outer Space Treaty existed. It primarily problematises how people could criminally harm other people, and later how human activities in space should treat space environs peacefully and respectfully (Adams, 1983; Blakesley, 1982; Blount, 2007; Casey, 2022; Christol, 1983; Diederiks-Verschoor, 1967, 1979; Gorove, 1972, 1991; Hardenstein, 2016; March, 1984; Ohmer, 2019; Robbins, 1983; Robinson, 1974; Seshagiri, 2005; Taubenfeld, 1961),

The fact these social scientific and legal fields of study already scrutinised the final frontier of harm, crime and policing, may mean that space criminological understanding of harm done *to* and *in* space by people is less a radical stance than an almost axiomatic one. However, recognising this continuity does not diminish the field's potential to synthesise, extend, and reconceptualise these insights on a cosmic scale. Lam et al. (2025) note that space criminology as a whole field is not entirely new and may be seen as an extension of prior imaginaries or terrestrial green criminology,[2] which is, to a certain degree, not entirely untrue when acknowledging the green criminological foundation of astro-green criminology[3] (as a part of space criminology) (Burns & Lampkin, 2024; Lampkin, 2020; Lampkin & McClanahan, 2024; Lampkin & Wyatt, 2025; Lampkin & White, 2023; Lampkin & Wyatt, 2022). However, their critique constitutes a rather limited observation and unambitious treatment of space criminology, altogether failing to engage with the field's transformative potential. At the same time, and at the other extreme, lies Takemura's concept of an ultimate astro-green criminology, which explores the possibility of intelligent extraterrestrial civilisations capable of harnessing space-based solar power and other sustainable energy sources from which humanity might learn (Takemura, 2022). Albeit intellectually provocative, this approach may be perceived as excessively speculative and perhaps too transformative, for now.

Positioned between these extremes, this paper adopts a more grounded perspective, analysing scientifically supported insights from theoretical astrophysical thought-experiments on high-energy phenomena to then situate these phenomena as loci of absurd harm, also by anticipating them as plausible speculative frontiers of celestial energy extraction. This implicitly means space criminology must confront its own deeply ingrained anthropocentric focus on the cosmos.

From space rocks to spacetime ripples: rethinking space extractivism

In the 1870s, the HMS *Challenger* expedition documented mineral-rich nodules on the seafloor. During that expedition in 1874, oceanographer John Young Buchanan wrote in a letter to his family that polymetallic nodules could be of 'great commercial importance' (Glasby, 1977, p. 4). Almost a century later, scientific analyses of marine mineral resources sparked industrial interest in deep-sea mining (Mero, 1965; Wang, 1970). And roughly a decade later, there was proof of concept for technological feasibility of deep-sea mining of these nodules (Beiser, 2023). This shows that, like space mining today, deep-sea mining that began as speculation, ultimately became realisable. Furthermore, that maritime history also reveals how such early speculation ignored devastating ecological impacts on fragile marine ecosystems, and critical debate started when the harm was already done (Beiser, 2023). In fact, only recently have green and especially blue criminologies been developed that critically examine deep-sea mining as part of wider patterns of marine extraction and regulatory failure, while stressing precaution against such aggressive exploitation (Aliozi, 2025; García Ruiz et al., 2022; García Ruiz, 2021; Hutchinson, 2023; Morelle-Hungría et al., 2023).

Although space criminology engages in critical debates on illegitimate, off-Earth territorial claims, neocolonialist exploitation, and ambivalent space governance from which harms of extracting space resources results, its prime anthropocentric focus remains on stable "things," for example, our Moon or "trillion-dollar" asteroids, such as 16 Psyche; these are relatively predictable, "anchored" celestial bodies, mirroring land or mineral deposits on

Earth (Burns & Lampkin, 2024; Lampkin, 2024; Lampkin & Wyatt, 2025; Lampkin & Wyatt, 2022; Takemura, 2019, 2022). What remains absent are analyses of implicit extractivist interests residing in theoretical astrophysics of dynamic celestial and cosmic energy sources, including solar winds, planetary storms, or tidal interactions, despite such scenarios already being prospected in the space sciences (Gámez Losada & Heiligers, 2021; Hay et al., 2025; Liu et al., 2025; Stoica et al., 2016; Tsuda et al., 2013). So, considering how terrestrial extractivism expanded from mining fixed deposits to capturing kinetic energy through wind, water, and tides, and where green and blue criminology belatedly caught up on, space criminology could (and should) anticipate speculative frontiers in dynamic space resource extraction in order to avoid denial of the potential harms we could bring to them and/or they could inflict upon us by critically analysing current astrophysics. This paper, therefore, entails a form of space criminology that functions as what could be considered a critical sociology of astrophysics, as it scrutinises the social, extractivist, and speculative dimensions ingrained in the study and theorisation of dynamic cosmic phenomena, and by which it resembles sociologies of physics that analysed social underpinnings of physical sciences (cf. Hatherly et al., 2008; Lima et al., 2020).

First, it must be acknowledged that these dynamic frontiers are not abstract speculation, given the studies on harvesting energy from moving cosmic phenomena. For instance, the Sun emits a continuous stream of charged particles known as the solar wind, which hypothetically can be captured as plasma by using magnetic loops or sails, to eventually convert its motion into electrical energy (Liu et al., 2025). Then there is the travelling of light as an energy source, which carries momentum. Think about missions such as Japan Aerospace Exploration Agency (JAXA)'s IKAROS or The Planetary Society's LightSail 2 that have shown how solar radiation propels spacecraft by converting the flow of photons into propulsion or energy (Gámez Losada & Heiligers, 2021; Tsuda et al., 2013). What comes to mind as well is off-Earth atmospheric wind energy, potentially harvestable at Jupiter and Saturn. These planets are both gas giants that possess immense and persistent atmospheric storms. The kinetic energy of these storms could, again theoretically, power floating "wind-harvesting" platforms, much

like turbines on Earth. NASA's WindBots project explores this concept for gas giant energy-use (Stoica et al., 2016). As a last example is the idea of extracting tidal energy from celestial bodies being in close gravitational interaction, such as Jupiter and its moon Io that experience tidal flexing, generating heat and energy that, in theory, could be tapped (Hay et al., 2025).

To avoid repeating criminology's earlier oversight of harmfully extracting kinetic forces on Earth (e.g., rivers and tides), the space criminology presented in this paper proactively addresses the harms of extracting dynamic energy streams in outer space, focusing on one of the most extreme and concentrated forms of cosmic motion: black holes. While solar winds, planetary storms, and tidal interactions illustrate the untapped potential of moving celestial phenomena, black holes contain far more concentrated as well as far more dangerous energy (extraction activities). Especially spinning or orbiting black holes have enormous kinetic and gravitational energy that far surpass that of planets or stars (Abbasi et al., 2025; Blandford & Znajek, 1977; Domcke et al., 2025; Dyson et al., 2024; Dyson & Pereñiguez, 2023; Einstein & Rosen, 1935; Hay et al., 2025; Herman et al., 2021; Inoue & Yokoo, 2011b; Lu et al., 2023; Penrose, 1969; Smolin, 1997).

From a space criminological perspective, black holes represent not only a frontier for potential energy extraction but also unprecedented sites of harm, because any project or initiative (in the future) that aims to harness their rotational or accretion energy, for example through megastructures, orbital turbines, or hypothetical Penrose-like processes (Abbasi et al., 2025; Penrose, 1969), could pose catastrophic risks that remain largely unconsidered in current criminological and zemiological analyses. Just the idea that black hole-mining personnel could face lethal tidal forces capable of spaghettification, stretching and tearing them apart if they venture too close to a black hole, highlights the extreme and existential nature of such potential harms, thus worthy of a prospective, zemiological space criminology.

So, although speculative, such an analysis is crucial, given that theoretical astrophysical studies already contemplate black hole energy extraction, meaning space criminology cannot dismiss it as mere science fiction. Just as marine mining was once considered absurd until it became reality, black hole energy extraction may

follow a similar trajectory, producing mass-scale harm. Anticipating these existential risks, even if currently regarded as absurd space oddities, is therefore essential for the development of a prospective, not-so-anthropocentric space criminology.

A space criminological oddity: absurdism and black hole energy extraction

Making absurdism sensible for space criminology

> 'We've codified our existence to bring it down to human size, to make it comprehensible. We've created a scale so that we can forget its unfathomable scale' (*Lucy (2014) - Quotes - IMDb*, n.d.).

To explore the idea of black hole-energy extraction and related unfathomable harm yet to still fathom the unfathomable scale of it, an understanding of the absurd (which is not such a *contradictio in terminis* as it may seem) can be helpful. Even if only to (re)orientate space criminology toward the existential conditions humankind is confronted with when/if we manage to exploit vast, dynamic cosmic phenomena (Angelo, 1993; Galántai, 2004; Takemura, 2022). It is about coming to terms with a way to comprehend harm at scales and in contexts that go beyond anthropocentric frameworks, while resisting the temptation to dismiss the problem simply because it exceeds our present ability to fully comprehend it. To do so, Albert Camus' absurdism assists here in making sense of the confrontation between meaning-making and the indifferent vastness of the cosmos, done so specifically to make space criminological sense of unfathomably harmful cosmic phenomena.

Almeshaal's work represents a rare application of Camusian absurdism in criminology, using the absurd to explore existential tensions faced by female prisoners (Almeshaal, 2021). It brings a creative criminological imagination to criminal justice research, which is otherwise largely absent in the field. Yet, within its terrestrial focus on moralised responses and individual experience, it simplifies Camus and lightly romanticises the absurd, overlooking his broader social-philosophical insights. Absurdist space criminology should avoid this romanticisation, particularly when it speculatively explores extreme, cosmic phenomena, in this case,

black hole extractivism.

Albert Camus' philosophy centres on the absurd, essentially, the conflict between humans' search for meaning and the universe's indifference. In his novels, such as *The Stranger* (Camus, 1942), he depicts how accepting life's inherent meaninglessness with emotional detachment could unpack on an individual level, whereas in *The Plague* he expands the absurd to a collective human struggle, highlighting solidarity and resistance in the face of suffering (Camus, 2010). In *The Fall* he examines guilt, responsibility, and moral reflection amid a meaningless world (Camus, 1991). While stressing the importance of confronting reality honestly, creating personal meaning, and acting with courage and integrity despite uncertainty, it is in his *The Myth of Sisyphus* (Camus, 2012) where he first frames the absurd through Sisyphus' eternal, futile labour, advocating for a defiant embrace of life rather than nihilism. He defines it as a conflict between the human drive for meaning and the universe's indifference:

> 'A world that can be explained even with bad reasons is a familiar world. But, on the other hand, in a universe suddenly divested of illusions and lights, man feels an alien, a stranger. His exile is without remedy since he is deprived of the memory of a lost home or the hope of a promised land. This divorce between man and his life, the actor and his setting, is properly the feeling of absurdity' (Camus, 2012, p. 6).

Essentially then, he argues, to deal with feelings of absurdity is to recognise absurdity, which should not lead to despair but to, as he stresses, revolt against meaninglessness. It entails a defiant embrace of life despite its lack of any ultimate meaning. The metaphor of Sisyphus, condemned to eternally push his boulder uphill, then becomes emblematic of perseverance in the face of futility. It is this aspect of Camus' absurdist perspective that allows space criminology to go beyond critiquing 'bad reasons,' i.e. harmful space expansionism, and go beyond 'good reasons' for doing so, i.e. sustainable and emancipatory space exploration (Takemura, 2022), toward embracing indifferent, unfathomable harm caused by a black hole (initiated and/or amplified by human space expansionism).

Hence, meaning-making, when seen through a Camusian

perspective, could be considered to result from an anthropocentric impulse that drives us to apply scale onto unscalable danger, fabricating it into something measurable. It is exactly that kind of meaning-making that has also driven colonialism, obsessively wanting to control the environment and other humans, having led to slavery and resource exploitation throughout history (Eski, 2023); a logic that informs space expansionism too, given how terrestrial hierarchies and extractive rationales frame celestial bodies (Rothe & Collins, 2025). Moreover, this anthropocentric desire to scale has shaped criminology itself as well, as is clearly reflected in how RAT and RCT, for example, funnel down into measurable factors, where it treats spatial and temporal contexts as perceived "stable" backdrops for predictable offender–target–guardian interactions (Clarke & Cornish, 1985; Cohen & Felson, 1979; Cornish & Clarke, 2014; Felson & Clarke, 1998).

As analytically convenient as it may be, this approach has historically limited the field, excluding large-scale or systemic harms such as genocide, state-corporate crimes, and environmental destruction, which cannot be fully reduced to human-scale variables. It is a way of doing criminology that has been heavily criticised over half a century now by a range of critical criminologists and cultural criminologists, but also and especially by zemiologists (Canning, 2018; Canning & Tombs, 2021; Davis & White, 2023; Green & Ward, 2019; Hillyard & Tombs, 2017). It moves away from "crime" to socially produced harm that has offered the conceptual reach for space criminology (Lampkin & White, 2023), especially because it is there where harmful activity often manifests beyond criminal law's jurisdiction or imagination (Canning, 2018; Canning & Tombs, 2021; Hillyard & Tombs, 2017). Zemiology therefore also disregards scientific value-neutrality, while advancing an openly normative and public-facing scholarship (Davis & White, 2023).

Space criminology, in particular astro-green criminology has taken the zemiological perspective onboard for its situating of space activities within green criminology's concern for multispecies and planetary well-being (Lampkin & White, 2023). It treats outer space as an extended environment where space mining impacts, debris cascades, radiative contamination, and sky-brightness and -darkness loss are environmental harms irrespective of their legal

status but do demand precaution, accountability and redistribution of risk, as zemiology advocates (Canning & Tombs, 2021).

However, the challenge at hand is not merely integrating zemiological thinking into space criminology to then transpose it to the cosmos where humans will harm space environments and potential extraterrestrial life. In fact, a zemiology within space criminology is limited if it remains confined to human-caused harms, however grave or atrocious they may be, such as astrocide (Eski, 2025a). A zemiology-enriched space criminology should account for the vast, unfathomable destruction by and of celestial phenomena themselves too, such as the eradication wrought by solar flares, the annihilating pull of black holes, the brute trauma of stellar collapse, or the metaphysical churn of spacetime itself. It should do so exactly *because* these forces resist the anthropocentric scaling of harm that underpins most (critical) criminological and zemiological frameworks themselves, yet they shape the very conditions of reality as we know it. This is the absurdity space criminology must carry onto the hill, even more so if/when we become an interplanetary species.

This critique is not entirely new. Carrabine (2024) observes that the Anthropocene is haunted by spectral harm and a temporality "out of joint," meaning, we cannot truly fathom the scale of harm done by climate change, and the attempt to think harm at a cosmic scale confronts us with a similar dissonance. As a matter of fact, it forces us to confront the limits of human-centred criminological frameworks, echoing Lucy's reflection in the eponymous film. Our efforts to scale harm by categorising and making it comprehensible, risk blinding us to their truly unfathomable dimensions. Cosmic harm too resists such reductive scaling, exposing the inadequacy of any conceptual framework when confronted with forces that are neither moral nor terrestrial, yet undeniably and existentially harmful for us human beings and celestial bodies. These forces redefine harm not as a rupture within a moral or legal order, but as harmful, reality-enabling and reality-bending constants: dynamics embedded in the very structure of spacetime existence, beyond human comprehension yet inescapably real. They are truly overwhelming, resembling the existential awe astronauts experience during the aforementioned overview effect. It is precisely that fundamental impact that space criminology must apprehend and

convey.

So, to turn this philosophical insight derived from absurdism into an actionable epistemic posture for the field, comprising a recognition of the limits of human comprehension, without retreating from engagement, space criminology ought to wonder, as phenomenologist Edmund Husserl did (Husserl & Merleau-Ponty, 2002):

> 'What sense could the collapsing masses in space, in one space constructed a priori as absolutely homogenous, have, if the constituting life were eliminated? Indeed, does that elimination itself have the sense, if it has any at all, of an elimination of and in the constituting subjectivity?' (Husserl & Merleau-Ponty, 2002, p. 131).

Husserl's questions target a fundamental and existential tension residing within cosmic harm, which is the indifference of vast, destructive phenomena to human meaning and subjectivity. If we were to accept the idea that harm relies on a constituting consciousness to give them sense, then cosmic harm seems to confront us with an existential paradox, namely, that harm is simultaneously real and unreal, and thus absurd.

This is where Meillassoux's suggestion to challenge the view that reality is inseparable from human thought proves helpful, directing us to the possibility of an independent, mind-external reality by rejecting Kantian "correlationism" and acknowledging that a contingent cosmos existed long before human consciousness and will persist beyond it (Meillassoux, 2010). His advocacy of speculative philosophy reinforces the notion that cosmic harm unfolds within a reality indifferent to human meaning, one that escapes anthropocentric frameworks. Literature on what is referred to as cosmic horror, suggests that consciousness itself is a tragic anomaly and an evolutionary misstep that curses humans with the capacity to suffer and reflect on their own meaningless existence (Ligotti, 2018). His anti-natalist position and deep engagement in thinking about harm, implies that it is not merely a condition of life – on Earth – but is a reality-shaping structure, and because of it, an ontological structure of suffering that is as real as it is indifferent. The indifferent, silent and mute cosmos amplifies this absurdity, where Bostrom's "infinitarian paralysis" seems to be at work (Bostrom, 2011; Moynihan, 2020), that is to say: if all possible

events occur infinitely across an eternal, limitless universe in the most harmful way possible, the ethical weight of our actions simply collapses. It could lead to cosmic-induced fatalism, wondering why would we grieve extinction or resist atrocity if everything, every single harm, every single injustice, is endlessly reiterated elsewhere?

The scale of cosmic harm and the boundless, possibly infinite, expanse of the universe overwhelms human comprehension, which would make meaning, consequence, and moral frameworks fragile or perhaps even irrelevant. This ontological as well as epistemological vertigo captures an absurd condition in which cosmic harm is at the same time real, indifferent, and impossible to fully fathom. However, it is then about beginning to revolt against such real, indifferent and unfathomable harm, as Camus would have urged. Space criminology can draw meaning from absurd harm. In fact, it could be a "platform" to test the absurdist space criminology of dynamic energy extraction in outer space. Black holes as cosmic phenomena with an enigmatic nature then provides a lens to explore absurdist harm in prospective practice.

Extracting black hole energy

What are black holes? Being among the largest ultramassive, cosmic phenomena, black holes were initially described as "dark stars" by John Michell in 1783, for which Karl Schwarzschild provided the first mathematical solution to Einstein's equations of general relativity in 1916 to describe a black hole's warped space. Robert Oppenheimer and others considered the idea that a black hole could be formed by a massive collapsing star. The term "black hole" itself became a term coined by John Wheeler in 1968 (*John Michell*, n.d.). As an astrophysical subject of study, a black hole consists of a specific spacetime region or sphere, where gravity is so strong that all matter, even light, cannot escape it. The outer boundary of a black hole is referred to as the event horizon where once matter passes, it cannot return. Whereas they are sometimes presented in popular imagination as mysterious or speculative, black holes are well established in scientific research, theoretically predicted as well as empirically observed, such as the black hole shadow in the galaxy M87* (Akiyama et al., 2019), the supermassive black hole at the centre of our own galaxy, i.e. Sagittarius A* (Hees et al., 2017), and recorded black hole mergers (Andrusenko et al., 2022).

According to different theoretical models, including the Schwarzschild solution for non-rotating black holes and the Kerr solution for rotating ones, black holes have a basic structure. The "no-hair theorem" implies that their observable properties are reduced to just three parameters: mass, spin, and charge (Sarkar, 2019). Moreover, black holes exist at very different scales. Also, they are not just simple endless voids where everything disappears. Instead, they are cosmic phenomena that have far-reaching effects in the cosmos due to their accumulation of matter. In doing so, they produce such huge amounts of energy that they can drive some of the most violent astrophysical phenomena in the universe. For example, supermassive black holes at the centres of galaxies can power quasars and are also known as active galactic nuclei. Meaning, there are galaxies whose central black holes consume matter so fast that they release gigantic radiation across the electromagnetic spectrum (Fabian et al., 2015). Black holes can also release streams of plasma that travel at near light speed over enormous distances, while infalling matter often creates an accretion disk that radiates energy (Abramowicz & Fragile, 2013; Shakura & Sunyaev, 1989). In fact, the possibility that primordial black holes were formed right after the Big Bang implies they may partially account for dark matter (Carr & Kühnel, 1975). Put differently, black holes could be seen as cosmic engines, shaping galactic dynamics through processes of accumulation and energy release, with even reality-altering capacity.

For absurdist space criminology, their significance lies less in their physics and more in the scale of powerful destruction they embody, which challenges the anthropocentric frameworks through which we usually conceptualise harm. Scientific endeavours to explore and theoretically test energy extraction from black holes make them especially relevant, as they form a dual significance: both as causes of immense destructive power and as hypothetical sources of potentially infinite energy, either of which fundamentally challenges anthropocentric "scales" of harm.

We now turn to black holes as energy sources. In this context, they were first studied by Roger Penrose (Penrose, 1969). Dubbed the Penrose Process entails the rotating (Kerr) of black holes that can be tapped for energy due to the unique structure of the ergosphere: a region outside the event horizon where spacetime is

dragged by the black hole's rotation. There, when a particle, a spacecraft, an astronaut or a photon, or any entity enters the ergosphere, it can split into two components, with one part falling into the black hole while the other escapes. It is then because of the twisted geometry of spacetime that the ingoing particle may carry negative energy relative to an external observer, allowing the escaping particle to emerge with more energy than it originally possessed. Over time, this mechanism could even reduce the black hole's rotational speed, effectively transferring energy from the black hole to an external system.

To visualise this in everyday terms, even though still unfathomable at the same time given its scale, it could be considered as fishing in a fast flowing, whirling river, where you cast your line into the stream. Part of the line sinks into the depths (falling into the black hole), while the other part is carried by the flow back to you, now with additional momentum (extra energy), meaning the energy does not come from the object itself but from the current. This is the black hole's rotational energy. However, unlike conventional fishing, the medium is spacetime itself, twisted and moving, so the "catch" is purely energetic, not material. The catch is not the fish but the act of fishing itself that creates new energy. In this way, the Penrose Process can be seen as "borrowing" rotational energy from the black hole: the ingoing component effectively subtracts energy from the black hole, while the escaping component carries a net gain of energy outward.

Blandford and Znajek (1977), who built on Penrose's original idea, showed that magnetic fields interacting with a spinning black hole could produce energy too by extracting from powerful relativistic jets. Recently, it has been suggested that black hole accretion disks could provide energy as matter spirals inward, almost as fast as light. If immense enough, they could heat up and radiate energy to be captured by hypothetical megastructures, such as Dyson spheres (Dyson et al., 2024; Dyson & Pereñiguez, 2023; Hay et al., 2025; Inoue & Yokoo, 2011b). Next to black holes independently, once they merge, gravitational waves are caused that could create ripples in spacetime itself. Black holes as massive accelerating objects transport energy across cosmic distances in waves that, theoretically, could provide electromagnetic energy by using magnetic fields in waveguides (Domcke et al., 2025;

Herman et al., 2021). It is important to recognise that this energy-harvesting potentiality of black holes depends on context-specific power systems. They are highly sensitive to the surrounding cosmic environment, as Abbasi et al. (2025) showed regarding black holes that are situated in a background of quintessential energy, which functions like a cosmic "climate" shaping spacetime. According to them, key effects of that process include faster-spinning black holes with larger ergospheres (spin effect), orbit-destabilising conditions (quintessence effect), lower energy for prograde and higher for retrograde motion, a Penrose Process limited to ~35% efficiency (less under extreme conditions), and an irreducible portion of mass-energy that caps extractable energy. In sum, their insights imply that black holes are not independent, uniform or predictable wells of ultimate energy (cf. Takemura, 2022); instead, their energy supply is contextual, depending on spin, charge, the local cosmic environment, and the physics of spacetime itself.

Because of that contextuality, space criminology should account for forces and scales fundamentally indifferent to anthropocentric frameworks, as these forces pose existential, reality-altering challenges to conventional notions – even if they are critical – of harm and accountability. This is especially important if, or when, the day comes there will be attempts to control, manipulate and benefit from black hole forces, given their potential for catastrophic, existential and unfathomable harm.

"Reality Harms" Due to Black Hole Energy Extraction

Although it currently appears unimaginable that humankind might one day approach a black hole, which would resemble how we could hardly imagine mastering the seas (see section 3), the skies, space, and now cyberspace, human expansionism pushes perceived limits. The difference between "terrestrial" criminology and space criminology is that the latter pushes prospectively thinking about harm much further, providing before-the-act criminologies that anticipate future harms before they could suddenly surprise or overwhelm us (Eski, 2025b; Eski & van Sintemaartensdijk, 2024; Lampkin & Wyatt, 2022; Poss et al., 2024).

Absurdist space criminology extends this perspective even further to a future phase in human development in which we achieve a Type II or Type III Kardashev scale civilisation, or perhaps

a Type IV capable of building megastructures such as Dyson-spheres (Angelo, 1993; Galántai, 2004; Gray, 2020; Hsiao et al., 2021; Inoue & Yokoo, 2011a; Takemura, 2022). Such an advanced civilization would have to possess 'magnificent feats of astroengineering,' including 'harvesting black holes' which serve as extremely dense energy sources and as gravitational tools for system-scale engineering, supporting interstellar habitats, advanced robotic operations, and multigravity experiments (Angelo, 1993, pp. 843–845). Takemura introduces examples of extraterrestrial energy to space criminology, including Dyson spheres or swarms capturing a star's output, Type II civilisations harvesting all stellar energy, interstellar colonisation with replicating probes, integration with planetary systems to optimise energy use, and hypothetical Type III/IV civilisations managing energy at galactic or universal scales (Takemura, 2022). His focus, however, is on efficiency and survival of humankind, rather than on the harms that SETI-inspired mega-extraction could inflict upon us, by ourselves. Moreover, while he uses the Fermi Paradox, Drake Equation, and Kardashev Scale, these remain speculative abstractions. What is missing is an engagement with the physical realities of energy extraction and the risks they carry, thus making it important for space criminology to consider the existential, structural, and potentially reality-altering harms that could arise from human interaction with such extreme cosmic phenomena exploitation.

Therefore, if we were ever to attempt to harness their immense energy, in this case black holes, by translating theoretical physics observations into practice, the severely harmful consequences to human beings could be as extreme and incomprehensible as these forces themselves. Moreover, concerns should arise regarding who will perform such heavy labour of extraterrestrial dynamic resource extraction. Historical analogies from colonial and industrial expansion suggest that exploited working classes were often subjected to harsh forced labour with inhumane conditions, as well as confronted with the most direct harms from the new frontiers (Dolan, 2025; Okia, 2022). Also today, cheap yet dangerous work is often very harmful and lethal to the marginalised, suffering from "industrial hazards" as safety crimes and inhumane employee policies (Tombs et al., 2013; Tombs & Whyte, 2008, 2010). In space expansionism, this harmful pattern will most likely repeat (Rothe

& Collins, 2025), which will include those first humans (or AI-assisted robotic workers (Haramia, 2025)) approaching a range of cosmic resources and their occupation-related dangers (Federici & Caffentzis, n.d.; Galaida et al., 2022), including black holes, thus potentially facing spaghettification and other extreme hazards.

Here, the space "industrial hazards" involved in black hole energy extraction can be conceptualised as forms of *reality harms*, extending the zemiological conception of harm for an absurdist space criminology that designates an ontological violence that consists not merely of physical pain and harm, but also of the tearing of lived experience itself by the distortions of spacetime. Meaning, imaginatively, unfathomable harm may have realistic reality-bending as well as reality-altering consequences, divided into two intertwined categories:

a) the spaghettification of entities, including human bodies and consciousness, and;
b) human-induced disruptions to spacetime itself, where any attempt to manipulate cosmic forces, risks amplifying harm beyond conventional comprehension.

A) Spaghettification

In the science fiction movie *Interstellar* (Nolan, 2014), the character Cooper, the main protagonist, approaches the supermassive black hole Gargantua where he falls into it and enters a multidimensional reality without being spaghettified, as would hypothetically happen. In the movie, Gargantua has immense mass that produces relatively soothing tidal forces at the event horizon, making bodily annihilation possibly avoidable. Physics, however, suggests a different story.

Stephen Hawking writes in his *A Brief History of Time* about spaghettification (Hawking, 2017), which he considers an effect of black hole gravity in which an infalling astronaut would be stretched by tidal forces until reduced to a thin strand of particles, as if they became spaghetti. The process begins when one strays too close to a black hole, where one passes the point where stable orbits are possible and begins spiralling inward. Even before reaching the event horizon, an astronaut would be exposed to extreme radiation from the surrounding accretion disc, where gas

and dust heat up and emit intense X-rays and gamma rays. While infalling, there might be attempts to signal for help; however, these messages will be distorted by gravitational redshift, hence, appearing weaker and stretched in wavelength to distant observers. This is the point where the process of spaghettification commences, where time itself will behave differently. For the infalling astronaut time would flow still normally once crossing the event horizon, but to an outside observer, the astronaut appears to slow down and fade away, and any signal sent is redshifted into silence. Once inside, any fall would lead inward where you would be cut off from the universe outside the black hole (Bloomer, 2021; Wheeler, 2007).

During the fall toward a black hole as well, extreme gravitational lensing bends light from your surroundings, possibly creating several, time-delayed images of yourself. Put differently, perceivable past and future versions of yourself could be perceived as twisted images around the vast gravity (Thorne, 2014). This has been called self-lensing or higher-order images near the photon sphere (Ghazale, 2025; Tsupko et al., 2025; Tsupko, 2022; Virbhadra & Ellis, 2000), which has been depicted in the movie *Interstellar*. Before spaghettification begins, the experienced spacetime distortions and their surreal effect may produce a haunting meta-awareness of multiple versions of yourself at different stages of the fall that could evoke a deep existential reflection on a past self, frozen in fear of the unknown, and perhaps even a future self, still descending toward inevitable destruction. The surreal "self-lensing" making you meta-aware of your own vulnerability, enables you to apprehend the inevitability of suffering, seeing yourself across time while still falling into the abyss. It altogether forms an absurdist intersection of black hole physics and human consciousness, in which the warping of light mirrors the warping of time and perception, producing a exceptionally intense psychological and philosophical experience.

However, direct, experiential harms due to black hole-based spaghettification have not happened yet, and therefore, whether we would survive such an event (or not), and its consequences, are to this point empirically and fundamentally unknown, even if the underlying physics appear real to us. As theoretical physics argues, spaghettification is a natural process that happens when

the overwhelming gravity of a black hole pulls more strongly on one part of an object than another, making it an uneven pull, referred to as tidal force that stretches the object lengthwise while squeezing it from the sides (Estrada, 2025; Fazzini, 2025; Kontomaris & Malamou, 2017; Pinochet, 2022). The result is an extreme distortion, where first something or someone changes into a thin strand, then into fragments, and eventually down to subatomic particles. It is an irreversible process of possibly unlimited stretching, where an entity could be completely dismantled, and as such, it is a form of harm that may be totalising and beyond repair (Kontomaris & Malamou, 2017; Pinochet, 2022).

The idea of being pulled into a long, thin thread of matter, where your body remains one connected structure while elongated along the direction of the black hole's pull and compressed in the perpendicular directions, is an excruciating thought. The gravitational gradient stretches the body along its length while compressing it in width, transforming it into a thin, elongated thread, where muscles, bones, and organs are torn apart under forces trillions of times – unfathomably – stronger than Earth gravity. Yet it is precisely this process, vis-à-vis the Penrose Process, that enables energy extraction: the escaping component is a piece of this stretched thread, flung outward and carrying away energy from the black hole's rotation.

Very recent theoretical physics challenges the inevitability of all black holes and total destruction through spaghettification. Whereas standard models imply that anything crossing the event horizon is pulled apart and annihilated at the singularity, newer models reveal integrable singularities, where the destructive tidal forces are softened (Estrada, 2025). It has been described as "gentle spaghettification." The idea of gentleness is based on loop quantum gravity models that imply that as the infalling and collapsing core of any entity reaches Planck-scale densities,[4] quantum gravity effects prevent a full singularity, producing a quantum bounce that reverses the collapse temporarily. Shortly afterward, shell-crossing singularities occur, where different layers of infalling matter intersect. This is considered gentle, because the black hole tidal forces may stretch and compress the matter, but it would remain finite (Fazzini, 2025). Meaning, the layers are distorted but not torn apart, indicating that spaghettification as a harm is not

always absolute, but graded, where spacetime curvature would still diverge but not in a way that necessarily breaks objects down completely. Nevertheless, the harm would still lead to fundamental transformation under intolerable conditions, and thus extreme and irreversible harm.

Accounting for the absurd of black hole "logics," spaghettification harm, once considered through 'a set of viewpoints that are simple enough to make understanding possible, yet comprehensive enough to permit us to include in our views the range and depth of the human variety' (Mills, 2000, p. 133), the most unfathomable involves the experience of spacetime itself when falling into a black hole. Because once near it, the relationship between subjective experience and external time could become fundamentally distorted, as has been suggested (Gohd, 2023; Kornowski, 2017; Wang, 2023; Worsley & Worsley, 2016). Due to time dilation on the event horizon, your personal seconds of harm, e.g. your last heartbeats, nerve signals, and pain sensations, may be experienced normally; however, the universe outside the black hole that you could still see, seems to race forward unimaginably fast (Bloomer, 2021).

This black hole absurdist "logic" seems to suggest a cruel symmetry: the shorter the span your subjective experience of harm, the more of the external universe you might witness. Put differently, your narrative of harm may be a single moment of agony that could correspond to an experience of billions, trillions of years of cosmic evolution may appear to flash past. Perhaps the closer you get to your total annihilation by dissolving into a glimpse, your final moments might seem to encompass epochs of the universe's future, perhaps not eternity itself, but an unfathomable acceleration of the cosmos beyond human perceptual scale.

In reverse, and from the perspective of an external observer, however, your suffering appears frozen, endlessly prolonged, like a tableau of agony suspended forever at the edge of spacetime, while their time flows onward without ever glimpsing at eternity. The paradox lies in that, while the infaller's agony is brief yet total, to an external gaze it is infinite yet motionless, which are, theoretically at least, two irreconcilable truths coexisting across relativistic divides.

The speculative mismatch is profoundly horrifying and

horrifyingly profound, where the victim's last experiences could be violently compressed in spacetime yet simultaneously projected infinitely outward, forming an extreme example of existential, unmediated reality harm. The experienced reality of the black-hole-victimised person and that of the distant observer are intertwined and spacetime-diluted, metaphorically like two ends of a spaghetti strand shared between Lady and the Tramp, stretched across incomprehensible cosmic distances. This fathomed harm indicates a paradox, one in which intense subjective harm could produce a (near-)eternal observation of the cosmos, if we follow the absurd logic of black holes themselves and theoretically accept that tidal forces and relativistic time dilation would, indeed, result in such outcomes. If anything, it exemplifies a fathoming of a form of reality harm in which suffering is amplified beyond human comprehension, interacting with and being subjected to the very fabric of spacetime that inherently and fundamentally challenges anthropocentric notions of harm.

Given humanity's history of ignoring catastrophic risk for profit (e.g. exploiting enslaved people on the high seas despite unimaginable suffering), space expansionist logic could similarly drive us to expose many to extreme harm in extracting black hole energy, blinded to existential consequences by the lure of gain for the few. And human action introduces another layer: just as climate change demonstrates how local interventions can cascade into planetary-scale effects, attempts to extract or manipulate black hole energy could unintentionally trigger unknown black hole dynamics, that could produce harmful consequences not only nearby but possibly across reality itself.

B) Harms to spacetime

Alongside human-experienced reality harm, there is the absurdist category of human-enabled or amplified reality harms that could result from black hole energy extraction. These may, in turn, harm spacetime itself. Resembling how terrestrial expansionism (e.g. through overfishing, deforestation, or fossil-fuel emissions) consists of a recurring pattern where seemingly local interventions produce planetary-scale harms, a similar question arises regarding space expansionism: even if black hole energy extraction is theoretically possible (Abbasi et al., 2025; Abramowicz & Fragile, 2013;

Blandford & Znajek, 1977; Carr & Kühnel, 1975; Domcke et al., 2025; Dyson et al., 2024; Dyson & Pereñiguez, 2023; Fabian et al., 2015; Hay et al., 2025; Inoue & Yokoo, 2011a; Penrose, 1969; Shakura & Sunyaev, 1989), should it be done, knowing that its consequences could potentially ripple into systemic, galactic, and perhaps even reality-altering harms?

The attraction of black holes as energy sources is clear, given that their accretion processes can convert matter into radiation with efficiencies far exceeding nuclear fusion, offering a potentially inexhaustible supply of power to sustain interstellar habitats, long-duration robotic missions, and even Dyson Sphere–scale projects (Galántai, 2004; Inoue & Yokoo, 2011a; Takemura, 2022). However, the possibility of it going wrong is always present, as we have learnt from history. In fact, these extraction interventions on black holes could produce localised harmful effects as well as threaten the fabric of reality.

Disturbing a "calm" black hole could, theoretically, trigger runaway accretion or tidal disruption events, releasing intense radiation that might sterilise nearby systems, whereas rapid spin extraction or misaligned accretion could ignite relativistic jets, potentially depositing energy over kiloparsec scales and reshaping star formation in entire galaxies (Barausse & Lapi, 2021; Fabian, 2012, 2013, 2016; Fabian et al., 2015; Fabian & Lasenby, 2019; Mirabel & Rodríguez, 1999; NASA, 2025). More extreme scenarios might include gravitational-wave recoil from induced mergers, which could eject a supermassive black hole from its host nucleus[5] and thereby rearrange stellar orbits within galactic centres (Merritt et al., 2004). Such events could have catastrophic astrocidal consequences (Deudney, 2020; Eski, 2025a) and, in the most extreme cases, even result in galacticide, as was envisioned by the world's first space lawyer, Andrew G. Haley in 1963 (Haley, 1963, p. 26).

These are still "only" potential harms that could affect physical matter within our known reality. However, certain risks associated with black hole energy extraction could impact reality itself. For example, harvesting energy from rotating Kerr black holes via the amplification of specific bosonic fields, a process known as superradiance, could hypothetically create a confined, runaway amplification of the field, analogous to a black hole "bomb." This could generate enormous concentrations of energy, potentially

destabilising nearby matter, producing intense electromagnetic or particle emissions, and possibly altering the local spacetime energy density (Cardoso et al., 2004; Dias et al., 2006; East, 2017; Hod, 2014; Konoplya, 2008; Teukolsky, 1972).

When "digging deeper" into a black hole, not just extracting energy from its rotation, there are theoretical processes where the core of a black hole could be extracted, as it contains enormous energy, with a single solar-mass black hole holding roughly 1.8 × 10t w joules, which is equivalent to the Sun's total output over 10 billion years. It could potentially power entire planetary systems or galaxies, with the following catch: if tampered with, this might produce extreme tidal forces with quantum effects that could expose the black hole singularity by removing the event horizon and producing what is called a naked singularity (Huang & Zhang, 2025). In theory, the black hole spacetime disruptive capacity could then "leak" into the universe, destabilising surrounding spacetime at an unimaginably vast scale and extraordinarily hazardous for reality itself. Other speculative consequences include transient wormhole-like structures or topology changes, which might generate time-loops through negative energy densities that rearrange the causal order and flow of information itself (Morris et al., 1988). These could trigger classical instabilities like the Gregory–Laflamme instability observed in black strings and rings in 5D or higher spacetime (Emparan & Reall, 2008; Horowitz, 2012; Ishibashi & Kodama, 2011; Myers & Perry, 1986; Obers, 2009).

In sum, if initiated due to harvesting black holes, these instabilities could fragment the black hole into localised high-energy regions, producing extreme gravitational bursts that might interact with our 4D universe, warping spacetime and creating transient "dimensional cracks." While such scenarios are highly speculative, they are not less conceivable than humankind's historical and contemporary patterns of energy extraction. Indeed, these patterns can be imagined as continuing in space, possibly amplifying their reality harming effects and enabling or worsening runaway gravitational fluctuations, high-energy radiation emissions, and exotic Planck-scale disturbances that could destabilise nearby matter or producing observable anomalies in energy, momentum, and spacetime curvature. Paraphrasing Slavoj Žižek's observation that it is easier to imagine the end of the world than the end of

capitalism (Ramírez, 2010), it is equally conceivable that humankind would risk tearing reality itself for-profit than abandon the space expansionist drive to harvest. This is itself an absurdist imagining and an eloquent acknowledgment of a system willing to risk the end of reality before the end of profit.

To sum up, from a Camusian perspective, spaghettification and the harms to spacetime caused by black hole energy extraction reveal that meaning-making itself appears inseparable from the absurd. The closer one would approach and attempt to exploit cosmic phenomena, such as black holes, the more compressed the subjective experience could become, even as these events unfold across near-infinite cosmic time. In this confrontation, we may witness processes that are nearly eternal, yet we remain powerless to intervene (spaghettification), all while our harmful actions could potentially generate enduring, all-encompassing reality harms (harms to spacetime). These harms extend beyond individual experience, potentially affecting the human perception of spacetime and the very structure of spacetime itself, introducing consequences that interact with the universe's apparent indifference. An absurdist space criminology should not only anticipate and understand these harms prospectively but must also situate itself within that very meaning-making, as the last section delves into.

Conclusion and discussion: space criminology as meaning-making

In delivering an absurdist space criminology, it can be argued that the human species, based on "for all humankind" meaning-giving that cloaks unbridled space expansionist ambitions and practices (as reflected in lunar and Martian colonisation and asteroid mining), appears poised to wield the power of influence over celestial bodies in the near future, and in the far future, possibly dynamic cosmic phenomena. Theoretical astrophysics, as marine biology once did centuries ago for contemporary maritime exploitation, considers dynamic cosmic phenomena to be harvested of their energy, which, if ever possible, would transform humankind from biophysical 'actants' that reshaped Earth fundamentally (Shearing, 2015, p. 257), to cosmic actants, becoming (inadvertent) agents of cosmic-scale harm. We could, in principle, transform objects of extreme natural danger into instruments of

systemic, multi-millennial consequences, whose effects might persist long after the initiating actors *(we, ourselves!)* are gone, cascading across galaxies.

Accelerating this Camusian absurdist space criminological thinking, what if the potential scale of human influence as a cosmic actant, is conceivably so extreme in manipulating matter and energy, far beyond present technology, that it might, theoretically, intentionally or accidentally catalyse events on the scale of universe-creation, such as a localised Big Bang? Put differently, whether human or other sentient entity, what if the indifferent cosmos exists with a predetermined or latent origin? While this remains highly speculative, it highlights a possible responsibility inherent in thinking critically about cosmic-scale agency and harm, especially when questions about the universe's origin, pre-Big Bang conditions, and potential multiverses have entered serious (theoretical) cosmologist and astrophysical inquiry over two decades (Bojowald, 2007; Clegg, 2009; Gasperini & Veneziano, 2003; Kaloper et al., 1999; Mersini-Houghton, 2022; Rees, 2007). So, although seemingly absurd, such (astro)physics theory-based speculation cannot be ignored by a space criminology. If it tries to anticipate and reckon with future harms, the field must engage these possibilities in an original fashion while/by avoiding (its own) anthropocentric assumptions. Either way, the full scope and severity of such human or sentient agency, and harmful consequences, might only be truly understood millions or billions of years later, constituting a source of harm that, as Camus would have it, is as indifferent to future life as the universe appears to us today.

That in and of itself is an absurdity, which is precisely the starting point of an absurdist space criminology. The "reality harms" of spaghettification, relativistic time distortion, and even the potential destabilisation of spacetime represent experiences of suffering and risk that are at once vast and unknowable. They literalise the Camusian tension between human consciousness and an indifferent cosmos. Here the absurd emerges most sharply, which is in space criminology's attempt to anticipate (grave) future harms that, by definition, exceed comprehension. In this sense, space criminology becomes itself a form of meaning-making over phenomena that defy meaning, mirroring Camus' Sisyphus, descending again to retrieve his rock: an absurd hero who recognises

the futility of control yet refuses to abandon the task (Camus, 2012, pp. 119–122).

The act of confronting unfathomable harm, whether through envisioning annihilation, experiencing near-infinity, or contemplating risks to spacetime itself, becomes an act of space criminological revolt. It transforms the incomprehensible into a place for reflection, ethical reckoning, and maybe even responsible speculation now, similar to space criminological work done on astrocide (Eski, 2025a). The absurd here is therefore not paralysing, but instead, generative: a call to persist in making space criminological meaning without the illusions of mastery that positivist criminology has so often claimed. In this conscious labour, we may even find a form of joy, not in overcoming the struggle but in the struggle itself.

Notes

1 In this paper, the terms space and outer space are used interchangeably.

2 Green criminology critically studies environmental harms and crimes, the actors involved, the victims affected, and societal responses, emphasising ecological, social, and criminal/planetary justice (White, 2025).

3 Astro-green criminology is an emerging subfield of green criminology that analyses anthropogenic environmental harms in outer space, including orbital debris, space mining, space tourism, and emissions pollution, providing a framework to study space-related harms, offenders, victims, and societal responses (Lampkin & Takemura, 2025).

4 These are extremely high densities where matter is squeezed so tightly that normal physics breaks down, and spacetime as we know it no longer works (Shivni, 2016).

5 The host nucleus is the centre of a galaxy where the supermassive black hole usually resides.

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