

Martin Heidegger and the Being and Time of Black Holes

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*Scientific narratives about cosmology often present black holes as frightening objects of both creation and destruction, the centres of which are concealed behind event horizons. According to studies, black holes are capable of distorting time and tearing apart anything that plunges toward them. This article asks what the latest knowledge about the properties of black holes can contribute to philosophical understandings of being and time. Drawing on both scientific and narrative constructions of black holes in books written by physicists, the article analyzes black holes in relation to Martin Heidegger's philosophy of ontology in *Being and Time*. The article argues that the topics of concealment, time, and mortality form interrelated points of intersection among scientific constructions of black holes and Heidegger's philosophy. First, scientific commentaries on the concealment of singularities speak to Heidegger's interpretation of the ways being is concealed in modern society. Second, with regard to time, the phenomenon of gravitational redshift invokes Heidegger's criticisms of clock time and, by extension, notions of infinitude. On the other hand, theories about Hawking radiation and the decay of black holes also invoke Heidegger's thesis that time subsists predominantly as a passing away toward the cessation of existence. Third and finally, Heidegger's renowned and controversial explication of mortality helps frame black holes symbolically as forward-projections toward the impossibility of existence. Bringing these three subjects together, the article concludes that, as Heideggerian symbols of being and time, black holes represent projections toward the possibility of impossible modes and forms of existence. In this sense, black holes emblemize a relationship between being and time that marks the potential limits of existence, as humanity and science understand it.*

Keywords: Black holes, Martin Heidegger; being, time, mortality, concealment, singularities

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Introduction

This article explores intersections between scientific narratives about black holes and Martin Heidegger's philosophy of ontology in *Being and Time*. Drawing on current knowledge about black holes and figurative representations of them in books written by scientists, the article locates three interlinked points of comparison between black holes and

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Being and Time: concealment, time, and mortality. The first part of the article addresses these subjects by examining how scientific commentaries depict black holes as concealed objects of destruction and creation, which speak to ideas of both infinitude and inevitable decay and dissipation. The second part charts crosscurrents between these portrayals of black holes and Heidegger's interpretation of temporality, death, and the concealment of being in *Being and Time*. Heidegger's philosophy situates being specifically in relation to individual experience, working against contemporary developments in science, including Albert Einstein's theories of relativity. Yet a Heideggerian reading of present-day scientific narratives about black holes helps reframe the philosophical significance black holes carry as cosmic objects that proffer insights into the nature of being and time. Building on Heidegger's understanding of being as a forward-projection in time toward unrealized possibilities, the article argues that black holes symbolize, in Heidegger's terminology, the possibility of impossible modes of existence. In this way, as philosophical tropes, black holes capture a relationship between being and time that marks the potential limits of existence, as humanity and science understand it.

Black Holes: Destructive, Creative, and Concealed

Often regarded as the “weirdest things in the universe” (Musser, 2015: 24), black holes have a reputation for extremity, danger, and demonic power. When writing about black holes, physicists deploy a range of metaphors and similes to capture these qualities, likening them to invisible monsters (Galfard, 2015: 28; Harland, 2003: 193; Musser, 2015: 161), giant spiders (Geach, 2018: 133; Gubser and Pretorius, 2017: 66), and “brooding, hulking beast[s]” (Scharf, 2012: 99). Many physicists also explicate black holes by describing hypothetical descents into them, which typically include graphic portrayals of horrible deaths and even sometimes analogies to descents into hell (Susskind, 2008: 36; Impey, 2010: 177). Neil deGrasse Tyson writes, “Without a doubt, the most spectacular way to die in space is to fall into a black hole. Where else in the universe can you lose your life by being ripped apart atom by atom?” (2007: 283). Similarly, Brian Greene guides his readers through the experience of falling into a black hole, writing, “you would be stretched with a force that would quickly tear your body to shreds” (1999: 80). Physicists also tend to emphasize that the singularity of a black hole is the locus of its dangerous power. Leonard Susskind writes, “No place is as nasty as the singularity of a black hole” (2008: 32). Steven Gubser and Frans Pretorius describe a singularity as a “terrible, infinitely compressed kernel of matter” (2017: ix). Fred Adams and Greg Laughlin state that a “singularity is a point where, roughly speaking, all hell breaks lose” (1999: 137). The figurative language physicists call upon to describe singularities complements but also diverges from their constructions of black holes. Whereas black holes are akin to monsters, spiders, or rapacious beasts, singularities are usually analogous to “open wound[s]” (Seife, 2000: 183) or “devastating rift[s]” (Greene, 1999: 343) in spacetime. These descriptions and image patterns present black holes as diabolical creatures, the hearts of which encapsulate breakdowns in spacetime. In a literary sense, black holes are like monsters that demarcate the limits of the universe.¹

In scientific narratives, singularities are associated with danger and destruction, but relatedly, they are also allied with concealment and threats of exposure. For instance, terms like “cosmic censorship” and “naked singularity” suggest that singularities are akin to obscene objects that must be covered up. As far as science knows, all black holes contain

¹ Some physicists directly invoke the idea that black holes mark the limits of the universe. See for instance Greene (1999: 344), Seife (2000: 184), Adams and Laughlin (2000: 112), and Tyson (2007: 284).

event horizons, which means that none of their singularities are “naked.” Most physicists treat this cosmic censorship, as Roger Penrose dubbed it, not only as a natural phenomenon but also as a protective device against something horrible. Charles Seife writes, “the singularity of a black hole is so ugly, so dangerous, that nature tries to shield it, preventing anyone from seeing the zero at the center of a black hole and returning to tell the tale. Nature has a ‘cosmic censor’” (2000: 183). As mentioned, Susskind refers to singularities as the nastiest places in the universe, comparing the potential effects of “their alien and brutal properties” to “any torture Dante imagined” (2008: 37), but he also emphasizes that they are safely contained, describing them as “tightly sealed vault[s]” (2008: 184). Scharf imagines a dire scenario in which an “event horizon would be torn apart, and the true singularity would be exposed and naked,” before proceeding to affirm that “Singularities are best kept hidden behind event horizons. If they weren’t, then, in technical terms, all hell would break lose” (2012: 108). Finally, Paul Davies comments that “singularities are so obscene they will always be decently clothed by black holes” (2001: 57). In these examples, the destructive and excessive capacities of singularities work in lockstep with their necessary concealment. Singularities are not merely wounds or tears in spacetime; they are hideous if not obscene reservoirs of destruction, comparable to the deepest pits of hell, which the universe does well to hide from humanity and everything else.

Notwithstanding the connection between the sinister properties of singularities and images of concealment, physicists also speak about black holes as centres of creation linked to the origins of the universe. Case in point, the latest evidence indicates that all galaxies have supermassive black holes at their centres, and moreover, the existence of quasars suggests that black holes play the lead role in the formation of their hosts.² Neil deGrasse Tyson and Donald Goldsmith write that, although supermassive black holes account for “less than 1 percent of a large galaxy’s total mass,” they nevertheless “dominate the energetics of galaxy formation” (2004: 138). Cosmologists have discovered that quasars already existed less than 700 million years after the Big Bang, so it appears that supermassive black holes are tied to the earliest structural formations in the universe.³ In fact, scientists like Musser (2015: 197), Carol Rovelli, and David Harland have wondered if the Big Bang may have developed in conjunction with a black hole, perhaps one that inhabited another universe. For example, Harland asks whether the “Big Bang is really no more than an internal perspective of the formation of a black hole?” (2003: 229). Rovelli diagrams how the process through which “Matter gets squashed, but not all the way to an infinitely small point” in singularities may correspond to the Big Bang: “Quantum gravity generates a huge pressure that makes matter bounce out, precisely as a collapsing universe can bounce out into an expanding universe” (2017: 200). Thus, in scientific narratives, black holes have a certain duality, with their

² Quasars are ultra-luminous objects created when the friction and viscosity of interstellar gas plunging toward an event horizon cause huge levels of electromagnetic radiation emission. Despite the small size of supermassive black holes compared to their host galaxies, the “intense energy output” of quasars, which includes not only their luminosity but also the “powerful ‘wind’” from their accretion disks, can transfer enormous amounts of “energy or momentum into the surrounding interstellar medium,” triggering the development of new stars (Geach, 2018: 143).

³ One of the chief conundrums in contemporary studies of black holes involves the question of how and why supermassive black holes formed so early in the history of the universe. As far as science knows, black holes form through the collapse of large stellar remains, but the oldest black holes seem to have appeared around the same time that stars were forming, raising questions about the chain of causality. For considerations of this mystery, see Gubser and Pretorius (2017: 74; 113), Kidger (2007: 37), Scharf (2012: 179-80), and Hawking (“Classical,” 2010: 4).

monstrosity and concealment playing off of their stature as central engines in the universe. As Galfard suggests, a duality between the centrality of black holes and their inimical qualities is not contradictory, at least when juxtaposed with other massive bodies: “Take the Earth. Its centre is the densest, hottest, harshest place there is (within the Earth). Take the solar system. At its centre lies the Sun, the densest, hottest, harshest place there is (within the solar system)” (2015: 28). In scientific commentaries, black holes may be analogous to infernal pits that are so awful they must be draped behind event horizons, but they also correspondingly represent the centres of not only galaxies but also perhaps universes. Speaking symbolically, black holes signify a centrally-located dialectic between terrifying destruction and originary creation.

The dramatic language scientists use to describe black holes dovetails with their depictions of the impact black holes have on the structures of time. There are different types of black holes, but the common definition of them is that they are “regions of space where the gravity is so high that the fabric of space and time has curved back in on itself, taking the exit doors with it” (Tyson, 2007: 283). A black hole has no distinct surface, but it does have a “point of no return,” the aforementioned event horizon, which is the region where the exit velocity required to escape the gravitational pull of the black hole exceeds the speed of light. One of the bizarre facets of black holes is that, due to their intense gravity, the passage of time slows down considerably near their event horizons, a phenomenon known as gravitational redshift. Capitalizing on this phenomenon, physicists often construct fantasies about time-travel by envisaging people in spaceships orbiting close to an event horizon.⁴ What is perhaps even stranger about black holes is the theory that “It takes infinite time to fall into a black hole, measured from the frame of someone outside” (Muller, 2016: 83). To illustrate this point, Susskind sketches a picture of an individual watching a companion falling toward a black hole, asserting that, from the perspective of the observer, her friend would appear to become “more and more lethargic, slowing almost to a standstill” while seeming never to cross the point of no return (2008: 45). The person falling into the black hole *would* experience a transition over the event horizon, but extricating herself from this region would be tantamount to travelling backwards in time. As Greene asserts, one of the speculative theses that has grown out of these conceptualizations of black holes concerns the passage of time within them: “since all of the matter that has crossed the event horizon is inexorably drawn to the center of the black hole, and since once there the matter has no future, time itself comes to an end at the heart of a black hole” (1999: 344). Among other things, such speculations acknowledge that it is impossible for anything, even light, to convey information about the workings of a black hole from beyond the event horizon. The lack of naked singularities means that science has no verifiable theory about what happens to matter and energy beyond the point of no return.

If time “comes to an end at the heart of a black hole,” then black holes may appear to be infinite objects, somehow exempt from the temporal workings of the universe. However, contemporary science indicates that, in actuality, black holes emit heat and thus display entropy, slowly losing mass before finally evaporating to nothing. Stephen Hawking was the first scientist to identify this process. His discovery was startling, in part because, for

⁴ For example, Rovelli imagines a rocket ship positioned close to the event horizon of a black hole: “If the rocket stays near enough to the horizon for one hour, and then moves away, it would then find that, outside, in the meantime, centuries have passed. The closer the rocket stays to the horizon, the slower — with respect to the outside — time runs for it. Thus, travelling to the past is difficult, but travelling to the future is easy” (2017: 196-97). For similar examples, see Adams and Laughlin (2000: 116-17), Susskind (2008: 71-72), and Davies (2001: 36-40).

all their terrifying qualities (and in fact *because* of these qualities), black holes appear to be remarkably simple objects. They consume their entire past histories, leaving nothing but the censoring event horizon and three potential properties, mass, electric charge, and rotation rate.⁵ However, Hawking discovered that black holes can radiate photons due to the entanglement of quantum and thermal fluctuations near their event horizons — entanglements that cause black holes to lose energy.⁶ As Musser puts it, “Hawking’s startling point was that decay is the rule of nature. Almost everything in this world eventually dies. Black holes are not exempt” (2015: 27). Black holes carry associations of infinitude, not only due to their radical distortion of time but also because of their potential links to the Big Bang. In a related vein, scientists have also described the “infinite density” of their singularities — though quantum gravity suggests that there are limits to density, even in a singularity (Rovelli, 2017: 200; Susskind, 2008: 134-39). Nonetheless, although black holes invoke notions of infinite time, they do not stand outside of time. They may well emblemize the limits of the universe, but evidence indicates that they are still bound up with the entropic decay that afflicts all things embedded in time.

A Heideggerian Analysis of Black Holes: Concealment, Time, and Mortality

How do scientific constructions of black holes overlap with Martin Heidegger’s existentialist philosophy in *Being and Time*? There are three main points of connection, based on the subjects of concealment, time, and mortality. The first topic, concealment, accesses both scientific and philosophical questions about the nature of being. In scientific narratives, the hidden monstrosity and obscenity of singularities works in concert with the centrality of black holes and their roles as catalysts in the formation of galaxies, if not universes. In *Being and Time*, Heidegger argues that the heart of all creation and existence in the universe is concealed from people. What is concealed for Heidegger, however, is not an object, but the concept of being. Heidegger writes, “that which remains *hidden* in an egregious sense, or which relapses and gets *covered up* again, or which shows itself only ‘*in disguise*’, is not just this entity or that, but rather the *Being* of entities” (1962: 59). Heidegger makes a distinction between phenomena that are covered up because they are “quite *undiscovered*” (1962: 60) and those that are buried under social forms of elision, which revolve around everyday perspectives on humanity, the world, and reality. In one sense, the singularities of black holes are concealed because they are undiscovered — scientists know that they exist based on the influence they have on their surroundings, but they have been unable to observe them first-hand. Yet Heidegger’s point that “Being and the structure of Being lie beyond every entity and every possible character which an entity may possess” (1962: 62) reorients the relevance of his interpretation to black holes.

From Heidegger’s standpoint, the concept of being lurks behind singularities (as it does for anything), but importantly, singularities are also central engines in the creation of being, as modern science understands it. As mentioned, the presence of primordial black holes implies that they served as original components of the early universe. What is more, scientists

⁵ The stark simplicity of black holes is known as the “no-hair theorem.” For further considerations of this theorem, see Adams and Laughlin (2000: 112), Gubser and Pretorius (2017: 72), Greene (1999: 335), and Hawking (“Quantum,” 2010: 39).

⁶ For discussions of this process, see Susskind (2008: 168-74), Krauss (2012: 155-56), Rovelli (2017: 197-99), Greene (1999: 336-37), Harland (2003: 227-28), and Adams and Laughlin (2000: 131-33).

have speculated that the Big Bang could have emerged from an antecedent black hole (such as in Rovelli's example of crushed matter "bouncing out" from a singularity). In this way, black holes are not just *any* entity in the universe; they are objects that might stand at the core of being itself. In the context of *Being and Time*, the concealment of singularities takes on a symbolic resonance. As with any entity, the being of singularities is "hidden" or "covered up" due to a variety of factors; but as potential loci of being itself, singularities also offer a tangible example of the way being is intrinsically hidden in the cosmos. In other words, through their inherent properties, singularities concretize Heidegger's thesis that being tends to be concealed.

At the same time, in Heidegger's philosophy, being is concealed not because it is naturally obscene, destructive, or monstrous, but because it is buried under collective, everyday perspectives that compel people to focus on more immediate, trivial concerns. Having said that, the element of danger allied with singularities does intersect with Heidegger's investigation of the ways society covers up the meaning of being. To understand this intersection, it is necessary to consider the second point of connection between black holes and Heidegger's philosophy, the subject of time. As James Demske (1970: 50), Sean Ireton (2007: 240), Martin Weatherston (2002: 149), Richard McDonough (2006: 6), and Emmanuel Levinas (1996: 13) have pointed out, one of the principal theses of *Being and Time* is the notion that time is not a feature or property of being, but rather constitutes the "*fact of being itself*" (Levinas, 1996: 13). For Heidegger, investigating being is synonymous with investigating time, and vice versa. However, although Heidegger's career overlapped with Einstein's theories of relativity, he adopts the stance that modern physics is complicit in the process of covering up the intimate relationship between being and time. As David Scott considers, Heidegger regards physicists as participants in an inauthentic perception of time that construes it as "reversible, cyclical, and iterative" — a perception grounded on the ways modern technologies, specifically clocks, keep track of time (2006: 196).

Heidegger declares that clocks reduce time to "an uninterrupted sequence of 'nows'" devoid of either a "beginning" or an "end" (1962: 476). For Heidegger, because the hands on a clock point constantly to a "now" which is "always *already* a 'forthwith' that is no longer," they create the sense that time stretches across an infinite, circular series of "nows." Every "now" is always simultaneously a "not-yet-now" and a "no-longer-now," so each "now" is essentially indistinguishable from any other. In short, clocks treat the passage of time as a ceaseless progression that has neither a point of commencement nor a terminus. Yet if, as Heidegger declares, modern physics buys into this perspective, then the scientific depiction of black holes at least offers a unique take on so-called clock-time. To an exterior observer, anything crossing an event horizon would get suspended in a frozen "now," creating a portrait of infinitude in which the past and future are separated by an eternal present. A person witnessing somebody falling into a black hole could observe a true "now" extricated from the interplay between "not-yet-now" and "no-longer-now." On the other side, that black holes are themselves finite objects suggests that they do have both starting points and endpoints, meaning their existence ultimately falls outside of an endless sequence of "nows." The tension between Heideggerian ideas about clock-time and the finitude of black holes underlines the symbolism black holes carry as objects representative of being and time, a point I return to below.

The finitude of black holes also introduces the third and final connection between *Being and Time* and black holes, the topic of mortality. Heidegger's main complaint about the clock-time model is that it exemplifies how "world-time and accordingly temporality, in general,

have been levelled off and covered up” (1962: 476). Clocks contribute to the concealment of temporality by hiding the ontological relationship between being and time in the life of the individual.⁷ For Heidegger, clock-time artificially separates time from the individual’s experience of the world, presenting it as an external and infinite continuum. Heidegger counters that, for any individual, the basic meaning of time is that it is always passing away and refuses to “let itself be halted” (1962: 478). In this view, the individual does *not* experience time as an infinite movement of interchangeable “nows”; instead, she experiences time as a passing away toward an end, namely the end of her life. What society, physics, and modern technology conceal is the existential threat at the core of time, the individual’s mortality. Furthermore, the individual’s death — something that arrives inevitably through time — cuts to the core of being since it accesses the most fundamental questions about the individual’s existence in the world.

Heidegger’s interpretation of mortality reinstates the question of how scientific narratives that portray singularities as hidden sources of danger tie into his theories about social concealments of being and time. Heidegger argues that society conceals the meaning of mortality by demanding that any given individual view death as an outside danger consigned to the distant future. From the social standpoint, death is a “mishap” (1962: 296) or a “threat” (1962: 297) that besieges others and *may* eventually imperil the individual. The upshot is that the public crafts a narrative which tells individuals they should have the courage to view death with tranquility and indifference. Consequently, an “evasive concealment in the face of death dominates everydayness” (1962: 297), cultivating the notion among people that, although death certainly does happen, *their* deaths can always be avoided for the time being. John Williams asserts, “The ‘when’ of death is put off to the remote future, and so the fact that death is possible at any moment is covered up” (2006: 107). Heidegger argues that an “authentic” view of mortality begins with the admission that death is in fact both certain and indefinite. The individual certainly will die, but she does not know when. This simple formula buttresses Heidegger’s argument that death is a state people occupy from the start of their lives, even if they never reach it *in* their lives: “Death is a way to be, which Dasein takes over as soon as it is. ‘As soon as a man comes to life, he is at once old enough to die’” (1962: 289). When Heidegger says that clock-time covers up being, his point is that clock-time feeds into the notion that, for the individual, mortality is a remote event of no real concern — a possible calamity trapped forever in an abstract “not-yet-now.” Clocks create the impression that every “now” is simultaneously already past and forthcoming, but the “now” of death remains perpetually forthcoming, as though it is a static moment that somehow exceeds the infinite circle of time. For Heidegger, though, what time truly represents is the individual’s relentless movement toward a confrontation with her own mortality, which is nothing less than a confrontation with the question of her being in the world.

Taking these points into account, the connections between scientific discourses about black holes and Heidegger’s theory of mortality bring another layer to the topic of concealment. Scientists tend to underline the dangerous power of black holes by imagining

⁷ Heidegger uses the term *Dasein* (“being there”), but for the sake of clarity, I adopt “the individual” as a translation. Heidegger’s concept of *Dasein* emphasizes that any question of being, no matter how far-reaching, is inseparable from the question of how humans understand being. Richard Sembera writes, “Heidegger informs his readers that answering the question of Being is equivalent to explaining how it is possible for Dasein to understand Being at all” (2008: 142). Related to this question is the follow-up query of what being means for the singular individual, though Heidegger does keep open the possibility that *Dasein* could invoke a collective body. See Stroh (2015) and Fynsk (1982: 187-88) for evaluations of whether “*Dasein*” necessarily refers to a single individual.

people falling into them, picturing them suffering incomparable levels of torture before being “squeezed like toothpaste from a tube and elongated into many fragments, extruded like biological spaghetti” (Impey, 2010: 177). In scientific narratives, imagery centred on the diabolical power of black holes works together with the concealment of singularities behind event horizons. In *Being and Time*, societal delineations of death conceal the significance of the individual’s relationship to mortality, asking her to regard death as something external and distant, which is “not-yet-now.” For Heidegger, however, the demand that individuals view death as remote and unthreatening only strengthens the impression that death is fearful. For Heidegger, fear is a situational emotion that arises when death appears to be drawing closer to a person (such as in dangerous situations, old age, or illness), but society insists that individuals stamp out their fears by telling themselves that death is avoidable, irrespective of the circumstances. In the public reckoning, death is nothing *but* a terrifying event that the individual needs to put off at all costs. Therefore, in both *Being and Time* and scientific commentaries on black holes, concealment works together with fears of death. Yet the key point is that, in these narratives, concealment accentuates the terror of death only to demonstrate that the individual should *not* fear it — at least not yet. The scientific narratives state that a black hole could eradicate the entire Earth,⁸ but they also make the point that, fortunately, black holes are distant, scarce, and covered up, and thus not an immediate threat. Relatedly, in Heidegger’s reading, society recognizes that death is menacing and may well lead to the cessation of the individual’s existence, but the public also maintains that, for any individual, death is distant and scarce — a “mishap” or “accident” that only happens to others, not to oneself. The paramount difference in this comparison is that, whereas the concealment of singularities can be seen as a natural protection against the deadly carnage of black holes, society’s concealment of death obfuscates the simple reality that the individual definitely will die and could do so at any time.

Black Holes as Heideggerian Symbols of Being and Time

Scientific understandings of black holes and Heidegger’s comprehension of mortality overlap but also diverge from one another, so what do the cross-sections reveal about being and time? The first step to answering this question is to outline what a Heideggerian exploration of mortality ultimately says about the individual’s relationship to being and time. One of the key axes of Heidegger’s argument is the claim that death never arrives in the individual’s life. He refers to death as the “*possibility of the impossibility of any existence at all*” (1962: 307). In these terms, what death represents for the individual is the potential loss of any actualization at all — a possible loss of the very notion of possibility: “Death, as possibility, gives Dasein nothing to be ‘actualized,’ nothing which Dasein, as actual, could itself be . . . the possibility reveals itself to be such that it knows no measure at all, no more or less, but signifies the possibility of the measureless impossibility of existence” (1962: 307). From Heidegger’s standpoint, death is not an event in someone’s life, nor is it a process of accretion; rather, it is a possibility that the individual approaches through time and yet never reaches. The reason she never reaches it is that death fails to present her with any recognizable mode of existence. Heidegger asserts that this conception of mortality reveals a fundamental truth about the individual’s relationship to being and time, namely that she

⁸ Adams and Laughlin provide a hypothetical description of a black hole approaching the Earth, outlining a sequence of events that includes deformations to the planet, earthquakes, and tsunamis, a process of obliteration that would culminate with the planet being “pulled like taffy into a disk of vaporized rock which forms a whirlpool in its stampede to enter the impinging black hole” (2000: 128).

exists as a forward-projection into unrealized possibilities. As Charles Guignon phrases it: “that my basic possibility is one that cannot be actualized involves recognizing that what I *am* at the most basic level is a reaching forward into possibilities, not an actualizing of possibilities” (2011: 197). For Heidegger, the anticipation of possibilities *and* the inability to fulfill them are core components of the individual’s relationship to being and time.

The second step to answering the question of what confluences between Heidegger’s philosophy and black holes reveal about the relationship between being and time is to revisit the topic of clock-time and finitude. Black holes may be central, cosmic objects that signify a dialectic between creation and destruction, but they can also be taken as Heideggerian symbols of being and time. As remarked above, from one perspective, black holes appear to offer a new angle on clock-time, which might in fact work against Heidegger’s criticisms. For Heidegger, the problem with clock-time is that every “now” indicated on a dial is at once forthcoming and yet already past, a process of tabulation that artificially flattens time into a span of infinite points moving in a cycle. Black holes seem to undercut this criticism by showcasing that the essence of time can indeed be located in a synthesis between “now” and infinitude. From an outside observer’s standpoint, anything falling into a black hole would slow and then grind to a halt, remaining caught in an endless “now.” One could say that this gravitational redshift captures a breakdown in time, but alternatively, one could argue that the distortion would equip a hypothetical observer to see time as it exists in itself. One of the challenges science faces when examining elementary particles such as electrons involves the difficulty of extrapolating them from their surroundings and scrutinizing them in isolation; but if the basis of this challenge is that subatomic wave-particles tend to be entangled with their environments, time is even more hopelessly entangled with *its* environment, existence itself. Observing something (even a person) about to cross an event horizon might be the closest equivalent to seizing hold of time — to slicing it, freezing it, and putting it under a microscope, so to speak. Such an experiment might reveal that, when time truly does occupy a genuine “now,” it becomes infinite. Yet this result would suggest that the meaning of clock-time is accurate: time really does inhere as an infinite sequence of “nows.” After all, if one tries to pinpoint time as an exact “now,” it reveals itself as infinitude — which is, according to clock-time, the same essence temporality has when it is flowing forward.

On the other hand, that black holes are finite and perishable pushes back against the correspondence between them and clock-time while also recalling Heidegger’s thesis that, for individuals, being shows itself as a forward-projection into unrealized possibilities. Given that the universe is 13.8 billion years old, all black holes, including primordial ones, must have had points of origin within that timeframe. A blackhole in another universe may well have served as the impetus for the emergence of *this* universe, but although this possibility does hint at an infinite multiverse,⁹ it does not imply that any one black hole should be eternal. So too, if black holes do eventually radiate away to nothing, then they also have points of terminus. How long, though, is the lifespan of a supermassive black hole? The simple answer is, vastly longer than the current age of the universe. Musser writes that a “black hole equal in mass to our sun” might decay over “trillions of years” into a “jumbled, formless spray of particles” (2015: 27). Supermassive black holes can be millions or even billions of times more massive than the Sun, and some estimates indicate

⁹ When writing about the Big Bang, Lisa Randall describes the possibility that this universe is “one of many universes that grew out of a universe/multiverse that has always existed” as the “least unsatisfying” answer to questions about what preceded the Big Bang or why this universe seems to encompass all of existence (2015: 30-31).

that they will evaporate over gargantuan timescales measured in googols (Frautschi, 1982: 217). Supermassive black holes are finite in the sense that they, like everything else, decay and disperse, but their lifespans are so vast that it is difficult to conceive of the future they will inhabit. In relation to *Being and Time*, such black holes do not symbolize the stasis of an eternal “now,” but rather capture a forward-projection into what is, for science, an unrealized possibility: a universe that could be up to 10^{100} years old. For Heidegger, an individual experiences time as a forward-projection in part because death does not arrive as a known mode of existence — as long as she is alive, death remains outstanding. Black holes, meanwhile, encapsulate the Heideggerian dynamics of time because they subsist as unfathomably long-lived mortal objects, the deaths of which hint at forms of existence unknown and inaccessible to current knowledge about the universe.

Heidegger’s appraisal of how individuals can develop what he calls an “authentic” understanding of mortality adds one final dimension to a comparative analysis of his philosophy and black holes. Heidegger claims that only by recognizing her mortality as the “*possibility of the impossibility of any existence at all*” (1962: 306-7) can the individual make a decision to choose existence over nothingness. For Heidegger, “freedom towards death” (1962: 311) revolves around embracing the anticipatory and contingent “thrownness” of existence.¹⁰ In this way, the individual is free to affirm existence as it is, which includes her pursuit of unobtainable possibilities, or she can choose the possibility of impossibility, the potential nullity of death. Of course, black holes cannot make such a choice, but humanity can perhaps draw on what black holes represent ontologically to understand cosmic relationships between being and time. Viewing black holes as symptomatic of a forward-projection into unrealized possibilities means accepting that everything in existence, no matter how powerful, is afflicted with death and decay, but it could also be tantamount to accepting that there are forms of existence which are not just unknown but impossible for humanity. Existence as science understands it commenced with the Big Bang, so anything that happened before that moment is inaccessible. One could say that nothingness preceded the Big Bang, but a Heideggerian way to rephrase this statement is to assert that what came before the Big Bang is the possibility of the impossibility of existence — that is, the possibility of modes of existence that form no part of existence, as humanity experiences it or as science interprets it. Also, although science can chart future developments in the universe by tracking past and current patterns, it may eventually run up again against the possibility of impossibility — forms of existence beyond anything it could even begin to grasp.

Conclusion

As objects that encapsulate being and time, black holes hint at notions of infinitude, but in a Heideggerian analysis, they also embody a projection toward the limits of possible existence. Speaking figuratively, the fearsome destructive power of black holes and their corresponding concealment underscore their roles as tropological gatekeepers at the limits of the universe, but what are concealed in them are not just singularities but also relationships between being and time that are impossible. Indeed, theories of general relativity break down and give way to quantum physics in studies of black holes, but consequently, the actual

¹⁰ In Heidegger’s terminology, “thrownness” refers to the way any individual, by being born, is “thrown” into a world full of history, frameworks, and modes of being that she did not choose. On a fundamental level, the individual grasps that coming into existence is *not* a possibility for her — she is, by definition, always already in existence.

workings of singularities remain mysterious. Theories of general relativity also break down in investigations of the originary moments of the universe, specifically the Planck era, further suggesting a relationship between an antecedent black hole and the Big Bang. Thus, if black holes mark the limits of the universe, they do so not by proving that existence writ large has a beginning and an end but by suggesting that *their* beginnings and endings intersect with impossible forms of existence. In the context of *Being and Time*, black holes are more than reminders that everything deteriorates and falls apart over time. They also remind humanity that the impossibility of existence is not interchangeable with absolute nothingness. The black holes at the middle of galaxies might, in their own ways, be moving relentlessly toward impossibility, leaving humanity and perhaps even this universe behind in their march forward through the thrownness of being and time.

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