The Multiverse in Science Fiction, Metaphysics and Natural Science

Mika Oksanen

University of Helsinki

Abstract

In this article I go through the history of the notion of a multiverse, and compare how it has been used in non-fiction (in philosophy and natural science), and in science fiction. Within non-fiction I discuss, among others, modal realism and theories of branching space-time in metaphysics, and within natural science, the many worlds interpretation of quantum mechanics and the theories of cosmic inflation and braneworlds. In fiction I look (among other subjects) at Victorian precursors of the notion of multiverse, Michael Moorcock's multiverse, super-hero multiverses, and utopias and dystopias that make use of a multiverse. I also discuss the danger of nihilism raised by many versions of a theory of a multiverse. I also examine and critique, in the light of philosophy and natural science, the feasibility of some common tropes of this type of narrative—like that of a person meeting duplicates or counterparts when traveling through the multiverse.

1. Introduction

The multiverse has lately been a very hot topic in speculative fiction (i.e., both in science fiction and fantasy). It has appeared even in some rather popular big budget movies, and therefore even many people who do not usually consume much speculative fiction may have stumbled upon it, probably often to considerable confusion. Most of these movies have been superhero movies, but there have also been other movies using the theme such as *Everything Everywhere All at Once* (2022), an action comedy where Evelyn Wang, an ordinary Chinese American laundromat owner, must save the multiverse from an evil counterpart of her daughter. Particularly big among superhero movies have been *Marvel Cinematic Universe*'s *Spiderman: No Way Home* (2021) and *Doctor Strange in the Multiverse of Madness* (2022); the animated Marvel movie *Spiderman: Into the Spiderverse* (2018), and the movie about DC Comics's superhero, *The Flash* (2023).

Superheroes have encountered the multiverse also in TV shows. These include such shows as *Loki* (2021-2023), where the Asgardian god Loki is forced to work for the Time Variance Authority, which initially tries to prevent the existence of the Multiverse as it could lead to wars between universes that could destroy everything, *Flash* (2014-2023), and *Peacemaker* (2022), where the eponymous antihero is thrown into a parallel world ruled by Nazis.

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The multiverse has also relatively recently been used in TV shows other than superhero shows. For example, the series *Man in the High Castl*e (2015-2019), inspired by a novel with the same name by Philip K. Dick (Dick 1962), tells the story of a parallel earth where Nazis had won the Second World War, and one subplot involves them trying to invade other earths.

Many people may then have heard of the multiverse just recently. However, the idea is far from new, and it has been used not only in fiction, but also in philosophy and natural science. In this paper I aim to give an overview of the history of the idea and an analysis of it.

2. The Multiverse in Metaphysics and Natural Science

It may surprise some to learn that the multiverse is not purely fictional. By this I do not mean that it actually exists, though it may, but only that hypotheses according to which it does exist have been seriously proposed by competent natural scientists, philosophers and theologians. Such theories include in philosophy most prominently *modal realism*, theories of *branching space-time*, and *ontic structuralism* in metaphysics. In physical cosmology they include the *many worlds* interpretation of quantum mechanics, the *braneworld* scenario of string theory and the theory of *cosmic inflation*.

Discussions of the multiverse in philosophy and natural science are often connected, at least in the case of naturalistic philosophy, and cannot be strictly separated. For example, discussions of natural scientific hypotheses of a multiverse commonly lead to philosophical discussions of the methodology of natural science.

There are many scientists and philosophers of science (like George Ellis [2011]), who not only do not accept such hypotheses but even hold that hypotheses postulating a multiverse are unscientific because they cannot be directly substantiated and are not falsifiable. However, this objection seems to presuppose a logical positivistic conception of natural science that has long been refuted, indeed shown to be self-refuting. It was already said (e.g. in Passmore [1967]) that logical positivism is dead, or as dead as a philosophical movement ever becomes. Following such a conception would also force us to reject hypotheses about atoms[1] or even all scientific laws (and perhaps even all statements about the past) as meaningless.

It should be generally accepted now that most scientific hypotheses cannot be conclusively verified or falsified or directly tested alone. They can only be holistically tested and tentatively confirmed or disconfirmed together with other background theories and auxiliary hypotheses. At least many hypotheses about a multiverse can in principle be confirmed and disconfirmed in this holistic way, so they are proper scientific hypotheses.

[1] Ellis claims that multiverse hypotheses are bad because they postulate more unobservable entities than the phenomena to be explained (Ellis 2011, 43). However, the same holds of hypotheses about atoms; according to such hypotheses there are far more unobservable atoms than observable macroscopic entities whose properties they explain.

However, it is another question whether scientific hypotheses postulating a multiverse are *good* hypotheses, hypotheses we could believe in. This article does not aim at answering this question; however, if they are hypotheses that have not yet been seriously confirmed or disconfirmed, they are just the kind of hypotheses that science fiction can best make use of.

What would the or a multiverse be? In other words, what do we mean by the word "multiverse"? What concept does the word express? Is it even a coherent concept?

A multiverse can be in a preliminary way described as some sort of whole – whether a set or a mereological sum or a more exotic kind of whole – formed by several different coexisting universes, i.e., worlds, i.e., cosmoses. What exactly this means, however, depends on what we mean by such words as "universe," "world," or "cosmos." Often but not always the Multiverse – with the definite article and sometimes a capital initial letter – is understood more precisely as the whole formed by *all* universes. However, sometimes other words are used for this concept; e.g. as we will see, in some superhero comic stories – such as those of Mark Gruenwald, Scott Snyder and Geoff Johns – the word "Omniverse" is instead used for this concept, and multiverses are in size between universes and the Omniverse.

The universe or the world or the cosmos is often understood as being the whole of all existing entities or at least all existing concrete individuals. If the word is understood in this way, then the concept of a multiverse appears to be just contradictory (as most proponents of multiverse theories of course realize; both Tegmark and Deutsch note this). However, the word can also be understood in less comprehensive senses, and then the notion of a multiverse becomes at least consistent.

Sometimes in older literature – both astronomical and fictional – a universe is understood as just a galaxy, and a world as even just a solar system or a planet.[2] If the words are used in this (by now rather archaic) way, then the concept of the multiverse is trivialized. It is by now practically certain that there are several planets, solar systems and galaxies, but this is not what we today usually mean by different universes, whose existence is not supposed to be practically certain.

Sometimes – e.g. in Eric Nelson Hatleback's *Chimera of the Cosmos* (2014) and Matthew Sedacca (2017) – ancient Greek and Hellenistic atomists such as Leucippus, Democritus and the Epicureans (and even earlier Pre-Socratics), and such early modern thinkers as Giordano Bruno, are held to have presented a serious theory of a multiverse. However, though atomists believed in infinitely many worlds, these worlds were closer to what we would today call solar systems (though they were not exactly *solar* systems as apparently they were all supposed to have an Earth at their center) than to what we would

[2] For example the space opera novel *Outside the Universe* – first serialized in 1929 in the pulp magazine *Weird Tales*, and afterward first collected in book form (in Hamilton 1964) – does not deal with travel between parallel universes, as its name might suggest, but with travel between galaxies. Hamilton uses "galaxy" and "universe" as synonyms; e.g. he refers often to the Andromeda universe. See Bettini (2005) for examples from astronomy and physical cosmology.

call universes (Long and Sedley 1987, 57-58).[3] Therefore this attribution seems very misleading to me.

However, there are many conceptions of a universe that are less comprehensive than the totality of all things yet more comprehensive than a solar system or a galaxy.

Hatleback and Sedacca also claim that the cyclic cosmology of ancient thinkers like Heraclitus and the Stoics, according to which the whole world is periodically burned and then reformed, anticipated the idea of a multiverse. Sedacca extends this claim also to cyclic cosmogonies in Buddhist theology.[4] This claim seems more plausible to me. Hatleback (2014, 63) calls this kind of multiverse a *temporally extended multiverse*, and Brian Greene (2011, 19) calls a similar contemporary notion the *Cyclic Multiverse*.

The notion of the Cyclic Multiverse has been occasionally used in science fiction. There are some stories where people from advanced civilizations succeed in passing from a dying universe to its successor, through the Big Crunch to the next Big Bang. The most famous of them may be Poul Anderson's *Tau Zero* (Anderson 1970), in which a spaceship of human colonists from a near future Earth ruled by Sweden, the Leonora Christine, cannot stop from moving at light speed because of an accidental collision. Because of time dilation time passes more swiftly outside than inside the ship, so that it reaches the last moments of the universe (more than a hundred million years in the future). It succeeds in passing from one iteration of the oscillating multiverse to another (by circling in the hydrogen envelope of the monobloc). The colonists settle a planet in the new universe.

Another treatment of this theme is *The Triumph of Time* (Blish 1958), the last book of James Blish's series *Cities in Flight*, a future history where Earth's cities are converted to spaceships with the aid of an imaginary technology called spindizzies. John Amalfi, the former mayor of a star-traveling New York City, must face the premature death of our universe due to its collision with a universe of anti-matter. By traveling to the metagalactic center (with the aid of a whole planet he converted to a spaceship) a group of humans led by Amalfi can somehow influence what kind of new universes will be born from the death of the present universe. However, Blish's story is more pessimistic than Anderson's; unlike the crew of the Leonora Christine in Anderson's story, humans themselves cannot survive to move into the new universes.

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[3] Hatleback argues (Hatleback 2014, 13) that it is part of the definition of a multiverse that the universes it contains are causally disconnected. He thinks that the many worlds postulated by ancient and early modern thinkers were causally disconnected. I am not sure if the notion of causal disconnection should be part of the definition of a multiverse; it does not appear that the sorts of multiple universes postulated in physical theories I will discuss such as the braneworld scenario would be *completely* causally disconnected. The many worlds postulated by the ancient and early modern thinkers were in any case not completely causally disconnected (as Lewis's worlds would be). On the other hand, if we speak of *very limited* causal connection, the notion of a universe threatens to become so vague as to be of little use.

[4] Some Hindu theologians also had a similar cyclic cosmogony, with the world periodically destroyed in a pralaya at the end of a Kalpa, i.e. a day of Brahma and then recreated (see e.g., *Laws of Manu* 52, 72-74). Therefore Hindus had a theory of the multiverse, if the Stoics did.

Perhaps the most optimistic treatment of this scenario is George Zebrowski's novel *Macrolife* (Zebrowski 1979). In this novel macroworlds, artificial self-sustaining space-habitats built by many intelligent species (humanity of course included), succeed in passing to the next universe (by circling in the ergosphere of the universal black hole, similar to Anderson's hydrogen envelope of the monobloc) and hope to survive even more universal deaths.

A far more comprehensive multiverse than the Cyclic Multiverse is the multiverse of extreme *modal realism*. David Lewis (1986, 71) defines a world or universe as a *maximal mereological sum of spatio-temporally connected individuals*. He argues that it is useful for many purposes (most prominently for giving a semantics for modal statements, i.e. statements using such concepts as possibility, necessity, contingency etc.) to suppose that there are very many such universes. We can call their combination the Modal Multiverse.

Whatever is metaphysically possible is according to Lewis's modal realism actual in some universe. In fact the latter is Lewis's definition of metaphysical possibility. (There are of course many rival theories of possibility in metaphysics which do not postulate a multiverse, such as theories which ground possibilities in the dispositions of actual individuals or take possible worlds to be abstract entities.[5] However, even theories that make use of possible worlds but do not take them to be concrete mind-independent particulars do not in my view postulate a genuine multiverse.[6]) Lewis's theory is not very popular among philosophers, most of whom find it to be incompatible with common sense as much as laymen do. However, there are some other philosophers who hold it, often in a significantly modified form, such as Philip Bricker (2020) and Tagashi Yagisawa (2010).

Theories of *branching space-time* such as that of Nuel Belnap (1992), further developed by Belnap, Müller and Placek (2021), form a modification of Lewis's theory where universes can be in one way spatio-temporally connected; they can contain a common past. According to these theories a *history* is roughly *a maximal set of point events any two of which have a common causal effect* (Belnap et al. 2021, 29). Though Belnap and his followers do not use these terms, we can call such histories single universes while the set of all existing point events, which Belnap et al. (2021, 8) call *Our World*, can be called the multiverse. I will call it the *Branching Multiverse*.

Theories of branching space-time can be viewed as expressing on a more abstract level a general idea, of which one specific, empirically justified realization is the many worlds interpretation of quantum mechanics, going back to the article "'Relative state' formulation of quantum mechanics" by Everett III (1957; see also Vaidman 2021). According to these theories, when an apparently indeterministic event such as radioactive

[5] Lewis would say that no such theories are realistic about modality, as the theories do not take talk of possible worlds quite literally. However, many of them do not hold such talk to concern mind-dependent or linguistic entities either, and therefore other philosophers count many of them as realistic theories.

[6] I would then not call Leibniz's original theory of possible worlds a multiverse theory, though e.g. Sedacca does so, since Leibniz's possible worlds only existed as ideas in God's mind.

decay or photon emission (or more controversially a human decision) occurs, the universe divides into two or more universes. Brian Greene calls this type of multiverse the *Quantum Multiverse* (Greene 2011, 333); a Quantum Multiverse is then a special case of a Branching Multiverse.

Max Tegmark (2014, 119) defines our universe as *the part of physical reality that we can in principle observe*. David Deutsch (1998) similarly defines in the universe as *all the directly perceptible matter and energy that surround us and the surrounding space*.[7]

These definitions clearly allow for the existence of beings outside our universe, and have been used to describe both theories of the multiverse that use cosmic inflation and those that use the many worlds interpretation of quantum physics. However, they are problematic in several ways.

Deutsch's definition assumes that we can directly perceive such particles as electrons in our universe, though we cannot perceive phantom particles which belong to other universes; however, positivists rejected atoms just as they reject other universes because they were not supposed to be perceptible. Deutsch (1888, 84) himself recognizes later, when dealing with epistemology, that it is a simplification to speak of particles as perceptible, but does not amend his definition.

It can even be argued that such definitions are too anthropocentric, and trivialize the concept of the multiverse almost as much as the definition of a universe as a galaxy. They could allow us to say truly that there are several universes even if we do not accept any controversial cosmological theories.

Theories of *cosmic inflation* suppose that the universe expanded very rapidly just after the Big Bang. According to some versions of the theory such as chaotic inflation, this created what are called bubble universes, contained in a greater universe which is often (e.g by Greene) called the *Inflationary Multiverse*.

The *braneworld* scenario takes as fundamental physical entities *branes*, a generalization of strings, which can be of different sizes, both elementary particles and entire universes. Branes which are universes may be separated by higher spatial dimensions (i.e. spatial dimensions besides length, breadth and height) and so constitute the *Brane Multiverse*.

Different conceptions of the multiverse can also be combined; Hatleback calls such combinations tiered multiverses (Hatleback 2014, 69). Max Tegmark (2014) supposes that there are four levels of the multiverse, where the first two correspond to different kinds of cosmic inflation and the third to the many worlds interpretation of quantum mechanics. Tegmark's theory is then in Hatleback's terminology a 4-tiered theory.

[7] Brian Greene (2011) also gestures at this sort of definition, but then says he will avoid wrestling with abstract definitions by adopting the approach applied by Justice Potter Stewart to define pornography: "I know it when I see it." However, this approach does not seem to work in the case of universes, since we cannot see a universe as a whole as we can see a pornographic magazine.

The Level IV multiverse consists of all worlds corresponding to some mathematical structure. Greene (2011, 464) calls it the *Ultimate Multiverse*. Though Tegmark is a physicist (and not a philosopher like Lewis or Belnap), this fourth level of the multiverse is not based on any physical evidence, as theories of cosmic inflation, or braneworlds, or the many world interpretation of quantum mechanics are, but is a purely metaphysical postulate. However, it is based on theories in the philosophy of science and mathematics and so connected loosely to natural science. The assumption of level IV presupposes *ontic structuralism*.

Structuralism is a highly controversial theory in the philosophy of science, which was proposed already by Bertrand Russell (1927, 249-256) in the form that only the formal structure of the external world could be known. It was presented in a stronger version by Rudolf Carnap (1928, 11-21, translated in Carnap 2003, 19-30), according to which we could not know anything but the structure even of psychological objects. Ontic structuralism strengthens even this to the thesis that there *is* nothing in any objects but their structure. Structuralism has been recently advocated e.g. by Worrall (1989). However, none of these philosophers connected structuralism with a theory of a multiverse.

Tegmark's version of structuralism, which is closer to Carnap's than Russell's version,[8] contains the *Mathematical Universe Hypothesis*, according to which our physical reality is just a big *mathematical structure*, where a mathematical structure is a *set of abstract entities with relations between them*.

The assumption of the existence of this fourth level is close to Lewis's modal realism, as Tegmark acknowledges (2014, 322). However, Tegmark maintains that his formulation is more rigorously defined, as it replaces Lewis's all possible worlds with all mathematical structures. However, it seems to me that Lewis's definition of a possible world is just as rigorous.[9] It is also clearly different: though both theories are similar in entailing the existence of extremely many universes,[10] none of Lewis's worlds is supposed to be a mathematical structure. A mereological sum of individuals is not a mathematical structure; a mereological sum is not a set, and it and its parts are not abstract entities but

[8] It is rather ironic that Tegmark's theory of a multiverse is based on an idea originally developed (among others) by Carnap, as Carnap was a logical positivist and positivistically inclined philosophers have been the fiercest critics of multiverse theories. However, Carnap and other logical positivists combined structuralism with verificationism, and it seems to me that this combination was radically incoherent from the beginning.

[9] Tegmark says that modal realism asserts that all imaginable universes exist. This is not quite correct. In some sense we can imagine inconsistent universes, and Lewis certainly did not think that they exist, nor do most other modal realists. However, Yagisawa weirdly enough does, as he believes in impossible worlds, so Tegmark's criticism may apply to Yagisawa's theory if not to Lewis's.

[10] Both are examples of what Hatleback (2014, 84-86) calls a *dimensionally separated multiverse*, as the universes they contain are not spatio-temporally connected even in higher dimensions of space or time.

concrete individuals. A mereological sum of course *has* a mathematical structure; however, it typically has several mathematical structures, and therefore cannot be simply identified with any of them.[11]

Lewis's modal realism does not presuppose the Mathematical Universe Hypothesis or the ontic structuralism on which it is founded, and personally I find these theories even more implausible than Lewis's theory. It appears to me that structuralism, even in the far weaker Russellian version, was already refuted by Maxwell Newman (in Newman, 1928); Newman argues that Russell's structuralism entails the absurd conclusion that nothing can be known about the external world except the number of objects in it.[12]

Brian Greene (2011, 485-487) distinguishes as many as nine different sorts of multiverse (which do not include the Modal Multiverse); the Quilted Multiverse, the Inflationary Multiverse, the Brane Multiverse, the Cyclic Multiverse, the Landscape Multiverse (which combines the Inflationary Multiverse with the Brane Multiverse), the Quantum Multiverse, the Holographic Multiverse, the Simulated Multiverse and the Ultimate Multiverse. We have already encountered some of these, and will yet encounter others. I would hesitate to call some of thes3 – such as a "multiverse" consisting just of simulated universes – genuine multiverses.

I will soon show that there are still many additional conceptions of a multiverse in speculative fiction that may not correspond exactly to any of these current scientific conceptions, such as the idea of a spatially scaled multiverse, a multiverse created by *time travel*, or a multiverse whose universes are separated by vibrations.

3. The History of the Multiverse in Speculative Fiction

It is unclear just when and where the notion of the multiverse originated, whether in fiction or theory. As we have seen, it is unclear exactly how the multiverse should be defined, and already because of this it is impossible to be precise about where the notion originated; different variants of it originated at different times. Additionally, it is hard to even pinpoint the earliest instances of any specific variant.

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[11] According to mereology, an individual can often be divided into several smaller individuals in many different ways. It is then possible (to give a simplified toy example) that e.g. $a = b + c$ and $a = d + e + f$, where "$x + y$" stands for the mereological sum of x and y. The individual a can then correspond to the structures $\langle\{b,c\},+\rangle$ and $\langle\{d,e,f\},+\rangle$, where "$x + y$" stands for the mereological sum of x and y. These structures are not yet mathematical structures, as b, c, d, e and f are not abstract entities. However, these structures (which might be called concrete structures) correspond to (i.e. are isomorphic with) mathematical structures where these individuals are replaced by mathematical entities (such as $\langle\{0,7\},+\rangle$ and $\langle\{1,2,4\},+\rangle$), where "$x + y$" stands for the mathematical sum of x and y. However, these are different structures (and are not even isomorphic) since they contain sets of different cardinality. The same holds naturally of Lewis's spatio-temporally maximal individuals, which may even in some cases be divided to parts in infinitely many different ways.

[12] Butterfield (2014) provides a recent criticism of Tegmark's theory, based on a distinction between pure and applied mathematics.

It is often claimed that the British author Michael Moorcock was the first to use the word "multiverse" in science fiction in 1962 in his *space-opera* novel *The Sundered Worlds*, a.k.a. *The Blood-Red Game* – initially serialized in the magazine *Science Fiction Adventures* as the novella *The Sundered Worlds* (1962) and its sequel *The Blood-Red Game* (1963.[13] However, this may not be quite correct, as R. A. Kennedy's scientific romance *Triuneverse* (Kennedy 1912) appears to have already used the word in science fiction (Lawley 2019).

Kennedy was perhaps the first to use in fiction the conception that very small objects in one universe such as atoms or electrons are huge objects such as solar systems or galaxies in another, smaller scale universe.[14] A multiverse of this kind has been called a *spatially scaled multiverse* (Hatleback 2014, 62). The idea has been anticipated in philosophy and natural science at least as early as in a collection of didactic poems, *Poems and Fancie*s (Cavendish 1653, 44) by Margaret Cavendish (1623-1673),[15] one of the revivers of ancient atomistic philosophy in early modern Britain. The conception was a bit later expressed in a stronger form in academic prose in Gottfried Wilhelm Leibniz's (1646-1716) *monadology.* It postulated that matter was not only infinitely divisible, but also actually subdivided without limit, so that there would be an infinite number of universes within each other (a view which an atomist such as Cavendish could not have accepted, as atomism supposed all things to consist of indivisible atoms).[16]

This conception has later been used by many other authors. Ray Cummings most famously used it in many stories resembling Burroughs's s*word and planet* stories. Most famous of them is the novel *The Girl in the Golden Atom*, initially serialized (as part of a

[13] The plot of the novel is grandiose indeed; as our universe faces destruction by contraction, Renark the Wanderer seeks a way to save mankind by leading it to another universe. He finds out that this involves saving the multiverse itself!

[14] You can perhaps find a rough anticipation of the fictional use of the idea of a spatially scaled multiverse in the story "The Diamond Lens" (O'Brien 1858) by Fritz O'Brien (1828-1862), where an obsessed amateur microscopist observes a beautiful female humanoid he names Animula within a drop of water by using a diamond acquired by murder as a lens. Like Cummings's later story, this story turns into a romance, but a much less happy one.

[15] This work might also be considered partly fictional, and so anticipate O'Brien and Kennedy. However, it is at most very weakly fictional as it tells purely allegorical stories, such as a story of a combat between Nature and Death, with such personified abstractions as Motion, Figure, Matter, Life, etc. as characters. It is doubtful if this counts as science fiction. However, Cavendish did later in 1666 write a work that rather clearly counts as early science fiction, *The Blazing World*.

[16] Leibniz said in *Monadology* (66-67): "Whence it is evident that there is a world of created beings – living things, animals, entelechies, and souls – in the least part of matter. Each portion of matter may be conceived as a garden, full of plants, and as a pond full of fish. But every branch of each plant, every member of each animal, and every drop of their liquid parts is itself likewise such a garden or pond." Roger Boscovich also argued for this idea (Hatleback 2014, 51), perhaps influenced by Leibniz. The idea was later used by several authors, e.g. by Nicholas Odgers in 1863 and in *Two New Worlds* by E. E. Fournier d'Albe (1907), who spoke of an *infra-world* (a world spatially smaller in scale than ours) and a *supra-world* (a world spatially bigger in scale than ours). D'Albe's treatise may have inspired Kennedy (Lawley 2019).

series of club stories) in the pulp magazine *All-Story Weekly* in 1919, of which Cummings (2005) is a modern scholarly edition. In it the protagonist (known just as the Chemist) ventures (implausibly) with the aid of a size-changing drug into a world within his mother's wedding ring. There he meets a beautiful girl, Lylda, whom he falls in love with. Many older superhero comics have also used the conception of a spatially scaled multiverse (Berkenwald 1977).

Donald Wandrei's story Colossus (1934) is not the first[17] but still the most famous story to apply the idea in a reverse direction. In Wandrei's story, the star pilot Duane Sharon from our universe leaves a war-ravaged Earth and breaks through into a greater universe, one of whose electrons our whole universe is.

The idea of a spatially scaled multiverse was a legitimate subject for speculation in Cavendish's and Leibniz's times and perhaps also in d'Albe's. Unfortunately quantum physics, which has provided evidence in favor of different kinds of multiverse, as in the many-worlds interpretation, has provided strong evidence against this fascinating variant of a multiverse,[18] since it holds that matter is not infinitely divided but quantized.[19]

Even if Moorcock had been the first to use the word "multiverse" in science fiction, a word should be separated from the concept or sense it expresses.[20] There are also many other words that are roughly equivalent, at least in one of their senses, to "multiverse" in the current sense, such as "megaverse" (used in the role-playing game *Rifts*), "pluriverse" (used by Theodore Sider in philosophy), "omniverse" (used in superhero comics), "cosmverse" (used in the role-playing game *Torg*), "macroverse" (used by Stephen King), "manifold" (used by Stephen Baxter), "superspace" (used by George Zebrowski), etc. The word "multiverse" had also been used far earlier, even before Kennedy or d'Albe, by the American pragmatist philosopher William James in 1895, in an article "Is Life Worth Living?" (James 1895, 10) and even earlier by William Denovan in 1873. However, they used it in a very different sense, to refer to a pluralistic, as opposed to a monistic,

[17] Besides Kennedy, Cummings had already applied the idea in a reverse direction before Wandrei in a novel serialized in the pulp magazine *Weird Tales* in 1927, which has been collected as *Explorers into Infinity* (Cummings 1965).

[18] However, Hastleback argues that a contemporary theory by Lee Smolin, according to which there might be universes within black holes, could count as a contemporary version of theories of a spatially scaled multiverse (Hastleback 2014, 77).

[19] In Wandrei's story Sharon's spaceship, the White Bird, can cross to a greater universe because it can reach a maximum velocity of thousands of light-years per second. Wandrei's story is then not only inconsistent with quantum physics, but also with the standard version of the theory of relativity, according to which the speed of light cannot be exceeded. Einstein's theory is mentioned in the story, but treated as just one theory among others, which is proved partly false in the world of the story. *Explorers into Infinity* (Cummings 1965) also rejected relativity theory, not only within the story but in a non-fictional preface to it.

[20] Such authors as Oliver Lodge, Gilbert Keith Chesterton and John Cowper Powys also used the word in a similar sense (Langford 2025).

conception of one single universe. Nevertheless, I will argue that there are connections between these two concepts of a multiverse, and show in Section 6 of this article that theories of the multiverse in the later sense of the word are also highly relevant to the question whether life is worth living.

You could argue that any story of *parallel worlds* is implicitly the story of a multiverse. An alternate i.e. alternative history story on the other hand need not involve the multiverse if it only deals with a single alternate history. Yet if a story deals with several coexisting alternate histories, which are not explained as dreams or simulations, it naturally becomes a story of parallel worlds and therefore a story of a multiverse.[21] However, lots of stories of parallel worlds precede Moorcock.

Since many forms of *portal fantasy* – i.e. fantasies where a person from our world is thrust to a magical world – utilize parallel worlds, they then also implicitly postulate the existence of a multiverse. This has even been made explicit in some of them by showing relations between parallel worlds. E.g. one book, *The Magician's Nephew* (Lewis 1955), in one of the most famous portal fantasy series of all, C. S. Lewis's *Narnia* series, introduces the Wood Between Worlds, where there are pools serving as portals to innumerable different worlds. However, in Lewis's novels only two of them besides our own world (and heavenly archetypes of it and Narnia, briefly glimpsed at the end of the series) are encountered, the magical world of Narnia and the corrupt and dying world of Charn.

Many space operas before Moorcock's also touch upon parallel worlds. For example, toward the end of E. E. 'Doc' Smith's *Children of the Lens* – serialized in 1947 and 1948 in the pulp magazine *Astounding Science Fiction* (first collected in book form in Smith, 1954) – the Lensman (a sort of space policeman) Kimball Kinnison is hurled by his enemies to a distant space from which his superhuman children have to rescue him. The notion of several spaces (which are said to contain planets) is implicitly a concept of a multiverse.

An implicit concept of the multiverse has also been used earlier in more literary works, as in Jorge Luis Borges's short story from 1941, translated as "The Garden of Forking Paths" (Borges 1962). This is a *metafictional* story. It introduces within a frame story concerning espionage during the First World War a fictional book by the former Governor of Yunnan, Ts'ui Pên, which tells obliquely about alternate histories. The sinologist Stephen Albert conjectures in the story (100) that Ts'ui Pên believed in "a dizzily growing, ever spreading network of diverging, converging and parallel times."

[21] Tales of time travel are also sometimes tales of a multiverse, but not always. Tales of temporal loops stay within the confines of a single universe. Tales where the past is changed can be tales of a multiverse if this creates coexisting alternate universes. However, if a time travel tale says that when a new alternate world is created the old one must be destroyed, as many such tales do, I would not count it a tale of a multiverse, as the different universes do not really coexist. A multiverse is created through time travel in at least one hard science fiction novel, Stephen Baxter's *Origin* (Baxter 2001). In the world of this novel there is at first only one universe with only one intelligent species, a variant of humanity. Having advanced sufficiently they get lonely and change the past to create several new universes with several intelligent species.

This may have been the first story to present the notion of branching time. However, it differs from theories of branching time and space-time seriously presented by such metaphysicians as Belnap, Müller or Placek or such physicists as Everett and DeWitt in the crucial respect that it allows times not only to diverge but also to *converge*.

If parallel worlds involve the multiverse, a concept of the multiverse has then been around in speculative fiction before Moorcock. In fact it may have been around already from the Victorian Age or even earlier.

Treatments of parallel worlds have been claimed – e.g. by Stableford (1981, 447-448) – to occur already in 1895 and 1896 in a short story by J. H. Rosny-Aîné and two short stories by Herbert George Wells.[22] However, the case for taking all of them as stories of parallel worlds does not appear very good to me.

Two of these stories concern people with extraordinary perceptual abilities, in one case innate and in the other temporary and due to an accident.

Rosny-Aîne wrote a short story, "Un autre Monde," translated into English as "Another world" (Rosny-Aîné 2010). It is narrated in first person by a mutant in the Netherlands, Karel Ondereet, who is in many respects different from ordinary people, being violet-skinned and physically weaker but more agile than ordinary humans. His perceptual abilities are especially unusual; while he is unable to see many ordinary colors, he can see other colors and even see through many solid objects.[23] Ondereet perceives that there are many living beings invisible to ordinary people, terrestrial ones he calls Moedigen and aerial ones he calls Vuren, which can even pass through living beings we see. The mutant says that they form another world alongside the one we usually see.

However, this world is separate from our own only epistemically. It would then be another universe according to Tegmark's and Deutsch's definitions of a universe – if the first person plural pronoun "we" in such phrases as "we can in principle observe" is interpreted so narrowly that it excludes hypothetical mutants such as Ondereet – but not according to any more objective definitions.

Wells's short story "The Remarkable Case of Davidson's Eyes" (Wells 1895) has an even weaker connection with the multiverse. It tells of a man who after an accident does not see the things in his vicinity but seems to see a distant beach. This is initially dismissed as a hallucination, but the story ends with it being shown to be a genuine view of a distant place. A character speculates that this long distance vision may happen through the fourth

[22] It has also been argued by Bettini (2005) that Edgar Allan Poe (1809-1848) already used a notion of the multiverse in 1848 in his essay (which he himself called a prose poem) *Eureka* (1848). This essay at least proposes a theory of the Cyclic Multiverse in *Eureka* (1848, 139), but this was hardly novel, as it had already been used by Stoic philosophers and by Hindu and Buddhist theologians. However there may perhaps also be found another conception of a multiverse in the essay in *Eureka* (1848, 101-102).

[23] The story as a whole is perhaps more about the mutant's attempts to fit into human society rather than the other world he sees.

dimension. The fourth dimension has indeed later been used often to separate and connect parallel worlds, but it does not appear to do so in this story.

Wells's short story "The Plattner Story" (Wells 1896) seems to me to have the best claim of these three stories to being a genuine story about parallel worlds. It brings together elements that have occurred separately in the other two stories. In it the fourth dimension does seem to separate parallel worlds.

It tells of a teacher in a small private school, Gottfried Plattner, to whom a student, Master Whibble, brings a bottle of green powder with mysterious origins to analyze. As Plattner sets the powder aflame it explodes, sending Plattner to another world lit by a green sun. It is a complete world, at least a parallel planet, with not only living beings as in Rosny-Aine's story, but also ground and buildings. Our world is visible in that world at night, and its beings can pass through beings in the other world. The world also contains counterparts of living and dead people from our world, looking like human heads on tadpole bodies. These counterparts are suggested to be like souls or astral bodies, which is odd for the usually materialistic Wells. When Plattner comes back, the positions of his organs have been reversed, which confirms that he has moved through the fourth dimension.

Perhaps the multiverse was then sort of introduced to fiction already in 1896, although in a very rudimentary form.

The idea that different universes are separated along a fourth or still higher dimensions has since then been very popular in speculative fiction (Stableford and Langford 2025). Such worlds separated from each other along a higher dimension are very often themselves imprecisely called dimensions in science fiction. Sometimes even parallel worlds which are not separated from each other in that way are still more imprecisely called dimensions. Hatleback (2014, 66) calls such a multiverse a *dimensionally connected multiverse*.

Theories of higher dimensions have also been very popular in pseudo-science, e.g. with some spiritualists, and some science fiction writers have been influenced by such fringe science, which may cause this idea to be regarded with disdain. Nevertheless, theories of higher dimensions have received some support from genuine physics; e.g. one version of string theory, the braneworld scenario, supposes that the multiverse actually has ten spatial dimensions (Greene 2011, 179). The physicist Michio Kaku (1994) has been a notable supporter and popularizer of the theory of higher dimensions.

Even though Moorcock did not originate the notion of the multiverse, he surely developed its treatment significantly and played a pre-eminent role in making it popular in speculative fiction. Moorcock has used the notion in stories belonging to the most different literary *genres*; we could indeed say that one of its most important uses in Moorcock is to enable the combination of different genres.[24]

[24] The multiverse is often used also by many other writers to enable the combination of diverse genres. The tabletop role-playing game *Torg* (Gorden and Slavicsek and Horne 1990) and novels

As we have already seen, Moorcock first used the notion of the multiverse in a space opera. This is unusual for him, since he has later said he does not like space opera and even that he stops reading a book when a starship turns up. Nevertheless, he has occasionally used space-operatic storylines even in his later works, such as the Doctor Who novel *The Coming of the Terraphiles* (Moorcock 2010), though usually only along with other kinds of storylines.

Moorcock has used the notion most notably in his stories about the *Eternal Champion*, a hero cursed to be constantly reborn in different worlds of the multiverse to fight to maintain the cosmic balance between Chaos and Law. The notion of the Eternal Champion belongs mostly to his fantasy stories, most of which can be more specifically classified as revisionist *sword and sorcery*, such as those concerning Elric of Melnibone (Moorcock's most famous hero), Hawkmoon, Corum and Erekosë. Moorcock may well have been the first author to use the multiverse in sword and sorcery stories,[25] at least to any significant extent.[26] However, the notion does not belong exclusively to fantasy, as Asquiol of Pompeii, one of the heroes of the space opera *The Blood-Red Game* (Moorcock 1974), is also held to be an incarnation of the Eternal Champion.

In these stories the godlike Lords of Chaos and Law fight eternally for the mastery of the multiverse. However, this is not a conventional tale of the struggle between good and evil, as neither Chaos nor Law are wholly evil or good. You could say that the Lords of Chaos seek to make Moorcock's multiverse also a multiverse in the sense of the word used by William James, a chaotic place without an overarching plan. The Lords of Law on the other hand seek to make it a *universe* in James's sense of the word, and perhaps even what James called a block universe. Moorcock's heroes often question the worth of life in a multiverse constantly threatened with chaos on one side and the sterility of perfect law on the other.

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based on it take this to an extreme. In them the different universes, here called cosms, whose dark lords invade our universe in the near future, are explicitly representatives of different genres of popular fiction; e.g. Orrorsh is a world of the horror genre, Aysle a world of high fantasy, Terra a world of pulp superheroes, etc. Another role-playing game using a multiverse to combine different genres is *Rifts* (Siembada, Carella et al. 1990), set in a world where a nuclear holocaust has caused ley lines to overflow with magical energy, creating doorways to many different universes representing different genres.

The idea of a multiverse can also be used to *satirize* the conventions of different genres, as in Fredrick Brown's *What Mad Universe* (Brown 1949), where the author Keith Winton from our world is flung to a parallel world obeying the conventions of space opera.

[25] Robert A. Heinlein was another early author who used the multiverse in a portal fantasy, *Glory Road* (Heinlein 1963), which has sometimes been classified as sword and sorcery and appeared only slightly later than Moorcock's first sword and sorcery stories.

[26] Earlier sword and sorcery stories had at most used other-dimensional worlds as places from which black magicians could conjure demons or monsters the hero had to fight; while Moorcock also does so, his heroes and anti-heroes also actually travel between universes and conjure monsters and demons themselves.

This idea of a conflict between Chaos and Law (or Order) has been imitated by very many later works of speculative fiction in all media. Chaos and Law have been used most notably in the biggest role-playing game franchise of all, Dungeons & Dragons, where chaotic and lawful are character alignments. This includes a setting with a multiverse that connects all the franchise's game worlds, *Planescape Campaign Setting* (Cook et al. 1994), which also draws from Moorcock in its conception of different planes of existence. The idea has also been used in Louise Cooper's long fantasy series *Time Master*, in DC's superhero comic *Doctor Fate*, etc.[27]

Moorcock was also one of the pioneers of the *steampunk* genre. Most steampunk stories are stories of alternate history (where technological development in the Victorian Age is swifter than in reality), yet they need not bring different histories together and so they need not be multiverse stories. Moorcock, however, was perhaps the first author to use the multiverse in steampunk stories, such as his stories of Sir Seaton Begg and Oswald Bastable.

Seaton Begg is a gentleman detective inspired by Sherlock Holmes and Sexton Blake, a Holmes pastiche for whom Moorcock actually wrote a conventional detective story (*The Caribbean Crisis*) in his youth. Begg has appeared in short stories collected in *The Metatemporal Detective* (Moorcock 2007) and a comic version adapted from them by Mark Reeve in the comic book series collected as *Michael Moorcock's Multiverse* (Moorcock 1999). He also appears in a new novel written together by Moorcock and Mark Hodder, *The Albino's Secret* (Moorcock and Hodder 2025), first of a new series. Begg is a metatemporal detective; it is not wholly clear what this means, but according to a story in *The Metatemporal Detective* (Moorcock 2007, 267) it means at least that he can travel between parallel worlds by increasing and decreasing his mass, which also for some reason involves traveling in time.[28]

Moorcock then still makes use of the somewhat outdated notion of a spatially scaled multiverse. However, in *The Blood-Red Game* (Moorcock 1974, 19) his hero Renark the Wanderer speaks of universes separated from each other by unknown dimensions, just as in (Wells 1896). It is not clear how these two conceptions of a multiverse, spatially scaled multiverse and dimensionally connected multiverse, fit together in Moorcock's stories. (This need not be an outright contradiction, as Moorcock's multiverse may be a tiered multiverse.)

While Begg can control his travels through the multiverse, poor Bastable is at first flung uncontrollably from one universe and time to another. He begins in *The Warlord of*

[27] Even the German space opera franchise *Perry Rhodan*, arguably the biggest science fiction franchise in the world (in terms of the amount of text it contains, though of course not economically), has used Moorcock's idea. It has cosmic entities called Cosmocrats and Chaotarchs that are rather close science fictional analogues of the Lords of Law and Chaos.

[28] It is said in some stories collected in *The Metatemporal Detective* (Moorcock 2007, 267) that time travel within one world is impossible. However, in other stories of Moorcock set in his multiverse such as The Dancers at the End of Time (Moorcock 1993) it turns out that this rule (called in the stories the Morphail effect) has some exceptions. (which also brings in the Cyclic Multiverse).

the Air (Moorcock 1971) as a captain in the army of the British Empire, who is first flung from 1902 to 1973 in a world where the First World War never happened and airships are the dominant mode of transportation. His travels bring him to understand the evil of colonialism and face his own guilt for previously taking part in it.

Moorcock has also used the multiverse in experimental stories such as the very surreal Jerry Cornelius stories and the slightly less surreal but yet experimental and difficult *Second Ether Trilogy* – collected in *The War Against the Angels* (Moorcock 2014) – which also has some steampunk trappings.[29] In this trilogy – a part of which has been adapted in comic form by Walter Simonson as a part of *Michael Moorcock's Multiverse* (Moorcock et al. 1999) – the Chaos Engineers fight the forces of Singularity (ruled by the Original Insect) in a way that is a more science-fictional (and even space-operatic) counterpart of the struggle between the Lords of Chaos and Law in Moorcock's sword and sorcery tales. The Chaos Engineers also travel between worlds by increasing and decreasing their mass.

4. The Multiverse in Superhero Comics and Films

Parallel worlds have been used in superhero comics on an ad-hoc basis almost since the beginning of the so-called Silver Age of comics. However, DC comics began to use them in a more systematic way in the 1960s, laying the groundwork for the DC multiverse. This was to have an extraordinarily complicated history, of which we can here present only the bare bones.

Gardner Fox first introduced in the pages of the Flash (the comic about a hero with superspeed), in the story "Flash of Two Worlds" (Fox et al. 1961), two parallel Earths, Earth-One and Earth-Two (soon also written Earth-1 and Earth-2). Each had its own different version of the Flash, Barry Allen on Earth-One and Jay Garrick on Earth-Two. Earth-One was the Earth where most of the events shown in the then current DC superhero comics were supposed to occur, while Earth-Two was where events shown in superhero comics the company (or its predecessors) had earlier published, during the so-called Golden Age of comics, were supposed to have occurred.

Later more earths with their own superheroes and supervillains were introduced. In most cases these contained characters from other comics companies DC Comics had bought, such as the Captain Marvel Family, characters from its old rival Fawcett Comics, who were placed on Earth-S (named for Shazam, the wizard who gave the family their powers), later named Earth-5. However, earths with original characters were also introduced; e.g. Earth-3 was supposed to be a world where the counterparts of the leading DC superheroes (who form the hero team Justice League of America) were all bad guys (forming the villain team the Crime Syndicate of America). It was postulated that all planets had similar counterparts, so that DC had really a multiverse and not just a multi-Earth. However, the counterparts of planets other than Earth were rarely used in stories.

[29] Hal Duncan is another British writer who has used the multiverse in experimental, surreal works in his *Vellum* duology, beginning with *Vellum* (Duncan 2006).

Fox's interpretation of parallel worlds was idiosyncratic; he postulated that different worlds occupied the same space but were separated by vibrating at different speeds.[30] I will call this kind of multiverse the Vibrational Multiverse.

Eventually writers and editors at DC such as Marv Wolfman began to fear that this plurality of worlds was confusing to readers. They were also anxious to make their comics more realistic and serious, purging them of goofy elements like super-powered pets and other talking animals, and to deal with the problem of their heroes aging too much for young readers to identify with. A cosmic reboot was seen as a solution to all these problems.

The DC multiverse was then destroyed in 1985 in the limited series *Crisis on Infinite Earths*, DC's greatest crossover event ever, collected later in one volume (in Wolfman, Perez et al. 2001).[31] In this series the cosmic supervillain Anti-Monitor, ruler of the anti-matter universe, woke from a coma and threatened to destroy all positive matter universes. Superheroes from several universes and times opposed him with the direction of the Monitor, the good twin of the Anti-Monitor. At the end all the remaining (positive matter) universes were merged into a single universe, and the timeline was altered by a final battle involving time-travel so that there had ever been only that one universe. All of DC's comics were partially rebooted so that all the heroes and villains that remained had always existed in the same universe, one without super-pets or talking animals or different versions of the same hero, and the heroes were younger with most of their past history wiped out. Many heroes such as the Barry Allen Flash and Supergirl also died, though this being superhero comics, in few cases permanently.

However, this turned out to lead to still greater confusion, as different writers rebooted their comics in ways inconsistent with each other; especially the continuities of the Legion of Super-Heroes (an originally teenage superhero team in a space-operatic future), Hawkman and Donna Troy (the first Wonder Girl) were thrown into chaos. DC's editors thought this confusion could be cleared by more reboots launched by cosmic crossovers.

Unfortunately such reboots always left DC continuity ever more convoluted and incoherent. The only problem they solved was the problem of heroes aging. However, as the readership of superhero comics was constantly getting older, it is dubious if this was

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[30] Fox's view of parallel universes might appear to have some very broad similarities with a theory in real physics, string theory's braneworld scenario, but these appear to be entirely coincidental; both make essential use of vibrations, but in entirely different ways. Braneworlds do not strictly speaking occupy the same space, as they are separated along higher dimensions.

[31] This crossover has recently been adapted (very loosely) to several media. It was adapted to live-action television in a crossover between different CW superhero series (contained in what fans call the Arrowverse) – *Supergirl*, *Batwoman*, *Flash* and *Arrow* – a crossover also called *Crisis on Infinite Earths*, which spawned comic prequels of its own. This crossover was also used to partially reboot the CW television shows just as the comic was used to reboot DC comics. The comic crossover has also been adapted to a series of three animated movies rebooting a series of animated movies and to a novel by Marv Wolfman.

any more a genuine problem, as older readers could easily identify with older heroes, even those who were married and had children.

These crossovers could not initially involve DC's original multiverse of worlds separated by vibrations any more, as it no longer existed in-story. However, they involved a lot of confusing time-travel where the past was altered time after time, and therefore involved a plurality of different timelines. These timelines formed according to a story written by Mark Waid but apparently inspired by Grant Morrison, *The Kingdom* (Waid et al. 2000), a single vast *Hypertime*. This could be considered a different kind of multiverse temporarily replacing the Vibrational Multiverse.[32]

Ultimately many writers began to get nostalgic for the storytelling opportunities of the multiverse, and the original vibrational DC Multiverse was eventually recreated (originally as just 52 universes) during the years 2005, 2006 and 2007 in the two related crossover series, *Infinite Crisis* (Johns et al. 2006) and the weekly comic *52*, whose first part has been collected in (Johns et al. 2007).

Since *52* there have been too many DC crossovers involved with the multiverse to discuss in any detail here – in roughly chronological order: *Final Crisis*, *Flashpoint*, *Convergence*, *Rebirth*, *Dark Nights: Metal*, *Doomsday Clock, Dark Nights: Death Metal*, *Infinite Frontier, Dark Crisis*, etc., with *DC K. O.* the latest, still going on as I write this. A good thing about many of the latest of them is that they are no more intended primarily or at all to reboot DC continuity but are developed as stories first and foremost.

Though the Vibrational Multiverse is back, and has been expanded to the Omniverse, Hypertime has not been wholly forgotten either. Geoff Johns has lately used it in many series, such as *Flashpoint Beyond*. The relations between the Omniverse and Hypertime are even debated within the DC Universe, with the time-traveling heroes the Time Masters claiming in "The Clockwork Killer, Chapter Five: The Joke's on Me" (Johns 2022, 1-2) in a television interview that Hypertime is more important than the Omniverse. The Omniverse and Hypertime are supposed to form together something called the Divine Continuum, and their interaction generates something called blue shift power.[33] (Here the world-building threatens to degenerate into pure technobabble.)

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[32] The Crisis also left standing a plurality of extra-dimensional realms such as the Fifth Dimension (home of the mischievous imp Mr. Mxyzptlk often pestering Superman), Azarath, Gemworld, the Phantom Zone, etc. These different dimensionally connected worlds could be said to form a third kind of multiverse in DC comics. DC Comics have also used the spatially scaled multiverse in some stories – see "Sizing Up The Microworlds" (Berkenwald et al. 1977) – but not very systematically. They have also used the Cyclic Multiverse, but again not systematically or even consistently.

[33] There is a real phenomenon in physics called blueshift, where the wavelength of radiation moving towards an observer decreases and its frequency increases. However, Johns's blue shift power appears to have nothing to do with this real phenomenon. It is apparently blue because Johns has brought Alan Moore's Doctor Manhattan from Moore's famous comic *Watchmen* to DC continuity and stipulated that he uses that power, and the power Doctor Manhattan uses has been depicted as blue.

The history of the Marvel multiverse is shorter and slightly less convoluted than that of the DC universe. The famous writer Alan Moore was largely responsible (together with other writers such as Mark Gruenwald and perhaps David Thorpe) for the systematization of the Marvel multiverse in the early 1980s (Marston 2022). Most of this occurred in a weird place, in stories of Marvel's British superhero, Captain Britain, whose origin was connected to Arthurian legends. These were told in comics such as *Marvel Super-Heroes* and *The Daredevils* published in the United Kingdom, not U.S.A., and later collected in *Captain Britain* (Moore and Davis 2002). Moore introduced an entire Captain Britain Corps, all of whose members were counterparts of Captain Britain from different parallel Earths. Moore or Thorpe named the main Earth of the Marvel universe Earth 616.

Apparently the Marvel multiverse is generated largely through time travel, so that attempts to make major changes to the past usually instead create new timelines. Therefore it is more similar to DC's Hypertime than to DC's original Vibrational Multiverse.[34] (This holds also for the Marvel Cinematic Universe.) However, other universes in the Marvel multiverse are apparently generated according to the theory of branching time. Time travel then just adds additional branches to the tree of timelines. However, this is still a slightly different conception of the multiverse than the Quantum Multiverse, as the Quantum Multiverse does not require any time travel.[35]

Mark Gruenwald distinguished (e.g. in the comic series *What If?* and *Quasar*) the Marvel multiverse from the greater Omniverse, which also contained universes where stories told in comics (or books or movies) from other publishers take place. Gruenwald et al. had earlier edited a fanzine called *Omniverse: The Journal of Fictional Reality* (Gruenwald et al. 1977) based on a similar idea, and written a pseudofactual essay, *A Treatise on Reality in Comic Literature* (Gruenwald 1976), on whose theories the fanzine was based. DC Comics has also in its latest cosmic crossovers used a distinction between several local multiverses and a greater Omniverse.

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[34] Marvel Comics have also made use of three other forms of a multiverse. It has used the idea of the spatially scaled multiverse, e.g. in some stories of the *Fantastic Four* and in the stories of the Microverse, in a comic book *Micronauts* based on a line of toys. However, in their latest stories they have retconned it to be a parallel world separated from ours along a higher dimension. (Peculiarly, it is still accessed by means of shrinking.) It has also used dimensionally displaced worlds such as The Dark Dimension, home to Doctor Strange's archenemy Dormammu and Strange's wife Clea, and Asgard, home of the thunder god Thor and Loki. It has also made use of the Cyclic Multiverse. According to an idea perhaps first introduced by Al Ewing – see e.g. "War in Heaven" (Ewing, Foreman et al. 2017) – the current Marvel cosmos (i.e. the whole Marvel multiverse) has been preceded by seven others. From the sixth of them comes one of its major villains, Galactus.

[35] However, it is argued by Deutsch (1998, 394-436) that the many worlds interpretation of quantum mechanics and relativity theory are *compatible* with time travel, even the kind of time travel where the past is changed. However, in Marvel stories – both comics and films – it is also possible to *destroy* timelines, as the Time Variance Authority initially specialized in doing in *Loki* (2021-2023). This does not make sense in the framework of the many worlds interpretation. Making sense of it would require a more recondite cosmology, e.g. a theory of two-dimensional time, which might also make sense of DC's Hypertime. (A philosophical theory of two-dimensional time is developed, e.g., in Meiland 1974.)

Marvel never tried to seriously get rid of their multiverse or reboot all their comics, so they avoided the overwhelming continuity problems of DC comics. However, Marvel did have their multiverse in its seventh iteration be destroyed, reduced to a single world – Battleworld – and then recreated as the Eighth Cosmos in the crossover series *Secret Wars* (Hickman et al. 2016).

5. Comparing Uses of Multiverse in Non-Fiction and Fiction

The way the multiverse is most commonly used in speculative fiction may not fit very well with serious theories about the multiverse. Speculative fiction has developed many conventions and tropes specific to itself that have little to do with metaphysical or physical theories. Even hard science fiction can use the multiverse; e.g. the novels by Anderson, Blish, Zebrowski and Baxter mentioned earlier in this article would usually be counted as hard science fiction, though the extent of their scientific accuracy has often been recently questioned. However, if it is to be really hard science fiction, multiverse stories may have to reject many popular tropes. One trope it would rather certainly have to discard or greatly modify would be that of a spatially scaled multiverse, as it is inconsistent with quantum mechanics.[36]

One other of the most popular tropes is that people may travel from one universe to another and meet counterparts, i.e., duplicates of themselves and of people and things known to them. E.g. in the movie *Spider-man: No Way Hom*e (2021), three versions of Spider-Man, three Peter Parkers, meet because of a disrupted spell and team up, while in the movie *Doctor Strange in the Multiverse of Madness* (2022) the wizard superhero Doctor Strange fights an evil corrupted counterpart of himself on a devastated version of Earth. While people meeting counterparts of themselves is more popular in films and comics than in prose fiction, yet even in prose people often meet counterparts of other, famous people and nations, and at the very least of planets such as Earth itself.

However, most serious theories about the multiverse do not allow for such encounters to be possible, and it is not clear (at least not to me) whether any serious theory entails that they would be possible. Many theories entail that different worlds contain counterparts but do not allow travel or even communication between worlds to be possible, while others may allow travel to be possible (at least in principle, though probably mostly not in practice), but may not predict that individuals in different universes would be counterparts of each other.

In order to give an adequate semantics for quantified modal statements, David Lewis's modal realism requires that worlds contain counterparts. However, it follows immediately from Lewis's definition of a world as a maximal mereological sum of spatio-temporally connected individuals that travel between different worlds is not possible, and so the counterparts cannot encounter each other. If a person or an object travelled from one world to another then they would be at one time a part of one world and at a later time

[36] The version of the spatially scaled multiverse where other universes exist within black holes is of course an exception if it is really a version of that conception.

a part of another world. Therefore the worlds would be spatio-temporally connected after all, and therefore neither of them would be a maximal sum of spatio-temporally connected individuals, contrary to the definition.

Theories of branching time also suppose the existence of counterparts but do not allow for travel between universes either, since such travel would require backward branching, i.e. that incompatible events could lie in the past (Belnap et al. 2021, 26). A traveler from one universe to another would have in her past both events in her home universe and events in the universe she has entered. Some of these would have to be incompatible for the universes to be different; e.g. one universe might contain the victory of the Allies in World War Two and another their defeat in it. However, theories of branching time only allow forward branching (Belnap et al. 2021, 26). Of course such theories could be modified to allow some backward branching. However, while this would be beneficial to a fiction writer it is not clear if it would have any theoretical benefits for a metaphysician or physicist.[37]

Travel between different bubble universes or brane universes or different iterations of the Cyclic Multiverse seems to be possible in principle, even if not in practice. However, it is less clear whether there is any reason to think that different bubble universes or brane universes would contain counterparts of individuals in each other.

It is often argued (e.g. by Max Tegmark, 2014, and Brian Greene, 2011) that they would have to contain counterparts if there are infinitely many of them. They argue that there are only finitely many distinguishable combinations of different kinds of elementary particles, and therefore if the multiverse is infinite the same combinations will have to exemplified in several universes.

However, this argument shows at most that some individuals in some universes have counterparts in others, not that all individuals in all universes have. It does not then show that humans or other intelligent beings would have any counterparts anywhere. At most it is highly probable (perhaps even with a probability infinitesimally close to one hundred percent) that we have counterparts, not necessary or certain. Furthermore, if our existence is in itself very improbable, it may not even be highly probable that we have any counterparts. E.g. if the genesis of intelligent life is very improbable, it might be the case that our universe is the only one with intelligent life.

Furthermore, if this kind of argument were valid it would entail (as the Greek atomists in fact already knew, as they used a similar argument for a very similar conclusion) that there are counterparts of our Earth in some very distant galaxy even within a single flat universe if that flat universe is spatially or temporally infinite. This seems implausible, but it has been held to be correct by some important thinkers; Brian Greene (2011, 59-60) calls such a view the *Quilted Multiverse*. It has been used in speculative fiction already by H. G. Wells's *A Modern Utopia* (Wells 1905) and by many others.

[37] However, it must be noted that Farr (2012) does argue that denying backward branching lacks physical justification.

Of course, if the author of a science fiction work does not want to write hard science fiction, but soft science fiction or science fantasy (of which superhero stories are clearly an example), the use of this trope need not be very problematic. However, even in their case the conception of the multiverse should be consistent, and it is doubtful if such stories have always succeeded even in this.

6. The Functions of the Multiverse in Science Fiction

Superhero comics and films use the multiverse mainly to get fights that are as big and high-stakes as possible, with the bad guys threatening to destroy or conquer not just the world or even the universe but the whole multiverse. They also use it to enable dramatic interactions of characters that could not otherwise meet, characters from different worlds, and to reboot their continuities diegetically.

There is nothing wrong with such functions, but they are rather trivial. However, the multiverse has also been used in science fiction for more serious purposes.

The multiverse can be used e.g. for the purpose of political philosophy.[38] In many stories a character from a world with one political system is flung to a parallel world with a different political system. This helps to highlight their contrast and may cause the character to reject his prejudices, as happens in Moorcock's anti-colonialist Oswald Bastable stories which I already mentioned.

Utopian and *Dystopia*n fictions especially use alternate parallel worlds to show how things could have been significantly better than they are or significantly worse if some political ideology had triumphed. Often an author takes a character from our world, and drops him into a parallel Utopian or Dystopian world, in order for us to see that Utopian or dystopian world from his perspective and (the author hopes) be persuaded of the author's political views along with the character. At other times fictions even take a character from a Dystopian world to a Utopian world or conversely to make the contrast between possible political systems as sharp as possible.

H. G. Wells's *A Modern Utopia* (Wells 1905) might be the first novel which in a way uses an alternate world for Utopian speculation, but it is a world in a distant part of our single universe, out beyond Sirius. However, later in *Men like Gods* (Wells 1923) Wells did use a genuine parallel world displaced from ours along a higher dimension as a Utopia. A failed scientific experiment by the members of that Utopian society accidentally brings the book's protagonist Mr. Barnstable and eleven other Englishmen (including influential people such as a politician and a clergyman) to it, but they do not fit well in a Utopian society.

[38] Of course the multiverse has been used for political purposes even in superhero comics and films. You could find some muted political commentary even in such primarily entertainment-oriented movies as *Doctor Strange in the Multiverse of Madness* (2022). E.g. the multiversal traveler America Chavez says at one point that food is free on most earths she has encountered, which can be interpreted as a criticism of (extreme) capitalism.

In more recent times, L. Neil Smith's *The Probability Broach* (Smith 2001) used a parallel world in another universe as a utopia. The novel takes the hard-boiled detective Win Bear from a dystopian statist world (perhaps intended to be a future of our world) and throws him into Smith's right-libertarian utopia, the North-American Confederacy, an America where the Whiskey Rebellion succeeded. Another, more left-wing recent use of this trope is *Another Now* (Varoufakis 2020) by Yanis Varufakis, who is better known as a socialist politician and the Greek Minister of Finance than as an author. Its protagonists Costa, Eva and Iris are not literally transported to another world in the multiverse (well, to spoil a little, not until the end of the novel), but Costa invents a computer, HALPEVAM, that somehow accidentally opens a wormhole and enables them to communicate with their counterparts in another world. That world diverged from ours in 2008, as the Occupy Wall Street Movement had as a counterpart the Ossify Capitalism movement, and it succeeded in overthrowing capitalism; however, the economy of the world is still a market economy.

A historically important example of the reverse idea, where a person from our world travels into a dystopian instead of a utopian parallel world, is Sarban's *The Sound of His Horn* (Sarban 1952). It is perhaps the first novel dealing with an alternative world where Nazis won World War 2. Escaping from a German prisoner of war camp during World War Two, Alan Querdilion somehow strays to the future of a dreadful world apparently parallel to ours, where the Master Forester Count Johann von Hackelberg is served by slaves bred for the purpose and hunts people.

Perhaps most importantly, science fiction can also show that the discovery of the existence of different sorts of multiverses might have quite dramatic *psychological* impacts and *ethical* consequences, and examine them.

In Larry Niven's quite horrifying story "All the Myriad Ways" (Niven 1968), Detective-Lieutenant Gene Trimble investigates (in a world parallel to ours) an epidemic of apparently unmotivated suicides and crimes. He finds out that they result from the fact that travel between alternate timelines has proven the existence of a multiverse where the universe splits *every time* someone makes a decision. Niven's story proposes that accepting the reality of such a multiverse would lead people to *nihilism*, the view that *it does not ever matter at all* what you decide to do, since your decision is reversed in some world.[39]

The danger of nihilism appears genuine in the case of *some* versions of the Branching Multiverse, including some versions of the Quantum Multiverse, in which *all* human decisions would be taken to be indeterministic.[40] The impact of the theory is made still worse by some rather horrible consequences of this kind of theory of a multiverse.

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[39] The main villain in *Everything Everywhere All at Once* (2022), Jobu Tupaki, is motivated by a similar kind of nihilism caused by the discovery of the existence of this kind of multiverse.

[40] Paradoxically, while Belnap et al. (2021, 8) think that a theory of branching time is in part justified because its form of indeterminism is the only way to preserve genuine agency, others may think that it on the contrary leads to just the kind of lack of agency and nihilism that Niven describes. Here we encounter truly profound and difficult philosophical problems about what agency and freedom even *mean*, which I do not of course have space to deal with in this article.

Such a theory entails that there arise unavoidably an enormous number of very unhappy worlds with lots of suffering and vice, such as worlds where Hitler won (as we have seen graphically depicted by many science fiction authors such as Sarban and Dick).

Some other theories of a multiverse may also lead to nihilism. For example, some forms of the theory of the Cyclic Multiverse – such as already the theory of the Stoics (Long and Sedley 1987, 308-313) – have been argued to lead to the theory of *eternal recurrence.* According to this theory every event is repeated exactly infinitely often. Ironically, this theory would lead to nihilism for an almost opposite reason to that because of which the theory of branching time leads to it, as we could according to it not make any choice except the one we or our counterparts have made before.

Friedrich Nietzsche already famously pointed out[41] the danger of nihilism in this theory (Nietzsche 1914, 48). However, he still found the theory not only plausible but even attractive. Apparently this was because he thought (in my view very dangerously) that *some* sorts of nihilism, *normal and active nihilism* and *nihilism in action* could enhance spiritual strength by helping the strong to reject outdated values (Nietzsche 1914, 21) and (in my view appallingly) that they could strengthen society by inciting the weak and sick to commit suicide (Niezsche 1914, 203-204).

It can also be argued that the theories of the Ultimate Multiverse and the Modal Multiverse lead to the same kind of nihilism as the theory of the Branching Multiverse, as they too claim that every decision is reversed in some world,[42] and to an even worse pessimism; they apparently entail that if a literal hell is at all possible, then even it is real in some universe.

On the other hand all these theories of a multiverse have also highly pleasing consequences. Many theories of branching time entail that if a Utopian society full of human happiness (such as we have seen has been depicted by Wells, Smith, Varoufakis and others) is at all possible, then it is also real in some universe. The theories of the Ultimate Multiverse and the Modal Multiverse apparently even entail that if a literal heaven is at all possible, it is real.

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[41] Nietzsche had an unusual conception of nihilism and its causes, as e.g. Christianity and Platonic philosophy were for him nihilistic ideologies, though their nihilism was not according to him the sort of nihilism he thought good, active nihilism. Nietzsche usually understood nihilism as a *life-denying* ideology. However, nihilism can be more strongly interpreted as a view according to which nothing really matters. Even a radically life-denying view (such as the theories of such pessimistic philosophers as Arthur Schopenhauer, Eduard von Hartmann or Philipp Mainländer in Nietzsche's time – see e.g. Beiser 2016 – or David Benatar currently) differs from this stronger sort of nihilism, as the view holds that something does matter, since it holds that non-existence is objectively better than life. However, it seems to me that many versions of the Quantum Multiverse, the Cyclic Multiverse and the Multiverse of Modal Realism lead to nihilism in the stronger sense of the word.

[42] David Lewis recognized this (in Lewis 1986, 123-128) and tried to respond to an argument against his Modal Realism based on the threat of nihilism by rejecting utilitarianism.

Nevertheless, in view of the danger of nihilism it may be a good thing that there is in reality no definitive proof of the existence of these kinds of multiverses. There are also other kinds of multiverse theories that do not threaten to deprive us of our agency in this way. Even all versions of the Branching Multiverse need not do so, since they need not deny that *many* human decisions are taken to be deterministic. For example, it appears intuitively plausible that decisions where *all* of the decision-maker's *motives* strongly favor one action over other available actions (and no powerful habits contrary to that action influence him) would be deterministic and would not cause the universe to split. Only decisions made between alternatives which are all supported by strong but incompatible motives (e.g. if selfish motives support one action and unselfish ones another) are plausibly indeterministic. Likewise the forms of the theory of the Cyclic Multiverse that have been argued to lead to eternal recurrence have quite strong additional presuppositions, e.g. that space and all forces are finite but time is infinite. These presuppositions can be questioned and have in fact been denied by advocates of the Quilted Multiverse. The theories of the Inflationary Multiverse and the Brane Multiverse in any case need not have such nihilistic consequences. They instead just fascinate us with the greatness of the multiverse they postulate.

The multiverse can most ambitiously be used for cosmological and theological speculation, concerning not just the fate of the lifeless universe but also the ultimate destiny of the human species and other life forms. We have already seen this in the work of Anderson, Blish and Zebrowski; however, it was carried far further already earlier in the work of Olaf Stapledon.[43]

Stapledon's *Star Maker* (Stapledon 1937) is an imaginary history of the whole universe, seen from the viewpoint of a human spirit that is liberated from its body and wanders the cosmos as a disembodied viewpoint, eventually merging with other liberated spirits. Finally at the end of the history of the universe, at the supreme moment of the cosmos, the cosmic spirit, the union of the spirits of all remaining intelligent beings, perceives the Star Maker i.e. God. It then learns that the cosmos whose final culmination it is, is only one of many cosmoses created by the Star Maker, each with its own time. Even more disturbingly, our universe is just a mere prototype for the ultimate cosmos the Star Maker plans to create, and the Star Maker cares little for the people in it.

Stapledon's cosmological speculations then also raise the threat of nihilism. Stapledon's protagonist also confronts it and ultimately finds meaning in two lights for guidance, human community and the "hypercosmical reality, with its crystal ecstasy."

[43] Stapledon did not use the word "multiverse" and spoke of cosmoses instead of universes, but this is irrelevant here.

7. Conclusion

The question whether there is a multiverse, and if there is, of what sort, is then of great importance to our whole worldview and life stance, as it affects even our view of the significance of all our decisions. However, the question is far from easy to answer. There is then a great need for further research into the theory of the multiverse in philosophy and natural science. Science fiction about the multiverse may help to excite interest in such research even in people who are not themselves researchers, and perhaps even to some extent inspire people to become researchers. In return it will get from such research fruitful ideas for stories that can possess aesthetic value even if there is in fact no genuine multiverse.

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