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WHY WORLDS NOW?

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The current surge of interest in imaginary worlds of all stripes has not taken place in a cultural vacuum. Few ideas, if any, have held more fascination for the human mind and have been explored by more disciplines than the possibility that there could be worlds other than the one we live in. In this chapter I will address the question of my title by surveying some of the developments in cosmology, philosophy, and media technology that made the idea of worlds other than our own into the popular concept that it is today.

Cosmology

A convenient way to approach a concept as elusive as that of "world" is to consult the definitions of a respected dictionary and to build on them or amend them. I will therefore start with the *OED* "world" definition:

WORLD

1. The earth.
2. Another planet like the earth.
3. The material universe of all that exists; everything.

The three "world" definitions of the *OED*, by embracing more and more celestial objects, parallel neatly the history of cosmology. The ancient Greeks were divided as to whether there exists one world or many. Aristotle, for instance, claimed that since other worlds would have to be just like our world, "there cannot be more worlds than one".[1] The existence of the sun and of the stars did not disprove this claim, because they were not like the Earth, and could not consequently be regarded as worlds. Aristotle's influence would last through the Middle Ages.

For atomists like Epicurus or Democritus, by contrast, everything that exists is a combination of atoms, and atoms can be combined in an infinite number of ways, resulting in an infinite number of worlds.

Inspired by Christian doctrine, which saw the Earth as the creation of God and its inhabitants as the beneficiaries of salvation, the Middle Ages returned to the belief that there is only one world, and that the center of this world is the Earth. Surrounding the Earth was a qualitatively distinct heavenly realm that contained planets and stars; whereas the Earth was made of four material elements—earth, air, fire, and water—the heavenly realm was made of ether; whereas on the Earth everything was material and mortal, in the heavenly realm everything was eternal and spiritual. The layers of this "great metaphysical onion", as Margaret Wertheim wittily describes it,[2] led from hell, situated at the bottom, inside the Earth, to paradise, situated at the top, where the four elements dissolve into ether. But the surface of the earth was incompletely known, and as medieval texts and cartography demonstrate, faraway regions were believed to be populated with the kind of creatures that we regard today as fantastic. Given the extraordinary variety of life forms believed to be found in the one and only world, there was really no need to imagine other worlds. This may explain why fiction began to be recognized as such (for instance, in Cervantes's *Don Quixote*) only after the earth was circumnavigated and became better known. As exploration made the world smaller, and science replaced myth as mode of knowledge, products of the imagination such as unicorns or one-eyed giants could no longer be seen as denizens of remote regions, and they had to be relocated to other, fictional worlds.

A well-known series of discoveries beginning in the 16th century put an end to the earth-centered cosmology of the Middle Ages: first the discovery that the earth revolves around the sun, rather than the other way around; then the discovery of other planets in the solar system; then the postulation that the sun is just another star in a galaxy; and finally the discovery by Edwin Hubble in the 1920s of other galaxies in the universe. This cosmological expansion led, as Rubenstein notes, to a semantic problem concerning the definition of 'world', a problem that the *OED* solves by proposing three different definitions: "During [the seventeenth century], even the scholars who *did* affirm a 'plurality of worlds' were affirming not a plurality of self-contained systems [such as the solar system] strewn throughout infinite space, but a plurality of inhabited planets, a plurality of suns. 'Worlds,' in other words, became the specific bodies that could be seen through a telescope."[3]

It is in this sense of world as celestial object, functioning as container for a variety of life forms, that the atomists of ancient Greece postulated an infinity of worlds. In modern times, their idea of combinations of atoms has been refined into arrangements of more elementary particles, but the result is numerically the same: today's cosmologists postulate an infinity of worlds because space is infinite (even though in constant expansion), and has room for all possible arrangements of matter. According to theoretical physicist Max Tegmark of MIT, space is in

fact so vast that each possible combination could be realized not just once but an infinite number of times.[4] There could be consequently multiple copies of the earth, and we could have exact doubles, as well as slightly different relatives, somewhere in the universe. Insofar as all the worlds of this cosmological model inhabit the same space-time as ours, and observe the same laws of physics, the copies of the earth could conceivably be visible from our world with a sufficiently powerful telescope, and they could be reachable by super spaceships. The only theoretical limitation to the mutual accessibility of worlds is the impossibility of traveling faster than the speed of light—a limitation that does not bother authors of science fiction. Though it does not contain duplicate celestial objects, the *Star Wars* and *Star Trek* fictional worlds (or universes), with their incessant interstellar and interplanetary travel, are good examples of this cosmological model. The totality of all that exists is, however, not limited to the space-time that contains our earth. According to Tegmark, space-time contains bubbles, due to an irregular stretching of its fabric. When these bubbles burst, a new universe is born. Other physicists, such as Brian Greene, attribute this power of universes to give birth to other universes to black holes or wormholes.[5] Passing through a black hole is an event of such violence that some of the constants of the equations that capture the laws of physics may change, with radical consequences for the new universe. Life, for instance, is possible only within a narrow range of values for the electromagnetic and strong nuclear forces; if these values are changed, life will disappear. Embedded universes may contain a different number of elementary particles than ours, or their space may have a different number of dimensions.

The idea of recursively embedded universes is still pretty tame, compared to a third kind of multiverse regarded by some physicists as a solution to the mysteries of quantum mechanics and derided by others as crazy. It is known as the "many-worlds interpretation of quantum physics". The theoretical need for such a model can be explained by reference to Schrödinger's cat. Schrödinger developed an equation that describes the quantum state of a system as a wave that evolves over time. Because the exact behavior of subatomic particles is unpredictable, Schrödinger's equation has been interpreted as representing a set of probabilities concerning the position of particles, rather than assigning them a precise location. When Schrödinger worked out the mathematical steps necessary to apply the equation to reality, he found out that they included an imaginary number. This could mean that electrons exist in a superposition of states, simultaneously occupying all the positions predicted by the equation. Schrödinger's cat, the victim of a famous thought experiment actually meant to discourage such an interpretation,[6] is consequently both dead and alive, since the nuclear reaction that releases a poison meant to kill him both occurs and does not occur. But no experiment (until recently) shows particles to be in a superposition of states. The standard way to deal with this paradox (known as the Copenhagen interpretation) assumes that the wave function collapses upon observation. Not so, says the many-worlds interpretation: rather than postulating a collapse of the

wave, it postulates a splitting of worlds, so that in world 1 the cat is alive, and the observer sees a live cat, while in world 2 the cat is dead, and the observer sees a dead cat. The act of observation has consequently no effect on the state of the cat. The consequences of this interpretation (inspired by the 1957 Princeton dissertation of Hugh Everett III and defended nowadays by Max Tegmark and David Deutsch[7]) are staggering: new parallel worlds are produced whenever a nuclear reaction takes place, which is basically all the time. In practical terms, this means that every time an alternative presents itself, all of its branches are realized. The consequences of the many-worlds hypothesis have been explored by science-fiction writer Larry Niven in a story titled "All the Myriad Ways".[8] If all possibilities are realized, the story suggests, it is safe to attempt suicide by Russian roulette, because in at least some possible worlds, something will happen and the gambler will survive. In most other worlds he will be dead but he will not know, and what you don't know doesn't hurt you. The many-worlds interpretation of quantum physics (henceforth, type-3 worlds) differs from types 1 and 2 in significant ways. In contrast to type 2, type 3 does not involve any alteration of the laws of physics, though it may be argued that it requires a Hilbert space of infinite dimensions, each world existing in a different spatial frame. In contrast to type 1, type 3 worlds do not coexist within the same space-time, and there is no hope of reaching them by super-fast spaceships. We can imagine the spatiotemporal frames occupied by these worlds as superposed upon one another, but separated by an ontological border that makes them mutually inaccessible. Another major difference between type-1 and type-3 worlds is that type-1 worlds exist independently of each other as different arrangements of matter, but type-3 worlds come into existence by splitting from a common stem. This idea of splitting has important consequences for the problem of transworld identity, since it means that individuals who have copies in different worlds can be manifestations of the same person, linked to one another by counterpart relations. To put this differently: in type 1 it is only a matter of blind luck that there is a person in another world who exactly duplicates all my properties; but in type 3, I and my doubles are the products of different paths forking out from a common situation. We are consequently the offspring of a single ancestor, and our differences correspond to potentialities that were realized in me but not in my counterparts.

Philosophy

My previous section "Cosmology" covered both philosophy and science, because as long as thinking about worlds was purely speculative, cosmology could not be distinguished from philosophy. The development of scientific methods of observation that started in the 16th century did not put an end to speculation, but rather created a split between philosophy and science. Philosophical treatments of the idea of a plurality of worlds run from Leibniz's 18th-century theory of monads to the mid-to-late 20th-century Possible Worlds Theory, though proponents of the latter (e.g., David Lewis) deny any debt to Leibniz. I will therefore pass quickly over Leibniz to deal in more detail with Possible Worlds (PW) theory. Suffice it to say that in his book *Théodicée* (1710), Leibniz argued that God considered all possible worlds, and chose the best one to be actualized, even though this "best possible world" still contains a lot of suffering. There are apparently limitations in the possible arrangements of matter and soul that even God cannot overcome, whether we attribute these limitations to the devil or to the laws of physics. Worth noting is the fact that, in contrast to the scientific theories outlined in the preceding section, Leibniz's vision is a strictly one-world cosmology, since the less perfect worlds are denied existence. "World" must, however, comprise in this case everything that exists, rather than corresponding to a specific celestial object.

Leibniz's distinction between the actualized and the merely possible foreshadows the central tenet of Possible Worlds Theory. PW theory was originally developed by members of the school known as analytic philosophy such as Saul Kripke, David Lewis, and Jaakko Hintikka[9] as a way to solve problems in the attribution of truth values to propositions modified by so-called modal operators (it is possible/impossible/necessary that p; it is indifferent/bad/good that p; p is allowed/prohibited/mandatory) and to counterfactuals (of the type "If Bill Buckner had been able to catch the ball that went between his legs, the Red Soxs would have won the 1986 World series"). While the theory postulates an infinity of worlds, corresponding to ways things could be or could have been, it does not grant equal status to all worlds: one of them is the actual world (AW), while all others are non-actual possible worlds (NAPWs). The truth-value of propositions can be assigned separately for every world of the system. A proposition is necessary when it is true in all worlds, possible when it is true in some worlds but not others, and impossible when it is false in all worlds. Moreover, a proposition that is false in the actual world may be true in a NAPW (for instance, that Darth Vader exists), and vice versa, something that is true in the AW (that Donald Trump exists) may be false in a NAPW, such as the world of *Star Wars*. PW theory intersects to some extent with speech act theory by regarding propositions as speech acts issued in one world concerning either this world or another. Thus when I say "Don Quixote is crazy", I am implicitly talking about the world created by Cervantes, not about the world where I reside, and my speech act may convey a true proposition. But if I utter the same proposition for the actual world, it will be false, since there is no Don Quixote in the AW. On the other hand, when I utter the counterfactual quoted above, I do so to say something about the actual world, namely how close the Red Socks came to winning the 1986 World Series, even though the sentence mentions facts that did not occur (namely the Red Socks winning the World Series). It is because counterfactuals are normally valued for the actual world that the discipline of counterfactual history can yield valuable teachings for our world, rather than being an escape from reality.

The opposition of an actual or real world to merely possible ones is central to PW theory, but the exact nature of actuality is open to debate. Two theories prevail. According to one of them the actual world is the only one that exists independently of the human mind; all others are constructs of the imagination, such as dreams, hallucinations, and fictional stories. In the other interpretation, known as modal realism and defended by David Lewis, all worlds exist absolutely, that is, materially, and the difference between the AW and NAPW is merely a matter of point of view: "actual" is an indexical term, like "I" or "here" or "now," whose reference depends on the speaker. For me the actual world is planet Earth and the cosmic system of which it is a part, but for Darth Vader the actual world is the world of *Star Wars*, and he rightly regards himself as a real person, not as a fictional character. By ascribing autonomous existence to (what we regard as) merely possible worlds, this is to say, by regarding all possible worlds as objectively realized, Lewis's conception of actuality converges with the many-worlds interpretation of quantum phenomena. Indeed, Tegmark cites Lewis in support of type-3 worlds, while Lewis, in the last paper he published (in 2004),[10] grappled with the issue of quantum suicide, arguing that it was not cause for rejoicing but cause for despair because there will always be a world where the suicide candidate destroys half of his brain but unfortunately survives.

The conception of possible worlds as products of the imagination suggests an association of these worlds with those of literary fiction. In the late 1970s, fictionality had been largely ignored by literary scholars, and the only people who regarded it as an interesting problem were representatives of philosophy of language. Among Possible Worlds philosophers, it is, paradoxically, David Lewis, the advocate of the autonomous existence of Possible Worlds, rather than those philosophers who insisted on their mind-dependent nature, who took a decisive step toward the theorizing of fiction. In his 1978 article "Truth in Fiction", Lewis reworked the algorithm he had developed to establish the truth conditions of counterfactuals to the case of statements about fiction, such as "Don Quixote is crazy", without, however, regarding fiction as a form of counterfactual, for fiction is told as true of NAPWs by a narrator situated in these worlds, while counterfactuals are uttered by a speaker located in AW who invokes NAPWs to say something about AW. (The algorithm itself is too complex to be explained in these pages; see Lewis 1978 or Ryan 1991).[11] Lewis's account broke ground in two ways: first, it allowed statements about fiction to be true or false, whereas one-world logicians, such as Bertrand Russell and Gottlob Frege, regarded all statements about non-existing entities (read: entities not existing in our world) to be false or indeterminate; second, it associated the content of fictional texts with "worlds". This move may seem self-evident now that the concept of "world" is largely taken for granted, but it was groundbreaking at a time when fictionality was either ignored, or defined, by John Searle,[12] in purely illocutionary terms (i.e., as a suspension of the rules governing speech acts). The potential of PW theory for narrative fiction has been explored by Umberto Eco, Thomas Pavel, and Lubomír Doležel, though these scholars do not necessarily envision a strict assimilation of the possible worlds of logicians to those of literature.[13]

Media and Technology

Cosmology and philosophy may be part of the cultural background against which the notion of world rose to prominence, but the force that truly explains its current popularity, and most directly answers the question of my title, is the media that bring imaginary worlds into our lives, and the technologies that support these media. To adopt a medial/technological perspective on worlds means that worlds should no longer be defined as "everything that exists", as they are defined in the cosmological and philosophical perspective, but should rather be conceived in cognitive or phenomenological terms. "My world", in this sense, is a habitat or environment (German: *Umwelt*) that supports me and that corresponds to my experiential horizon. This phenomenological conception of world rests on two properties: insofar as they surround me, worlds are immersive; insofar as I can reach out to them, use the objects that furnish them, communicate with the people who populate them, and perhaps even change them, they are interactive. If the purpose of media is to simulate as perfectly as possible our experience of the real world (a purpose Bolter and Grusin describe as "achieving the real",)[14] then creating immersive interactive environments should be the Holy Grail of media technology. In the 1990s, the developers of virtual reality (VR) technology openly endorsed this goal.

The immersive power of imaginary worlds is primarily due to the designer's artistry, but the choice of medium also plays a role in creating immersive worlds. Among the factors that contribute to immersion is the size of a world, because a vast world gives the user ample time to settle mentally into it, and because it can offer a large field of characters, landscapes, and events to the imagination. It is indeed much easier to immerse oneself in a large novel than in a short story, because in the short story, as soon as the world is mentally constructed, the tale comes to an end and the reader is expelled. Among the media that contribute to extension is the written word itself, as opposed to oral storytelling. Oral storytelling can certainly build large worlds (let's remember that the *Iliad* and *Odyssey* originated as oral epics), but it does so through an aggregation of autonomous, relatively short stories or episodes, while writing can build narratives of any complexity and worlds of any size, leaving it to the reader to decide how much time to spend in the world in one setting. This ability to build large worlds is also found in television, as opposed to film and drama. While the duration of film and drama is limited to what spectators can absorb in one session, television produces serials that can span many seasons, keeping spectators in a state of suspense that may last for whole weeks, and creating an addiction to the world of the show. The movie industry tries to emulate this addiction by turning popular films into franchises with endless sequels and prequels. Another way in which media can contribute

to immersion is the involvement of multiple senses in the apprehension of the represented world, an involvement that emulates our perception of reality. The history of media can indeed be written as the story of ever-expanding sensory dimensions. Purely verbal world representation does not offer data to the senses, but by speaking to the imagination, language allows the mental simulation of all sensory experiences. Other media can transform this imaginative experience into actual perception. Illustrations, made possible by advances in reproduction technology, added a concrete visual dimension to literary worlds; then film contributed movement and sound to images, and digital technology made multisensory representations accessible to touch, either indirectly, through fingers manipulating keyboards, joysticks, and touch-screens, or directly, through the haptic-feedback controllers used by video games.

By making the display of imaginary worlds dependent on the movements of a cursor or of the body, media also take a major step toward interactivity, the second of the properties that define our relation to the real world. Perhaps the single most important contribution of digital technology to world creation is the design of *playable* worlds. The majority of pre–computer age games took place on abstract playfields (an exception was the illustrated game boards for variants of the game Chutes and Ladders), and the game goals were only made desirable by conventional rules. Thanks to the graphic abilities of digital systems, games became able to deploy concrete worlds to the player, and the conventional goals were replaced with states that people would actually want to achieve, given the right circumstances. Rescuing princesses from dragons in a video game may seem at first sight conventional, but compared to kicking a ball into a net or aligning three pegs on a line (as in tic-tac-toe) it is a practically meaningful action leading to an inherently rewarding state. The shift from abstract playfield and conventional goals to concrete, surrounding worlds where one performs simulations of meaningful activities explains the enormous popularity of computer games. Video games not only engage our strategic or muscular abilities, as do board games and sports games, they can also engage the narrative imagination. While single-player video games allowed people to perform actions in visually rendered worlds, MUDs and MOOs made it possible for players to meet, communicate, impersonate characters, and create objects in a purely language-based environment. The two trends came together in MMORPGs, where players not only fulfill pre-scripted quests that move them up through the levels of the game, but also identify with avatars, form communities, build objects, and through all these activities, co-create virtual worlds. Active participation in imaginary worlds has in fact become so important to audiences that even when the medium does not allow real interaction, as is the case with novels and films, people may participate spontaneously in the world's creation through external contributions such as fan fiction, art and videos, or through the games of make-believe of cosplay events. Any immersive world can be made interactive by dedicated fans.

Conclusion

Why worlds now? We can understand "now" in two ways. In the first sense, "now" suggests a break with the past, an intense timeliness, and what needs to be explained (if the assumption is correct) is why people are currently more attracted to imaginary worlds than they were previously. But "now" can also be understood as "still now". In this second sense, imaginary worlds have always been important to the human mind, and what needs to be explained is their enduring appeal.

Let's start with the first interpretation. It is safe to say that (almost) all of us love imaginary worlds, though we differ widely in how close we want these worlds to be to what J. R. R. Tolkien called the Primary World. Yet while lovers of realistic worlds remain legion, it is nowadays the remote worlds of fantasy, science fiction, and online games that attract the largest number of visitors and that monopolize the headlines. This phenomenon can be explained in either negative or positive terms. The negative explanation is epitomized by the title of Jane McGonigal's 2011 book, *Reality Is Broken*.[15] According to Edward Castronova, the sorry state of reality is causing an *Exodus to the Virtual World* (i.e., the world of online games).[16] Similarly, Michael Saler regards the appeal of fantasy worlds in the late 19th and 20th centuries as a reaction to the "discourse of disenchantment" that, according to Max Weber, permeated 20th-century thought, a discourse that reflects "the loss of the overarching meaning, animistic connections, magical orientations, and spiritual explanations that had characterized the traditional world, as a result of the ongoing 'modern' process of rationalization, secularization, and bureaucratization".[17]

The negative arguments must, however, be counterbalanced by an account of what makes fantasy worlds more pleasurable to so many people than close relatives of the Primary World. In this age of ubiquitous images, fantasy worlds are visually more attractive than realistic worlds. They are the product of a gift of invention that has too long been ignored by literary critics, who tend to privilege writing skills over the art of world-creation. And finally, most fantasy worlds implement reassuring, through stereotypical archetypal plots in which the good guys always triumph over the bad guys after being tested to their limits. Suffering is part of life, these narratives tell us, but it is never in vain. The comforting pattern of reward for hard work also dominates the virtual worlds of games. Jane McGonigal, trying to explain why *World of Warcraft* (2004) is so popular, mentions the following: in *WoW* your "work" (the term she actually uses) is productive; you see immediate results (the world is changed when you complete a quest); you steadily improve yourself by taking on harder and harder tasks; your goals are always clear since they are given by the game; so is the sequence of steps you have to take: you face tasks, not problems.[18] There is no room for experimentation or creativity in these explanations, and it is no surprise that McGonigal describes only "level-up" game worlds, not worlds such as *Second Life* (2003) that provide no guidelines, but allow a much freer expression of individuality and creativity. McGonigal defuses accusations of escapism by arguing in favor of gamification, a process reminiscent of Pollyanna's Glad Game that

aims at improving our lives by turning everyday repetitive tasks into exciting games. Castronova, similarly, suggests that gamification will ultimately lead to the improvement of the Primary World by teaching design principles that erase the distinction between work and play.[19] Game worlds are designed for pleasure, he tells us, let's do the same thing with the real world. The optimism of this message is, however, dampened by the fact that the design of the Primary World is only partly under human control, since this world is given to us rather created by the imagination.

In support of the second interpretation of "now", Brian Boyd, a literary scholar who adopts an evolutionary perspective,[20] would probably say that the convergence of games and worlds that we observe today is the natural consequence of an adaptive development that first gave us play, and then out of play (more precisely out of pretend-play) gave us art, storytelling, fiction, and world-making (not necessarily in that order). The most tangible advantage of play, art, and fiction, according to Boyd, is their reliance on counterfactual thinking. Imagining ways things might be or might have been is indeed essential to planning future action or evaluating past ones. It extends our mental horizon beyond the here and now and opens possible worlds to the mind. When people start engaging with these worlds for their own sake, rather than subordinating them to utilitarian concerns, art, storytelling, fiction, and game worlds come into existence. It remains, however, to be decided whether these pursuits are themselves adaptations, bringing to the human race advantages that go beyond the benefits of counterfactual thinking, or whether they are the by-products of the more fundamental ability to imagine alternative scenarios, as Steven Pinker would argue.[21] One way or another, our present fascination with imaginary worlds has deep roots in human evolution.

Notes

1 As quoted by Mary-Jane Rubenstein in *Worlds without End: The Many Lives of the Multiverse*, New York: Columbia University Press, 2014, page 33.
2 Margaret Wertheim, *The Pearly Gates of Cyberspace: A History of Space from Dante to the Internet*, New York: W.W. Norton, 1999, page 54.
3 Rubenstein, *Worlds without End*, 2014, page 108.
4 Max Tegmark, "Parallel Universes", *Scientific American*, May 2003, pages 40–51.
5 Brian Greene, *The Elegant Universe*, New York: Random House, 1999.
6 Marie-Laure Ryan, "Narrative/Science Entanglements: On the Thousand and One Literary Lives of Schrödinger's Cat," *Narrative* 19.1, 2011, pages 171–86.
7 David Deutsch, *The Fabric of Reality: The Science of Parallel Universes—and Its Implications*, London: Penguin, 1997.
8 Larry Niven, "All the Myriad Ways" in Larry Niven, *All The Myriad Ways*, New York: Ballantine Books, 1971, pages 1–11.
9 See Saul Kripke, "Semantical Considerations on Modal Logic", *Acta Philosophica Fennica* 16, 1963, pages 83–94; David Lewis, *Counterfactuals*, Cambridge, England: Cambridge University Press, 1973; and Jaakko Hintikka, "Exploring Possible Worlds" in Sture Allén, editor, *Possible Worlds in Humanities, Arts and Sciences. Proceedings of Nobel Symposium 65*, Berlin, Germany: de Gruyter, 1989, pages 52–73.

10 David Lewis, "How Many Lives Has Schrödinger's Cat?", *Australasian Journal of Philosophy* 82(1), 2004, pages 3–22.
11 See David Lewis, "Truth in Fiction," *American Philosophical Quarterly* 15, 1978, pages 37–46; and Marie-Laure Ryan, *Possible Worlds, Artificial Intelligence and Narrative Theory*, Bloomington, Indiana: University of Indiana Press, 1991.
12 John Searle, "The Logical Status of Fictional Discourse", *New Literary History* 6, 1975, pages 319–32.
13 See Umberto Eco, *The Role of the Reader: Explorations in the Semiotics of Texts*, Bloomington, Indiana: Indiana University Press, 1984; Thomas Pavel, *Fictional Worlds*, Cambridge, Massachusetts: Harvard University Press, 1986; and Lubomír Doležel, *Heterocosmica: Fiction and Possible Worlds*, Baltimore, Maryland: Johns Hopkins University Press, 1998.
14 Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media*, Cambridge, Massachusetts: The MIT Press, 1999.
15 Jane McGonigal, *Reality is Broken: Why Games Make Us Better and How They Can Change the World*, London: Penguin, 2011.
16 Edward Castronova, *Exodus to the Virtual World: How Online Fun Is Changing Reality*, New York: Palgrave Macmillan, 2007.
17 Michael Saler, *As If: Modern Enchantment and the Literary Prehistory of Virtual Reality*, Oxford, England: Oxford University Press, 2012, page 8.
18 Jane McGonigal, *Reality Is Broken*, 2011, pages 52–63.
19 Edward Castronova, *Exodus to the Virtual World: How Online Fun Is Changing Reality*, New York: Palgrave Macmillan, 2007.
20 Brian Boyd, *On the Origin of Stories: Evolution, Cognition, and Fiction*, Cambridge, Massachusetts: Belknap Press of Harvard University Press, 2009.
21 Steven Pinker, *How the Mind Works*, New York: W.W. Norton, 1997.