INFINITE REALITY

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INTRODUCTION

"Right now, we're inside a computer program?"

With that monotone query, a very confused Neo, played by Keanu Reeves in the blockbuster film *The Matrix*, convinces hundreds of millions of viewers that virtual reality could be so real that people have no idea they are actually living in a simulation. Of course, *The Matrix* is just a movie, but brain science supports many of the ideas of the Wachowski brothers, who wrote, directed, and produced the film.

The brain often fails to differentiate between virtual experiences and real ones. The patterns of neurons that fire when one watches a three-dimensional digital re-creation of a supermodel, such as Giselle or Fabio, are very similar—if not identical—to those that fire in the actual presence of the models. Walking a tightrope over a chasm in virtual reality can be a terrifying ordeal even if the walker knows it's virtual rather than physical.

People interact via digital stimuli more and more. According to a recent study by the Kaiser Family Foundation, kids spend eight hours per day on average outside of the classroom using digital media. This translates to billions of hours per week. People interact with virtual representations in just about every facet of life—business transactions, learning, dating, entertainment, even sexual relationships. Online dating, which used to be somewhat stigmatizing, is now normative. Young adults consider their Facebook friends just as important as the people who live close enough to meet physically. In the world of online games and virtual worlds, millions of players spend over twenty hours each week "wearing" avatars, digital representations of themselves. Strikingly, the average age of these players is not fifteen but twenty-six. Household "console" video arenas, especially games, in which people control and occupy avatars, consume more hours per day for kids than movies and print media combined. To borrow a term from the new vernacular, virtual experiences are spreading virally.

Technological developments powering virtual worlds are accelerating, ensuring that virtual experiences will become more *immersive* by providing sensory information that makes people feel they are "inside" virtual worlds. In the United States, Nintendo's Wii, often coupled with a huge high-definition television, populates many living rooms. The players' physical actions are transformed into virtual body movements in the game. By the time you read this, Nintendo's Wii, Microsoft's Kinect, and Sony's PlayStation Move may incorporate 3-D displays. Virtual experiences are no longer embodied just by hunting and pecking on a keyboard or using a joystick: digital characters now move in tandem with players as they jump around, point guns, and swing racquets, golf clubs, and baseball bats.

Stereo, 3-D visual media technology—which not that long ago was only available to scientists and people using View-Masters—

promises to change the film, television, and game industry. Movie theaters entice audiences willing to pay a few extra dollars for 3-D glasses to watch blockbuster films. The game and television industry are promoting 3-D monitors to every household. The popular sports network ESPN even broadcasts in 3-D.

Although we aren't yet "jacking in" to the virtual world via a plug in the back of our head, as Neo did in *The Matrix*, digital media are providing more realistic experiences and not just for humans. Ten years ago, most household pets ignored television. Today, high-definition television transfixes, thrills, and sometimes enrages dogs and cats as they watch the fare on the Animal Planet network. They simply do not differentiate the digital image from reality.

This leads to an interesting proposition—the brain doesn't much care if an experience is real or virtual. In fact, many people prefer the digital aspects of their lives to physical ones. Imagine you never aged, could shed pounds of cellulite, or put on muscle mass at the touch of a button. Think about never having a bad-hair day, expressing an involuntary grimace, or getting caught staring. Think also about a world with no putrid smells but plenty of delightful ones, when it rains only when you are inside, and where global warming is actually just a myth. In this world, your great-grandfather is still around and can play catch with your six-year-old daughter. There is no dental drill or swine flu in this place.

But there are consequences to people occupying idealized digital worlds. This quandary is thematic in James Cameron's film *Avatar*, which took in more money than any prior film in United States history. In it, Jake Sully, a paraplegic soldier confined to a wheelchair, dons a virtual body of a member of another species, the Na'vi, on a distant planet. With avatar arms and legs, as well as a tail, he runs through jungles and swings through trees. He even falls in love.

On the one hand, *Avatar* depicts many wonderful aspects of vir-

tual reality. In the natural world, physically disadvantaged people are denied many behaviors that most take for granted. In the virtual world, people can choose whether their avatars have fully functioning bodies, regardless of their physical condition. One of the most popular virtual worlds, *Second Life*, has a higher proportion of physically challenged users than the general population, allowing them to shed any stigmatization they experience in the physical world. Paraplegics can not only walk and run again, but actually can fly through the air or teleport themselves thousands of (virtual) miles in an instant.

On the other hand, Jake learns that wearing his Na'vi avatar has emotional consequences. He is a human being at the beginning of the movie, but as he spends more and more time wearing his giant blue alien avatar, he loses his humanity. By the end of the film, Jake's psychological bond with his avatar is so strong that he abandons his ties to the human race.

Avatar's fiction is supported by science: dozens of psychological experiments have shown that people change after spending even small amounts of time wearing an avatar. A taller avatar increases people's confidence, and this boost persists later in the physical world. Similarly, a more attractive avatar makes people act warm and social, an older avatar raises people's concern about saving money, and a physically fit avatar makes people exercise more.

Outside of scientific laboratories, avatars can be a matter of life or death. On the positive side, an avatar can be immortal. Consider the case of Orville Redenbacher, who is still the spokesperson for the popcorn company, even though he passed away years back. Using video footage from commercials starring Mr. Redenbacher, advertisers were able to construct a digital model that looks just like him and can be animated to perform any action imaginable. So the popular spokesperson is now "acting" in new advertisements from beyond

the grave. There are commercial services today that will "immortal-ize" anyone who would like their avatars created and stored.

On the negative side, avatars can be sources of trauma. Con-sider the horrific case of a thirteen-year-old girl who committed suicide when she found out the "boy" with whom she interacted online wasn't who she thought he was. He was a fictional character created by others, who planned to hurt her feelings. She formed a strong attachment to the online persona. When she discovered he was fictional, she was devastated. In a less tragic but still disturbing event, in the early days of the Internet, there was a well-known rape case in cyberspace, in which one online user, via text, violated another in a virtual chat room. The victim, while physically un-harmed, was traumatized.

Avatars also have the distinction of being completely anonymous but inherently "trackable." One can wear an avatar of any gender, age, race, species, or shape, and via the avatar, it is possible to meet others in virtual spaces without them having a clue about one's physi-cal attributes and identity. On the other hand, any time people use the Internet, they leave a record behind (think "cookies" on Web browsers). Similarly, but in much greater detail, any time people enter a virtual space, they leave "digital footprints"—all the data the computer automatically collects: for example, speech, nonverbal be-havior, and location. This footprint can be used (and, in fact, is being used) by military and other government agencies to detect identity. In essence, while one can hide behind an avatar of a different name, the footprint still can give him away.

IN 1938, A CAREFULLY CRAFTED RADIO BROADCAST CAUSED MIL-lions of people to question their ability to differentiate the real from the virtual. Many of these listeners experienced emotions far worse

than doubt and confusion—they were terrified. Orson Welles, via radio broadcast, presented a highly realistic, news-style depiction of an alien invasion in an adaptation of the novel *The War of the Worlds*. Though the program was intended as entertainment, those who had not heard the lead-in to the show thought the broadcast was an actual newscast. So many people panicked and fled in their cars that highways were flooded with traffic. Others aimed their rifles and shot at water towers that resembled spacecraft, or wrapped towels around their heads to protect themselves from potential alien mind-control. Even scientists were fooled. Several geologists rushed to the alleged scene in New Jersey to examine the fallen meteorites surrounding the alien craft. In sum, a well-crafted virtual story galvanized a large population.

The *War of the Worlds* calamity highlights why today's virtual revolution is particularly potent. In 1938, there was a clear distinction between media producers and media consumers. In order for *The War of the Worlds* to reach people's homes, corporate support was required. The show's producer, CBS, was one of the very few organizations that had access to airwaves. Because only a handful of program directors decided what types of stories would be broadcast, maintaining rational control over media content was possible—though not foolproof, as the broadcast's hysteria proved.

Contrast that with today's world, in which consumers are also media producers. Try to find a college student without an elaborately constructed Facebook profile. It won't be easy. Students constantly update photographs and diary entries for the world to see. Similarly, YouTube videos, produced by anyone with a Web connection and a digital camera, can receive worldwide attention just hours after being produced. The people who use the Web also shape the content of the Web. Sometimes those people become multimillionaires—for example, the creators of the game *Farm-*

Ville, a simple Facebook app that may have more farmers than the planet does.

We sit on the cusp of a new world fraught with astonishing possibility, potential, and peril as people shift from face-to-face to virtual interaction. If by "virtual" one means "online," then nearly a third of the world's population is doing so already. More than 300 million Web sites and numerous online applications, including e-mail, chat rooms, video conferencing, computer games, and social networking, keep over a quarter of the world's nearly 7 billion humans busy—in some cases, obsessively—interacting virtually. Users average three hours per day online. In countries like South Korea, the average is much higher. Digital interactions among people are becoming ubiquitous at work and play. The vice president of Digital Convergence at IBM—that they have one is notable—predicted that all of their employees will have avatars in five years. Some projections claim that 80 percent of active Internet users and Fortune 500 enterprises will have a *Second Life* presence in the not-too-distant future.

If present growth rates hold, the number of Internet users worldwide could triple in four years, as will their time spent online, with the largest growth occurring outside of the Western world. Certainly, more and more people benefit from virtual interaction every day, which suggests a tipping point will be crossed, as popular social venues move from physical to the digital worlds. We are at the early stages of a dramatic shift in "cyber-existence"—think of it as the difference between 2-D and 3-D, between the merely interactive and the fully immersive.

IN THIS BOOK, WE PROVIDE AN ACCOUNT OF HOW VIRTUAL REALITY is changing human nature, societies, and cultures as we know them. Our goal is to familiarize readers with the pros and cons of the brave

new world in which we live. We explore notions of consciousness, perception, neuroscience, media technology, social interaction, and culture writ large, as they pertain to virtual reality—and vice versa. We are writing for a wide range of readers—science lovers, futurists, and, most important, anyone who has a sense, somewhere in the back of their minds, that the world is changing radically as more and more of life unfolds digitally. It's thrilling, exciting, and scary all at once.

This book aims to indulge the reader's curiosity not only for whatever is just around the corner virtually, but also for the distant future. Although we sometimes use science fiction to provide colorful examples, this book is grounded in scientific theory and empirical research (much of which we conducted ourselves).

Disruptive as it may seem, the shift to an ever more virtual world—of which the Internet was only one step—may be something close to inevitable, given how humans are wired neurophysiologically. Driven by imaginations that have long sought to defy the sensory and physical constraints of physical reality, humans continuously search for new varieties and modes of existence, only this time we're doing it via the supposedly cold machinery of digital space.