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## 6

### Our Split Screens

Sherry Turkle

Computers influence our thinking about life and mind. They may do this quite directly. Research in artificial intelligence and artificial life explicitly tries to build machines that model the human mind and processes of evolution. Computational media also influence our thinking through their presence in everyday life. They are betwixt and between categories, animate yet not alive, thoughtful but not conscious, capable of intelligent reasoning but not (yet) minds. As boundary objects, they have a particular vocation as "objects-to-think-with." As almost-psychological machines, computational objects are evocative. When we interact with computers, when we project ourselves into the worlds they offer, the machines provoke reflection on self, life, and mind. In this sense, life on the screen brings philosophy into everyday life.<sup>1</sup>

These days, we are actors in a wide variety of computational landscapes—for example, we put ourselves in the virtual spaces of simulation games and create representations of ourselves in virtual communities on the Internet. Such involvements have complex "identity effects." At the same time that our "lives on the screen" facilitate an increased fluidity of identity play, we are immersed in simulations whose underlying mechanisms we do not understand and that may encourage us to see the world in simpler rather than more complex terms.

#### VIRTUAL PERSONAE ENTER THE HUMAN LIFE CYCLE

##### Cycling Through

In cyberspace, as is well known, the body is represented by one's own textual description, so the obese can be slender, the beautiful plain. The fact



that self-presentation is written in text means that there is time to reflect upon and edit one's "composition," which makes it easier for the shy to be outgoing, the "nerdy" sophisticated. The relative anonymity of life on the screen—one has the choice of being known only by one's chosen "handle" or online name—gives people the chance to express often unexplored aspects of the self. Additionally, multiple aspects of self can be explored in parallel. Providers of online services offer their users the opportunity to be known by several different names. For example, it is not unusual for someone to be BroncoBill in one online context, ArmaniBoy in another, and MrSensitive in a third.

In the early 1990s, I studied a form of networked software known as MUDs (short for Multi-User Dungeons or Multi-User Domains). Using this software, people log in from all over the world, each at his or her individual machine, to join online virtual communities that exist only through and in the computer. MUDs are social virtual realities in which hundreds of thousands of people participate. The key element of "MUDding," the creation and projection of a "personae" into a virtual space, also characterizes simpler online communities such as bulletin boards, newsgroups, and "chat" rooms. MUDs may seem exotic, but they embody the general social and psychological dynamics of online life.<sup>2</sup>

When you join a MUD, you create a character or several characters, and you specify their genders and other physical and psychological attributes. Other players in the MUD can see this description. It becomes your character's self-presentation. In traditional role playing games in which one's physical body is present, one steps in and out of a character; MUDs, in contrast, offer a parallel life. Often, players on MUDs and the most avid participants in online life are people who work with computers all day at their "regular" jobs. As they play on MUDs, they may periodically put their characters to "sleep," remaining logged on to the game but pursuing other activities. From time to time, they return to the game space. In this way, they break up their work days and experience their lives as a "cycling through" between the real world and a series of simulated ones. The experience of "cycling through" is not limited to MUDs. One IRC (Internet Relay Chat) participant describes her experience of online talk: "I go from channel to channel depending on my mood. . . . I actually feel a part of several of the channels, several conversations. . . . I'm different in the different chats. They bring out different things in me." Identity play can happen by changing names and by changing places.

The "cycling through" behavior we see in virtual communities is made possible by the existence of what have come to be called "windows" in modern computing environments. Windows are a way of working with a computer that makes it possible for the machine to place you in several contexts at the same time. As a user, you are attentive to only one of the windows on

your screen at any given moment, but in a certain sense, you are a presence in all of them at all times. You might be writing a paper in bacteriology and using your computer in several ways to help you: You are "present" to a word-processing program on which you are taking notes and collecting thoughts; you are "present" to communications software that is in touch with a distant computer for collecting reference materials; and you are "present" to a simulation program that is charting the growth of bacterial colonies when a new organism enters their ecology. Each of these activities takes place in a "window" and your identity on the computer is the sum of your distributed presence.

The development of the windows metaphor for computer interfaces was a technical innovation motivated by the desire to get people working more efficiently by "cycling through" different applications, much as time-sharing computers cycle through the computing needs of different people. But in practice, windows have become a potent metaphor for thinking about the self as a multiple, distributed, "time-sharing" system. The self is no longer simply playing different roles in different settings, something that people experience when, for example, one wakes up as a lover, makes breakfast as a mother, and drives to work as a lawyer. The life practice of windows is of a distributed self that exists in many worlds and plays many roles at the same time.

This notion of the self as distributed and constituted by a process of "cycling through" undermines many of our traditional notions of identity. Identity, after all, from the Latin *idem*, literally refers to the sameness between two qualities. On the Internet, however, one can be many and usually is. If traditionally, identity implied oneness, life on today's computer screen implies multiplicity, heterogeneity, and fragmentation.

When people adopt an online persona they cross a boundary into highly charged territory. Some feel an uncomfortable sense of fragmentation, some a sense of relief. Some sense the possibilities for self-discovery, even self-transformation. I have been studying people in the process of creating online personae since the early 1990s. They are able to articulate how the very process is personally evocative. A twenty-six-year-old graduate student in history says, "When I log on to a new MUD and I create a character and know I have to start typing my description, I always feel a sense of panic. Like I could find out something I don't want to know." A woman in her late thirties who just got an account with America Online (AOL) used the fact that she could create five account "names" as a chance to "lay out all the moods I'm in—all the ways I want to be in different places on the system." Another named one of the accounts after her yet-to-be-born child: "I got the account right after the amnio, right after I knew it would be a girl. And all of a sudden, I wanted that little girl to have a presence on the Net, I wrote her a letter and I realized I was writing a letter to a part of me." A twenty-year-old undergraduate says, "I am always very self-conscious when I create a new



character. Usually, I end up creating someone I wouldn't want my parents to know about. It takes me, like, three hours." In these ways and others, many more of us are experimenting with multiplicity than ever before.

#### A Case Study of a Life on the Screen

"Case" is a 34-year-old industrial designer happily married to a female coworker. Case describes his RL (short for "real life") persona as a "nice guy," a "Jimmy Stewart type like my father." He describes his outgoing, assertive mother as a "Katherine Hepburn type." For Case, who views assertiveness through the prism of this Jimmy Stewart/Katherine Hepburn dichotomy, an assertive man is quickly perceived as "being a bastard." An assertive woman, in contrast, is perceived as being "modern and together." Case says that although he is comfortable with his temperament and loves and respects his father, he feels he pays a high price for his low-key ways. In particular, he feels at a loss when it comes to confrontation, both at home and at work. Online, in a wide range of virtual communities, Case presents himself as females to whom he refers as his "Katherine Hepburn types." These are strong, dynamic, "out there" women. They remind Case of his mother who "says exactly what's on her mind." He tells me that presenting himself as a woman online has brought him to a point where he is more comfortable with confrontation in his RL as a man. Additionally, Case has used cyberspace to develop a new model for thinking about his mind. He thinks of his Katherine Hepburn personae as various "aspects of the self." His online life reminds him of how Hindu gods could have different aspects or subpersonalities, or avatars, all the while being a whole self.

Case's inner landscape is very different from those of a person with multiple personality disorder. Case's inner actors are not split off from each other or his sense of "himself." He experiences himself very much as a collective whole, not feeling that he must goad or repress this or that aspect of himself into conformity. He is at ease, cycling through from Katherine Hepburn to Jimmy Stewart. To use the psychoanalyst Philip Bromberg's language, online life has helped Case learn how to "stand in the spaces between selves and still feel one, to see the multiplicity and still feel a unity." To use the computer scientist Marvin Minsky's language, Case feels at ease cycling through his "society of mind," a notion of identity as distributed and heterogeneous.<sup>3</sup> Identity, from the Latin *idem*, has been typically used to refer to the sameness between two qualities. On the Internet, however, one can be many and usually is.

Most recently, Ray Kurzweil, inventor of the Kurzweil reading machine and artificial intelligence researcher, has created a virtual alter ego: a female rock star named Ramona. Kurzweil is physically linked to Ramona. She moves when he moves; she speaks when he speaks (his voice is electroni-

cally transformed into that of a woman); she sings when he sings. What Case experienced in the relative privacy of an online virtual community, Kurzweil suggests will be standard identity play for all of us. Ramona can be expressed "live" on a computer screen as Kurzweil performs "her" and as an artificial intelligence on Kurzweil's web site.

In Western thinking about the self, "multiplicity" is a term that carries with it several centuries of negative associations; contemporary theorists are having an easier time with descriptions of multiplicity that stress the virtue of flexibility. We see this in the work of such authors as Kenneth Gergen, Emily Martin, and Robert Jay Lifton.<sup>4</sup> The essence of the "acceptable," flexible self is not unitary, nor are its parts stable entities. A person cycles through its aspects and these are themselves ever-changing and in constant communication with each other. The philosopher Daniel Dennett speaks of the flexible self in his "multiple drafts" theory of consciousness. Dennett's notion of multiple drafts is analogous to the experience of several versions of a document open on a computer screen where the user is able to move between them at will. Knowledge of these drafts encourages a respect for the many different versions while it imposes a certain distance from them.<sup>5</sup> The historian and theorist Donna Haraway, picking up on this theme of how a distance between self states may be salutary, equates a "split and contradictory self" with a "knowing self." She is optimistic about its possibilities: "The knowing self is partial in all its guises, never finished, whole, simply there and original; it is always constructed and stitched together imperfectly; and *therefore* able to join with another, to see together without claiming to be another."<sup>6</sup> What most characterizes Dennett's and Haraway's models of a knowing self is that the lines of communication between its various aspects are open. The open communication encourages an attitude of respect for the many within us and the many within others.

#### Screen Identities as Objects-To-Think-With

I first met notions of "decentered" identity, most notably that there is no such thing as "the ego"—that each of us is a multiplicity of parts, fragments, and desiring connections—in the intellectual hothouse of Paris in the mid 1970s. These ideas presented the world according to such authors as Jacques Lacan, Gilles Deleuze, and Félix Guattari. At the time that I met these ideas, my "French lessons" remained abstract exercises. These theorists of poststructuralism spoke words that addressed the relationship between mind and body, but from my point of view had little to do with my own.<sup>7</sup>

In my lack of personal connection with these ideas, I was not alone. To take one example, for many people it is hard to accept any challenge to the idea of an autonomous ego. While in recent years, many psychologists, social theorists, psychoanalysts, and philosophers have argued that the self



should be thought of as essentially decentered, the normal requirements of everyday life exert strong pressure on people to take responsibility for their actions and to see themselves as unitary actors. This disjuncture between theory (the unitary self is an illusion) and lived experience (the unitary self is the most basic reality) is one of the main reasons why multiple and decentered theories have been slow to catch on—or when they do, why we tend to settle back quickly into older, centralized ways of looking at things.

When twenty years later, I first used my personal computer and modem to join online communities, I had an experience of this theoretical perspective that brought it shockingly down to earth. I used language to create several characters. My actions were textual—my words made things happen. I created selves that were made of and transformed by language. And in each of these different personae, I was exploring different aspects of my self. The notion of a decentered identity was concretized by experiences on a computer screen. In this way, cyberspace became an object to think with for thinking about identity. In cyberspace, identity was fluid and multiple, a signifier no longer clearly points to a thing that is signified, and understanding is less likely to proceed through analysis than by navigation through virtual space.

Appropriable theories, ideas that capture the imagination of the culture at large, tend to be those with which people can become actively involved. They tend to be theories that can be “played” with. So one way to think about the social appropriability of a given theory is to ask whether it is accompanied by its own objects-to-think-with that can help it move beyond intellectual circles.

For example, the popular appropriation of Freudian theory had little to do with scientific demonstrations of its validity. Freudian theory passed into the popular culture because they offered robust and down-to-earth objects-to-think-with. The objects were not physical but almost-tangible ideas such as dreams and slips of the tongue. People were able to play with such Freudian “objects.” They became used to looking for them and manipulating them, both seriously and not so seriously. And as they did so, the idea that slips and dreams betray an unconscious started to feel natural.

In Freud's work, dreams and slips of the tongue carried the theory. Today, life on the computer screen carries theory. People decide that they want to interact with others on a computer network. They get an account on a commercial service. They think that this will provide them with new access to people and information, and of course it does. But it does more. When they log on, they may find themselves playing multiple roles; they may find themselves playing characters of the opposite sex. In this way they are swept up by experiences that enable them to explore previously unexamined aspects of their sexuality or that challenge their ideas about a unitary self. The instrumental computer, the computer that does things *for* us, has another side.

It is also a subjective computer that does things *to* us—to our view of our relationships, to our ways of looking at our minds and ourselves.

Online experiences with “parallel lives” are part of the significant cultural context that supports new ways of theorizing about nonpathological, indeed healthy, multiple selves.

### “Dr. Sherry”

There is another sense in which life online can challenge our sense of identity. This was dramatized for me when one day on a MUD, I came across a reference to a character named “Dr. Sherry,” a cyber-psychotherapist who has an office in the rambling house that constitutes this MUD's virtual geography. There, I am informed, Dr. Sherry administers questionnaires and conducts interviews about the psychology of MUDding. I have every reason to believe that the name “Dr. Sherry” refers to my fifteen-year career as a student of the psychological impact of technology. But I didn't create this character. Dr. Sherry is me but she is not mine. On the MUD, my character has another name—and does not give out questionnaires or conduct interviews. Dr. Sherry is a character name someone else created in order to quickly communicate an interest in a certain set of questions about technology and the self. I experience Dr. Sherry as a little piece of my history spinning out of control. I try to quiet my mind—I tell myself that surely one's books, one's public intellectual persona, are pieces of oneself in the world for others to use as they please. Surely this virtual appropriation is flattering. But my disquiet continues. Dr. Sherry, after all, is not an inanimate book, an object placed in the world. Dr. Sherry is a person, or at least a person behind a character who is meeting with others in the world. Well, in the MUD world at least.

I talk my disquiet over with a friend who poses the conversation-stopping question: “Well, would you prefer if Dr. Sherry were a ‘bot’ [an intelligent computer program that roams cyberspace] trained to interview people about life on the MUD?” This had not occurred to me but in a flash I realize that this, too, is possible. It is even likely to be the case. Many bots or “puppets” roam this MUD. Characters played by people are mistaken for these little artificial intelligences. I myself have made this mistake several times when a character's responses seemed too automatic. And sometimes bots are mistaken for people. I have made this mistake too, fooled by a bot that offered me directions or flattered me by remembering our last interaction. Dr. Sherry could indeed be one of these. I am confronted with a double that could be a person or a program.

People decide that they want to interact with others in a multi-user computer environment. They think that they will have new access to people and information—and there is little question that they do. But they find themselves playing in MUDs. They find themselves assuming multiple personae on



computer networks. They are swept up in experiences that challenge their ideas about a unitary self. They meet their double and it is a cyborg.

### IDENTITY, MORATORIA, AND PLAY

For some people, cyberspace is a place to "act out" unresolved conflicts, to play and replay characterological difficulties on a new and exotic stage. For others, it provides an opportunity to "work through" significant personal issues, to use the new materials of cybersociality to reach for new resolutions. These more positive identity-effects follow from the fact that for some, cyberspace provides what Erik Erikson would have called a "psychosocial moratorium," a central element in how Erikson thought about identity development in adolescence.<sup>8</sup> Although the term "moratorium" implies a "time out," what Erikson had in mind was not withdrawal. On the contrary, the adolescent moratorium is a time of intense interaction with people and ideas. It is a time of passionate friendships and experimentation. The adolescent falls in and out of love with people and ideas. Erikson's notion of the moratorium was not a "hold" on significant experiences but on their consequences. It is a time during which one's actions are, in a certain sense, not counted as they will be later in life. They are not given as much weight, not given the force of full judgment. In this context, experimentation can become the norm rather than a brave departure. Relatively consequence-free experimentation facilitates the development of a "core self," a personal sense of what gives life meaning that Erikson called "identity."

Erikson developed these ideas about the importance of a moratorium during the late 1950s and early 1960s. At that time, the notion corresponded to a common understanding of what "the college years" were about. These days, the idea of the college years as a consequence-free "time out" is more problematic. To mention only two factors, college is pre-professional and AIDS has made consequence-free sexual experimentation an impossibility. But if our culture no longer offers an adolescent moratorium, virtual communities often do. It is part of what makes them seem so attractive.

Erikson's ideas about stages did not suggest rigid sequences. His stages describe what people need to achieve before they can easily move ahead to another developmental task. For example, Erikson pointed out that successful intimacy in young adulthood is difficult if one does not come to it with a sense of who one is, the challenge of adolescent identity building. In real life, however, people frequently move on with serious deficits. With incompletely resolved "stages," they simply do the best they can. They use whatever materials they have at hand to get as much as they can of what they have missed. Now virtual social life can play a role in these dramas of self-reparation. Time in cyberspace reworks the notion of the moratorium because it may now exist on an always-available "window."

Having literally written our online personae into existence, they can be a kind of Rorschach. We can use them to become more aware of what we project into everyday life. We can use the virtual to reflect constructively on the real. Cyberspace opens the possibility for identity play, but it is very serious play. People who cultivate an awareness of what stands behind their screen personae are the ones most likely to succeed in using virtual experience for personal and social transformation. And the people who make the most of their lives on the screen are those who are capable of approaching it in a spirit of self-reflection. What does my behavior in cyberspace tell me about what I want, who I am, what I may not be getting in the rest of my life?

### SIMULATION AND ITS DISCONTENTS

#### Alive/Not Alive

In Piaget's classic studies of the 1920s on how children thought about what was alive, the central variable was motion. Simply put, children took up the question of an object's "life status" by asking themselves if the object could move of its own accord. When in the late 1970s and early 1980s I studied children's reactions to a first generation of computer objects that were physically stationary but that nonetheless accomplished impressive feats of cognition (talking, spelling, doing math, and playing tic-tac-toe), I found that the focus had shifted to an object's psychological properties when children considered the question of its aliveness. So although the presence of computational objects disrupted the classical Piagetian story for talking about aliveness, the story children were telling about computational objects in the early 1980s had its own coherency. Faced with intelligent toys, children took a new world of objects and imposed a new world order, based not on physics but on psychology.

In the 1990s, that order has been strained to the breaking point. Children will now talk about computers as "just machines," but describe them as sentient and intentional. Faced with ever more complex computational objects, in particular with the world of screen simulations that model evolution (for example, *Tierra*) and social process (the games in the "Sim" series—*SimCity*, *SimLife*, and the *Sims*), children are now in the position of theoretical bricoleurs or tinkerers, "making do" with whatever materials are at hand, "making do" with whatever theory can fit a prevailing circumstance. They cycle through evolution and psychology and resurface ideas about motion in terms of the communication of bits.

My current collection of comments about life by children who have played with small mobile robots, the games of the Sim series, and *Tierra* includes the following notions: the robots are in control but not alive, would be alive if they had bodies, are alive because they have bodies, would be alive if they



had feelings, are alive the way insects are alive but not the way people are alive; the Tierrans are not alive because they are just in the computer, could be alive if they got out of the computer and got onto America Online, are alive until you turn off the computer and then they're dead, are not alive because nothing in the computer is real; the Sim creatures are not alive but almost-alive, they would be alive if they spoke, they would be alive if they travelled, they're alive but not "real," they're not alive because they don't have bodies, they are alive because they can have babies, and finally, for an eleven year old who is relatively new to SimLife, they're not alive because these babies don't have parents. She says: "They show the creatures and the game tells you that they have mothers and fathers but I don't believe it. It's just numbers, it's not really a mother and a father." There is a striking heterogeneity of theory here. Different children hold different theories, and individual children are able to hold different theories at the same time.

### Cyborg Babies

In the short history of how the computer has changed the way we think, it has often been children who have led the way. For example, in the early 1980s, children, prompted by computer toys that spoke, did math, and played tic-tac-toe, disassociated ideas about consciousness from ideas about life, something that historically had not been the case. These children were able to contemplate sentient computers that were not alive, a position that grownups are only now beginning to find comfortable. Today's cyborg children are taking things even further; they are pointing the way toward a radical heterogeneity of theory in the presence of computational artifacts that evoke "life." In his history of artificial life, Steven Levy suggests that one way to look at where artificial life can "fit in" to our way of thinking about life is to envisage a continuum in which Tierra, for example, would be more alive than a car, but less alive than a bacterium.<sup>9</sup> My observations suggest that children are not constructing hierarchies but are heading toward parallel, alternating definitions.

Today's adults grew up in a psychological culture that equated the idea of a unitary self with psychological health, and in a scientific culture that taught that when a discipline achieves maturity, it has a unifying theory. When adults find themselves cycling through varying perspectives on themselves ("I am my chemicals" to "I am my history" to "I am my genes") they usually become uncomfortable.<sup>10</sup> But such alternations may strike the generation of cyborg children who are growing up today as just the way things are.

Children speak easily about factors that encourage them to see the stuff of computers as the same stuff of which life is made. Among these are the ideas of shape shifting and morphing. Shape shifting is the technique used by the evil android in *Terminator II* to turn into the form of anything he touched—

including people. A nine year old showed an alchemist's sensibility when he explained how this occurs: "It is very simple. In the universe, anything can turn to anything else when you have the right formula. So you can be a person one minute and a machine the next minute." Morphing is a general term that covers form changes that may include changes across the animate/inanimate barrier. A ten-year-old boy had a lot to say about morphing, all of it associated with the lifestyle of "The Mighty Morphin' Power Rangers," a group of action heroes who turn from teenagers to androidal/mechanical "dinozords" and "megazords" and back. "Well," he patiently explains, "the dinozords are alive; the Power Rangers are alive, but not all the parts of the dinozords are alive, but all the part of the Power Rangers are alive. The Power Rangers become the dinozords. It's all the same stuff," he says, "just yucky computer 'cy-dough-plasm.'" This comment is the expression of a cyborg consciousness as it expresses itself among today's children: a tendency to see computer systems as "sort of" alive, to fluidly cycle through various explanatory concepts, and to willingly transgress boundaries.

To sum up: When today's adults cycle through different theories, they are uncomfortable. Such movement does not correspond to the unitary visions they were brought up to expect. But children have learned a different lesson from their cyborg objects. Donna Haraway characterizes irony as being "about contradictions that do not resolve into larger wholes . . . about the tension of holding incompatible things together because both or all are necessary and true."<sup>11</sup> In this sense, today's cyborg children, growing up into irony, are becoming adept at holding incompatible things together. They are cycling through the "cy-dough-plasm" into fluid and emergent conceptions of self and life. Even the operating systems they work with encourage them to accept and use what they are shown at any given time—to take things at interface value.

### The Life of an Orgot

In the 1980s, most computer users who spoke of transparency were referring to a transparency analogous to that of traditional machines, an ability to open the hood and poke around. But when users of Macintosh computers began to talk about transparency in the mid 1980s, they were talking about seeing their documents and programs represented by attractive and easy-to-interpret icons. They were referring to an ability to make things work without needing to go below the screen surface. This was, somewhat paradoxically, a kind of transparency enabled by the screen's opacity. Today, the word "transparency" has taken on its Macintosh meaning in both computer talk and colloquial language. In a culture of simulation, when people say that something is transparent, they mean that they can see how to make it work, not that they know how it works.



"Your orgot is being eaten up," flashes the message on the screen. It is a rainy Sunday afternoon and I am with Tim, 13. We are playing *SimLife*, Tim's favorite computer game, which sets its users to the task of creating a functioning ecosystem. "What's an orgot?" I ask Tim. He doesn't know. "I just ignore that," he says confidently. "You don't need to know that kind of stuff to play." I suppose I look unhappy, haunted by a lifetime habit of not proceeding to step two before I understand step one, because Tim tries to appease me by coming up with a working definition of "orgot." "I think it is sort of like an organism. I never read that, but just from playing, I would say that's what it is."

The orgot issue will not die. A few minutes later the game informs us: "Your fig orgot moved to another species." I say nothing, but Tim reads my mind and shows compassion: "Don't let it bother you if you don't understand. I just say to myself that I probably won't be able to understand the whole game any time soon. So I just play." I begin to look through dictionaries in which orgot is not listed and finally find a reference to it embedded in the game itself, in a file called "READ ME." The text apologizes for the fact that orgot has been given several and in some ways contradictory meanings in this version of *SimLife*, but one of them is close to organism. Tim was right—enough.

Tim's approach to *SimLife* is highly functional. He says he learned his style of play from video games: "Even though *SimLife*'s not a videogame; you can play it like one." By this he means that in *SimLife*, like video games, one learns from the process of play. You do not first read a rulebook or get your terms straight. Tim is able to act on an intuitive sense of what will work without understanding the rules that underlie the game's behavior. When Tim is populating his universe in a biology laboratory scenario, he puts in fifty each of his favorite creatures, trilobites and sea urchins, but only twenty sharks. I listen to him thinking aloud about that decision: "I don't want fifty of those, I don't want to ruin this." Twenty is less than fifty and time will tell if it is the right amount. "My trilobites went extinct," Tim says. "They must have run out of algae. I didn't give them algae. I forgot. I think I'll do that now." Tim can keep playing even when he has no very clear idea what is driving events. While I was fruitlessly looking up "orgot," Tim got deep into an age of the dinosaurs scenario in *SimLife*. On the positive side, a player like Tim is learning to think about complex phenomena as dynamic, evolving systems. From one point of view, he has made far better use of his time than I have.

And yet, Tim's videogame habits of mind also raise larger questions. When his sea urchins become extinct, I ask him why.

Tim: I don't know, it's just something that happens.

ST: Do you know how to find out why it happened?

Tim: No.

ST: Do you mind that you can't tell why?

Tim: No. I don't let things like that bother me. It's not what's important.

When Piaget studied children's notions of causality, a child's world was full of things that could be understood in simple, mechanical ways. A bicycle could be understood in terms of its pedals and gears and a wind-up car in terms of its clockwork springs. In the late 1970s to early 1980s, the people who built or bought the first generation of personal computers understood them down to the bits and bytes. The operating systems that followed were far more complex, but invited that old-time, reductive understanding. Today, computer users such as Tim can completely ignore such understandings. Tim can stay on the surface, taking things at (inter)face value.

In the 1980s, the controversy in the world of computers and education was about whether computer literacy should be about programming. Would an emphasis on programming skills in the curriculum teach something important, or would it, as some feared in the parlance of the time, turn children into "linear thinkers." Today, the debate about computers in education centers around the place of educational software and simulations in the curriculum. Tim's response to *SimLife* (a level of comfort with play; not much understanding of the model that underlies the game) is not unusual. Just as some teachers do not want to be "reduced" to instructing children in a computer "appliance," many resent providing instruction in a learning environment that often strikes them as an overblown videogame. The question of simulation is posed from preschool through the college years. Why should four year olds manipulate virtual magnets to pick up virtual pins? Why should seven year olds add virtual ballast to virtual ships? Why should fifteen year olds pour virtual chemicals into virtual beakers? Why should eighteen year olds do virtual experiments in virtual physics laboratories? The answer to these questions is often: because the simulations are less expensive, because there are not enough science teachers. But these answers beg a large question: Are we using computer technology not because it teaches best but because we have lost the political will to adequately fund education?

### Readership in a Culture of Simulation

Simulation, whether in a game like *SimLife* or in a physics laboratory or computer-aided-design application, does teach users how to think in an active way about complex phenomena as dynamic, evolving systems. And they also get people accustomed to manipulating a system whose core assumptions they may not understand and that may or may not be "true." Simulations enable us to abdicate authority to the simulation; they give us permission to accept the opacity of the model that plays itself out on our screens. Simulation games are not just objects for thinking about the real



world but also cause us to reflect on how the real world has itself become a simulation game.

The seduction of simulation invites several possible responses. One can accept simulations on their own terms, the stance that Tim encouraged me to take. This might be called "simulation resignation." Or one can reject simulations to whatever degree possible, the position taken by a group of my colleagues at MIT, physicists who saw simulation as a thoroughly destructive force in science education. This might be called "simulation denial." But one can imagine a third response. This would take the cultural pervasiveness of simulation as a challenge to develop a new social criticism. This new criticism would discriminate among simulations. It would take as its goal the development of simulations that help their users understand and challenge their model's built-in assumptions.

I think of this new criticism as the basis for a new class of skills: *reader-ship skills for the culture of simulation*. On one level, high school sophomores playing SimCity for two hours may learn more about city planning than they would pick up from a textbook; but on another level, they may not know how to think about what they are doing. When I interview a tenth grader named Marcia about SimCity, she boasts of her prowess and reels off her "top ten most useful rules of Sim." Among these, number six grabs my attention: "*Raising taxes always leads to riots.*"

Marcia seems to have no language for discriminating between this rule of the game and the rules that operate in a "real" city. She has never programmed a computer. She has never constructed a simulation. She has no language for asking how one might write the game so that increased taxes led to increased productivity and social harmony. And she certainly does not see herself as someone who could change the rules. Like Tim confronted with the orgot, she does not know how to "read" a simulation. Marcia is like someone who can pronounce the words in a book but doesn't understand what they mean. She does not know how to measure, criticize, or judge what she is learning. As we face computers and operating systems of an increasingly dizzying size and complexity, this possibility feels so remote that it is easy to dismiss such yearnings as old fashioned. But Marcia's situation—she is a fluent user but not a fluent thinker—reposes the question in urgent terms. Marcia may not need to see the registers on her computer or the changing charges on a computer chip, but she needs to see *something*. She needs to be working with simulations that teach her about the nature of simulation itself, that teach her enough about how to build her own that she becomes a literate reader of the new medium.

Increasingly, understanding the assumptions that underlie simulation is a key element of political power. People who understand the distortions imposed by simulations are in a position to call for more direct economic and political feedback, new kinds of representation, more channels of informa-

tion. They may demand greater transparency in their simulations; they may demand that the games we play, particularly the ones we use to make real life decisions, make their underlying models more accessible.

We come to written text with centuries-long habits of readership. At the very least, we have learned to begin with the journalist's traditional questions: who, what, when, where, why, and how? Who wrote these words, what is their message, why were they written, how are they situated in time and place, politically and socially? A central goal for computer education must now be to teach students to interrogate simulations in much the same spirit. The specific questions may be different but the intent is the same: to develop habits of readership appropriate to a culture of simulation.

#### CODA: GLOBAL COMPUTING AND THE WORLD OF SCARY/SAFE

The pioneers of computing, and those who referred to themselves as computer "hackers" (when this term connoted virtuosity not criminality), had a style of computer mastery that played with risk and virtuosity by flying by the seat of their pants. If they were addicted to computing, it was as a medium for playing with the issue of control, and playing with control meant constantly walking that narrow line between having it and losing it. MIT hackers called this "sport death." One described it by saying: "The essence of sport death is to see how far you can push things, to see how much you can get away with." Programming evoked the thrill of walking on the edge of a cliff, of being able "to hold the system in your head for that half second, and hope you can save it, but knowing that it might all crash." It has been called the psychology of "scary/safe." Life is danger and triumph, screen to screen of it. The computer and its simulated worlds can provide defenses for our anxieties.

A first line of defense can be to deny vulnerability. It is reassuring to have a medium that offers reassurance through a promise of total mastery. It is reassuring to play in safe microworlds where the rules are clear. On the global scene, computer gaming, computer programming, and virtual realities share a great deal with the rule-driven and bounded world of Tolkien's *Lord of the Rings*. The commonalities were not lost on the earliest generations of computer enthusiasts. In the early 1970s, the computer scientists at Stanford University's artificial intelligence laboratory were so enamored of *The Lord of the Rings* that they built three elven fonts for the Stanford printers. Two of the researchers wrote a Tolkienesque, single-player quest game that became known as "Adventure" as it spread worldwide via the nascent Internet. The personal computer movement of the 1970s and early 1980s was deeply immersed in Tolkien and translated his fantasy worlds into hugely popular (and enduring) role-playing games such as "Dungeons and Dragons."



What the magic of Tolkien shares with the magic of computer code is that each offers fantasy objects that one can control and the opportunity to assert and reassert mastery. Each episode of *Fellowship* presents a danger; each has a resolution in mastery. You go from one block of intransigent code to another. You debug one part of the program, you debug another. Each screen, each level of a computer game is danger, each screen is mastered in its turn, and you always return to danger again. Life is exhausting, but the repetition of microworld triumphs is reassuring. In the fellowship of the microchip, you may crash but ultimately you win.

We used to call hackers "computer people." No more. In a certain sense, if we take the computer to be a carrier of a way of knowing, of a way of seeing the world and what is important, we are all computer people now. Our global immersion in code bears more than a family resemblance to our global immersion in games and fantasy. Computer programs and Middle Earth are compelling on a global scale. They are complex, multilayered, and self-referential. However, we are at a moment in history when playing in closed systems of our own devising reinforces dangerous habits of mind. When we think about Tolkien and when we think about computing, we are not thinking about ambivalence, about complex human relationships, about battles that don't end in infinite justice. But the simple clarities of our globalized computer worlds depend on their virtuality. The real world is messy and painted in shades of gray. In that world we need to be comfortable with ambivalence and contradiction. We need to be able to put ourselves in the place of others in order to understand their motivation. Above all, we need to resist binary formulations. For these things we can't look to computation any more than we can look to Middle Earth.

Walt Whitman once wrote: "There was a child went forth every day. And the first object he look'd upon, that object he became." We make our technologies, our objects, but then the objects of our lives shape us in turn. Our new screen worlds have scintillating, pulsating surfaces. They invite playful exploration. They are dynamic, seductive, and elusive. It is not clear what we are becoming when we look upon them.

## NOTES

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