True Risks? The Pleasures and Perils of Cyberspace

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> "Vinge's conceit of a magical universe as a description for cyberspace catapults the novella from the class of works that predict the future into the rarefied realm of works that have come to create it.... In giving the geeks a vision, Vinge also defined a road map, a project plan, presenting a future which *could* exist, if only we would work toward it." — Mark Pesce, virtual reality pioneer

The publication of Vernor Vinge's novella *True Names* in 1981 inspired a generation of computer scientists to think about life online in new ways. Vinge's depiction of a utopian community of cyber-outlaws who must battle both government enforcers and a mysterious artificial intelligence gave many readers their first inkling of the potential pleasures and perils of cyberspace. Vinge's work, as well as other early cyberfiction, influenced actual thought and practice in computer science and helped shape wider cultural understandings of what cyberspace might be and what types of people belonged there. This essay explores how such speculative fiction framed and foreshadowed real-life issues regarding online identity, community, privacy, and security.

Born in 1944, Vinge earned a Ph.D. in mathematics at the University of California, San Diego and taught math and computer science at San Diego State University for 30 years. He had a parallel career writing speculative fiction, and in 1966 published his first story—about the augmentation of human intelligence using computers, which would be an enduring theme.[1] *True Names* was inspired by a real-life experience in which Vinge and an unknown person were logged into the same computer anonymously and struck up a conversation via its TALK program:

> The TALKer claimed some implausible name, and I responded in kind. We chatted for a bit, each trying to figure out the other's true name. Finally I gave up, and told the other person I had to go—that I was actually a personality simulator, and if I kept talking my artificial nature would become obvious. Afterward, I realized that I had just *lived* a science-fiction story.[2]

In Vinge's novella, the development of an EEG interface ("the portal") allows users to connect their brain directly to the network, interpreting electrical signals as sensory input and using physical motions to activate software. A group of expert users harnesses this technology to create a virtual world where they can assume magical identities as "witches" or "warlocks" amid castles, swamps, and monsters of all shapes and sizes.

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[1] Vinge 1966.

[2] Vinge 2001, Introduction, 16.

They call this world "the Other Plane" and guard the entrance to their "coven" from unskilled trespassers:

> The correct path had the aspect of a narrow row of stones cutting through a gray-greenish swamp. The air was cold but very moist. Weird, towering plants dripped audibly onto the faintly iridescent water and the broad lilies. The subconscious knew what the stones represented, handling the chaining of routines from one information net to another, but it was the conscious mind of the skilled traveler that must make the decision that could lead to the gates of the Coven, or to the symbolic 'death' of a dump back to the real world. — *True Names,* 250

While the magical touches are entertaining, the illusions are not merely decorative: the imaginary landscape provides an interface to real computer systems. Indeed, its users consider the Other Plane a more efficient computer interface than old-style keyboards and screens—but also, "it was simply a hell of a lot of fun to live in a world as malleable as the human imagination" (272).

The offline context for these activities is an ambiguous mix of technological empowerment and political constraint. In Vinge's story, the Internet—which relatively few people had even heard of in 1981—is ubiquitous, seamlessly connecting the entire world, and distributed computing is the norm: ordinary individuals can rent computer time and storage on public platforms, where they can create and run programs ("spells") on the fly. Vinge foresees a pervasive information economy in which "ninety-eight percent of the jobs in modern society involved some use of a data set" (248). However, the US government seeks to limit citizens' activities within cyberspace, so those who acquire the computer power needed to enter the Other Plane are by definition outlaws. Warlocks must hide their offline "true names" lest they fall into government hands.

The main characters, Mr. Slippery and Erythrina, are members of a coven famous for its expert pranks against government or commercial databases. When federal agents learn Mr. Slippery's true name, they force him to help them catch an even bigger foe: a mysterious new character called the Mailman who may seek world domination. Mr. Slippery and Erythrina defeat the Mailman in an epic cyberspace battle and discover that he was actually a runaway AI program created by a military project. In gearing up for the fight, the two warlocks also take on superhuman powers by merging their consciousness with the world's computing systems: "the human that had been Mr. Slippery was an insect wandering in the cathedral his mind had become" (285). They must give up these powers in the end, but not before Erythrina creates a virtual clone of herself so that she can live forever in cyberspace. Throughout the story, Vinge evokes a richly detailed virtual landscape peopled with distinctive and nuanced characters. Beyond the technical innovations, he provides a compelling vision of why cyberspace would be worth creating, spending time in, and defending.

The only comparable fiction published before *True Names* was John Brunner's *Shockwave Rider* (1975). Even more than *True Names*, Brunner's story reflects the

widespread suspicion of both government and technoscience in 1970s America.[3] In *Shockwave Rider,* the US government controls the public's behavior by manipulating information, and secret schools train a cadre of super-intelligent children to do its bidding. Inspired by Alvin Toffler's 1970 bestseller *Future Shock,* Brunner depicts a future in which identity is malleable and many people have trouble adjusting to a rootless, "plugged-in lifestyle." Every person has a computer ID code that determines their level of social power; expert hackers can fabricate new identities and create "tapeworms" that alter their (or an enemy's) credit rating, criminal record, or other digital data. While *Shockwave Rider* resembles *True Names* in spotlighting the digital construction of identity and featuring a showdown between a heroic hacker and federal agents, Brunner does not depict online worlds or identities: the computer is strictly a tool for manipulating events offline.

Early cyberfiction influenced computer science in several ways: by generating a sense of excitement and purpose, by pointing to new research topics, and by providing shared metaphors and terminology. Brunner's notion of a "worm" is still used in computer security, while William Gibson's *Neuromancer* (1984) contributed the word "cyberspace" and popularized a vision of online life as glamorous, rather than nerdy. Unlike Gibson, however, Vinge had an expert understanding of computer technology. One of the most impressive aspects of his vision is how many different areas of computer science were inspired or foreseen by this short novel. The sections below explore Vinge's influence in a variety of areas and attempt to characterize the nature and limits of the social worldview shared by Vinge and those who followed.

Infrastructure and Interfaces

Vinge understood that creating a real-time, immersive virtual environment would take massive computing power. This constraint drives the plot of *True Names* at several points: for example, it forces the government to give the warlocks access to federal computers, and it retards the growth of the Mailman's AI program. The demands of cyberspace also inspired some real-world creators of computer infrastructure.

Daniel Hillis invented an influential, massively parallel supercomputer called the Connection Machine in 1983. In a 1992 article arguing why parallel computing is important to society, one of Hillis's main examples is its ability to support the creation of virtual worlds:

> Try to imagine the virtual worlds that will be made possible by the power of a shared parallel computer. Imagine a world that has the complexity and subtlety of the aircraft simulation, the accessibility of the video game, the economic importance of the stock market, and the sensory richness of the flight simulator, all of this with the vividness of computer-generated Hollywood special effects. This may be the kind of world in which your children spend their time, meet their friends and earn their living. (14)

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[3] Pew Research Center, 1998.

While Hillis does not say explicitly that his work was inspired by Vinge, he advises readers, "For some ideas about what virtual worlds may be like, the best source is science fiction. I recommend the work of William Gibson, or a story called 'True Names' by Vernor Vinge." (15 n7)

A more striking testimonial to Vinge's influence comes from Mark Pesce (see opening quote), a pioneer of virtual reality and co-creator of VRML, a protocol for 3D interactive graphics.

> The impact of Vinge's *True Names* can not be easily overstated. ... He presented a globally networked world into which human imagination had been projected... Did Vinge create virtual reality? In a practical sense, perhaps not, but something about his novella caused people to revision their work, and refocus themselves toward the ends he described. In an interesting inversion, life imitates art, and people dedicated their professional careers to realize Vinge's vision. I was one of them. (228)

Pesce reads a complex message into Vinge's work that goes well beyond the idea of cyberspace as a place to build fantasy worlds. Pesce argues that the "core theme" of *True Names* is that "the mastery of reality by magical technique opens hidden possibilities of human being" (234). While Vinge's magical environment may resemble later online games such as World of Warcraft, the tools of cyberspace give Slip and Ery power over the *real* world, not just an online fantasy; this makes them "decidedly post-human" (235).

Pesce agrees with Vinge that the metaphor of magic is not fanciful but actually the best way to capture the experience of VR: "Every object in cyberspace is a magical object" in the sense that it only exists (*as* an object with particular properties) through the collective belief and will of those participating. Using magical analogies is no more childish or irrational than using the metaphor of a "trashcan" or "file folder" to represent locations on a personal computer. "The generation of meaning is *always* a magical act" (230); cyberspace merely takes the social construction of reality to new levels. Pesce wants us to take seriously the "reality" of VR: both the fact that we construct meaning in VR much the same way as we do in the real world, and the potential for using VR as an interface to act on the real world.

In Vinge's story, the "real world" encountered by the characters was mostly computer systems (and the occasional nuclear missile). In 21st century incarnations, the virtual world might recreate actual terrain or city streets, layered with information about real or imagined properties of those locations. Geographer Jeremy Crampton comments on cyberfiction's influence on later geographical information systems:

> Google Earth is only one example (if a particularly well-known one) of the geospatial web or 'geoweb' comprised of map and location-based services available on the web. As a metaphor of *meaningful geographies for virtual data*, the idea can be traced back 25 years to 'cyberspace' in the science fiction of Vinge and Gibson (92, emphasis added).

Computer scientists Kirstie Bellman and Christopher Landauer identify yet another

element of Vinge's cyberspace infrastructure: the use of software agents to populate and maintain the virtual environment. In Vinge's story, the dragon (whimsically named after Alan Turing) that guards the Coven's castle is a computer program; other security programs include the spiders that infest the swamp and the Mailman himself. Bellman and Landauer's article on design guidelines for interactive environments cites Vinge's novella alongside more technical literature to support their argument that "agents with a much more open-ended purpose and scope of activities will be needed" to create virtual worlds that are "real places" (110).

Virtual Place, Community, and Identity

> One of the central features of *True Names* is the notion that a worldwide computer network would be a kind of *place* for its users. —Vinge, Introduction to *True Names,* 19

True Names provided the model for an early commercial, multi-player game/community called "Habitat," created by Lucasfilm Games in 1985. As described by designers Chip Morningstar and F. Randall Farmer, Habitat's virtual environment was "inspired by a long tradition of 'computer hacker science fiction,' notably Vernor Vinge's novella *True Names*" (175). In tribute, the currency used in the game bore the likeness of Vinge (221).

Morningstar and Farmer emphasize that it is not technology but human imagination that creates the reality of cyberspace: "a cyberspace is defined more by the interactions among the actors within it than by the technology with which it is implemented" (174; see also 180). This picks up on one of Vinge's technical insights in *True Names:* that an immersive experience need not require immense bandwidth. Ironically, Vinge invokes the power of plain text to explain how a graphical, 3D virtual environment could seem real:

> Even a poor writer—if he has a sympathetic reader and an engaging plot—can evoke complete internal imagery with a few dozen words of description. The difference now is that the imagery has interactive significance. (*True Names,* 252).

Interactive imagery means that players not only "see" the objects in Habitat (or Vinge's Other Plane), they can manipulate them, and the consequences are felt by all the inhabitants of the virtual realm. Collectively, players can employ simple objects and actions to create the feeling of a shared social space.

Morningstar and Farmer bring to life Vinge's sense of the virtual world as a community. While Gibson's cyberspace is mainly devoted to the serious business of commerce and crime (and these activities drive the plot of *True Names* as well), Vinge also saw the potential for what we would now call social networking—the opportunity for far-flung strangers to meet, "hang out," express themselves, and even fall in love. His warlocks spend as much time chatting as pulling stunts, and each has clearly invested time and energy in creating a distinctive virtual appearance and persona. Vinge was one of the first to recognize the appeal of being able to create an online "avatar" that is more powerful, attractive, or exotic than one's real physical body. Mr. Slippery, for example, muses that

Erythrina's beautiful appearance online might mask an ordinary body, or even someone seeking to escape social stigma:

> Almost as likely, she was massively handicapped. He had seen that fairly often ... Many of these types retreated into the Other Plane, where one could completely control one's appearance. (320)

The activities that enliven Vinge's tale—building an online identity, meeting new friends, seeking adventure—now form the core of today's social networking sites, blogs, and multiplayer games.

Artificial Intelligence

> "It turns out the Mailman was the greatest cliché of the Computer Age, maybe of the entire Age of Science. ... It was designed to live within larger systems and gradually grow in power and awareness... The program managers saw the Frankenstein analogy... Poor little Mailman, like the monsters of fiction—he was only doing what he had been designed to do." (*True Names* 325, 327, 328).

The great villain of Vinge's novella turns out to be an artificial intelligence program run amok. Yet AI is also its great hope: Erythrina adapts the Mailman program to create her own AI, to which she will somehow transfer her personality. This aspect of Vinge's book caught the attention of AI legend Marvin Minsky, and shortly after its publication Minsky made *True Names* the focus of his keynote speech at a science fiction awards banquet. He was then invited to write an afterword for the second edition of the book in 1983.

In his 1983 essay, Minsky credits Vinge with foreseeing a new way of programming: "there is evidence that he regards today's ways of programming... as but an early stage of how great programs will be made in the future" (336). In this envisioned future, AI programs would do the coding for us:

> Surely the days of programming, as we know it, are numbered.... Instead, we'll express our intentions about what should be done, ... Then these expressions will be submitted to immense, intelligent, intention-understanding programs which will themselves construct the actual, new programs. (336)

While Minsky clearly sees this as desirable and attainable, he also acknowledges the dark side of Vinge's vision. "The ultimate risk, though, comes when we greedy, lazy masterminds are able at last to take that final step: to design goal-achieving programs which are programmed to make themselves grow increasingly powerful"—like the Mailman in *True Names* (338).

On another level, Minsky sees in Vinge's scenario a mirror of his own model of the human mind, which in 1983 was about to be published as *The Society of Mind*. Minsky described the mind as a set of specialized machines that were mutually incomprehensible but could communicate over the brain's neural network using a limited symbolic language.

> In several ways, my image of what happens in the human mind resembles Vinge's image of how the players of the Other Plane have linked themselves into their networks of computing machines—by using superficial symbol-signs to control a host of systems which we do not fully understand.... So this is the irony of *True Names*. Though Vinge tells the tale as though it were a science-fiction fantasy—it is in fact a realistic portrait of our own, real-life predicament! (339, 344)

The logical extension of Minsky's argument (350-351) is that there is no real difference between the ordinary human mind, the human-computer hybrid that Mr. Slippery and Erythrina became during their battle with the Mailman, and an intelligent computer program. Following this logic, Vinge's model of human-computer interaction becomes a blueprint for AI's ultimate goal of creating an intelligent computer. As Minsky concludes,

> The only thing missing is most of the knowledge we'll need to make such machines intelligent. Indeed, as you might guess from all this, the focus of research in artificial intelligence should be to find good ways, as Vinge's fantasy suggests, to connect structure with functions through the use of symbols (352).

Cryptography, Privacy, Anonymity, and Security

> In the once-upon-a-time days of the First Age of Magic, the prudent sorcerer regarded his own true name as his most valued possession but also the greatest threat to his continued good health, for—the stories go—once an enemy, even a weak unskilled enemy, learned the sorcerer's true name, then routine and widely known spells could destroy or enslave even the most powerful. .. Now it seems that the Wheel has turned full circle... and we are back to worrying about true names again. (*True Names,* 241)

The opening lines of *True Names* resonate on a number of levels: they express the characters' distrust of the government, they reflect contemporary events in cryptography, and they seem to eerily foreshadow today's concerns with identity theft. Here I focus on the politics of cryptography, which in the late 1970s seemed to be approaching a standoff between the US government, which wanted to restrict public access to strong encryption, and computer scientists in industry and academia who advocated giving businesses and ordinary citizens the ability to communicate securely. Citing threats to national security, Congress had placed strong encryption on a list of export-restricted "munitions" since 1976. The National Bureau of Standards adopted an encryption standard based on IBM research, called DES, for general use in 1976. But its 56-bit key—which became the upper limit for exportable encryption technology—was relatively weak (it was broken by brute force in 1997). Vinge offers a computer-science insider's dim view of these restrictions as Mr. Slippery comments on his personal security measures:

> Like most folks, ... he had no trust for the government standard encryption routines, but preferred the schemes that had leaked out of academia—over NSA's petulant objections—during the last fifteen years. (*True Names,* 251)

Some of Vinge's fans read his work as a manifesto for public access to cryptography. While encryption can serve a number of purposes, such as e-commerce, these activists were particularly concerned with the right (as they would see it) to interact anonymously online. One of the most outspoken was Tim May, who had been a noted physicist at Intel before focusing on cryptography and the social issues surrounding it. A self-described "crypto-anarchist," he was a central member of the "Cypherpunks" mailing list, started in 1992, that discussed and developed ways to use technology to maintain individual privacy and anonymity. Technologies that were invented, improved, or promoted by the Cypherpunks include anonymous remailers, public key cryptography, and digital money (40, 44, 48).

Describing his first impressions of *True Names* in 1986, May writes:

> *True Names* certainly riveted me, and it fit with other developments swirling around in computer circles at the time. ... [David] Chaum's work... sparked the realization that a digital economy could be constructed, with anonymity, untraceability, and ancillary anarcho-capitalist features.... In other words, a cryptographically based version of Vinge's *True Names*...
> Arguably, Mr. Slippery is already here and, as Vernor predicted, the Feds are already trying to track him down. In 1988 these ideas motivated me to write and distribute on the Net 'The Crypto Anarchist Manifesto.' (35-36)

May used Vinge's term "True Name" in the manifesto itself, and new members of the Cypherpunks (who obviously borrowed their name from the "cyberpunk" genre) were encouraged to read the novella, as well as Brunner's *Shockwave Rider* and other cyberfiction (38).

Like Vinge, May and the Cypherpunks positioned technology within a political vision that questioned government's right to control either personal identity or the means of communication. May asks, "Why do we so often accept the notion that governments issue us our names and our identities, and that government must ensure that names are true names?" (43). He notes that in oppressive regimes, "Digital pseudonyms, the creation of persistent network personas that cannot be forged by others and yet are unlinkable to the 'true names' of their owners, are finding major uses in ensuring free speech" (44).

Yet May's characterization of *True Names* as "anarcho-capitalist" seems a misinterpretation and raises some interesting questions about the social visions guiding cyberspace fiction and research. Vinge's story does not particularly espouse capitalism—indeed, the main characters' disregard for private property would seem at odds with it—and the social organization appears to be more technocracy than anarchy: possession of computer hardware and programming skill equals power. Likewise, May's vision of a lawless utopia privileges technical skill and is founded in technological determinism:

> The combination of strong, unbreakable public-key cryptography and virtual network communities in cyberspace will produce profound changes in the nature of economic and social systems. Crypto anarchy is the cyberspatial realization of

> anarcho-capitalism, transcending national boundaries and freeing individuals to consensually make the economic arrangements they wish to make (44).

He explains that "A basic credo of the Cypherpunks movement has been that technological solutions are preferable to administrative or legislative solutions" (54). Yet this can only be equated with "anarchy" if technology is assumed to be politically neutral, a view that is naive at best and, again, places power in the hands of technologists with unspoken agendas.[4] Finally, the confident assertion by May and others that "The net is an anarchy" (69) has recently been challenged by scholars who have documented the very real power national governments have over their citizens' use of the Internet.[5]

In addition to making a connection between encryption, anonymity, and freedom, May picks up on another important theme in Vinge: the role of *reputation* in online communities. Pseudonymity may seem like an invitation to behave badly, but May argues that people who have invested time and effort in building a reputation for their online persona have an incentive to protect that investment by behaving well (38). This "reputation economy" is the glue holding together Vinge's Coven of outlaws; they have come to know, respect, and (minimally) trust each other over several years of interaction. Reputation is also the currency of the blogosphere and other early–21st century virtual forums, where pseudonymous authors can have large followings (though neither reputation nor true names seem to deter some of them from behaving badly).

Another political perspective on cryptography is offered by Leonard N. Foner, a researcher at the MIT Media Lab, who sees *True Names* as forecasting a dystopian world of government control, "a panopticon of unimaginable proportions" that will actually come to pass if the general public is denied access to strong cryptography (169).

> The plot of 'True Names' depends on secure communications and secret identities against even the most determined of opponents—national governments. Some have compared the ability to have private discussions to the right to bear arms: the last-ditch defense against oppression. ... Yet current political trends show that Vinge's extrapolation, in which normal people have no privacy and no hope of fighting governmental excesses, is right on target (169).

This view informs Foner's research on intelligent agents and online communities, which incorporates privacy protections into online interactions. But unlike May, Foner argues that the most important cryptographic issues are "sociological and political, not technical: Who gets to use it? Who gets to break it?" (153).

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[4] There is a vast STS literature challenging the view that technology is neutral. A good place to start is Winner 1980. For an example that specifically addresses computing, see Lawrence Lessig's
(2000) argument that "code is law."

[5] Goldsmith and Wu 2006.

Whom is the vision for?

Foner's questions bring us to the issue: who are the intended residents of cyberspace? All technologies are designed with particular kinds of users in mind, and all utopias privilege some values over others. Science fiction is one of the cultural forces that shape popular understandings of who the "natural" users and masters of new technologies are.

Mark Pesce saw the "socially ostracized technophile" as Vinge's target audience. In some ways, as noted above, the Other Plane is a technocracy; the Coven's membership is exclusive, with a clear hierarchy of skill, and technical mastery can literally translate to world domination. The closest present-day analog may be multiplayer online games, where players take on mythical personae and accumulate knowledge and resources that give them power. Tim May takes these elitist tendencies to an extreme with a vision of "crypto-anarchy" that is explicitly anti-democratic. Declaring, "I have very little faith in democracy" (73), he explains that "crypto anarchy basically undermines democracy: it removes behaviors and transactions from the purview of the mob" (74).

Yet in the background of Vinge's story are other groups, some characterized more as "social clubs" (257) than hardcore hackers, suggesting more pluralistic possibilities. Pesce notes that Vinge's promise of transcendence through superhuman intelligence—a phenomenon Vinge later dubbed "the Singularity"—is not reserved for an elite group: "Vinge seems to say that the Singularity is universal, affecting all humanity" (237). As Mr. Slippery muses in the closing lines of the story, "Processors kept getting faster, memories larger. What now took a planet's resources would someday be possessed by everyone" (330).

Is cyberspace for women? Most of the early cyberpunk stories have a macho edge, and the female characters generally do not share the computer skills of the men. By contrast, one of the striking aspects of *True Names* is its relative freedom from gender stereotypes. Erythrina, the most powerful hacker in the story, is a woman; and though her online appearance is stereotypically sexy, her offline body is elderly—a radical departure for a female romantic lead. The other major female character is a hard-nosed government agent, Virginia, who leads the team that busts Mr. Slippery. Both women are portrayed sympathetically, both are strong and skilled, and neither is defined primarily by her sexuality or her attachment to a male character. Vinge's story invites women to imagine themselves as full participants in cyberspace.

While none of the computer scientists who contributed to the 20th anniversary edition of *True Names* were women, this may simply reflect the relatively small percentage of women in the field. When Vinge wrote his story in 1981, the proportion of female computer science students was rising, and it may have seemed that full equality was not far off. However, women's share of CS degrees peaked at 37% in the mid-1980s and actually declined afterwards to 20.5% in 2006.[6] Some have argued that women are

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[6] National Science Foundation 2009, Table C-4, "Bachelor's degrees, by sex and field: 1997–2006."

deterred from entering the field by the popular image of computing as a preserve for male "geeks"[7]—an image that science fiction has probably done more to reinforce than to challenge. On the other hand, women participate in large numbers as creative *users* of cyberspace in areas such as social networking. Cyberspace does not exclude women, but their underrepresentation as technical experts and architects is troubling.

Interestingly, none of the early cyberspace novels foresaw young people as major participants.[8] While video games were already popular in the 1970s, personal computers for home use did not become widespread until the IBM PC in 1981 and the Apple Macintosh in 1984 (in its own version of life imitating science fiction, Apple used George Orwell's novel as the backdrop for its marketing campaign). As we will see, the presence of children on the Internet would create a very different sense of the risks involved.

Predictions and Outcomes

We have seen how a spectrum of computer scientists shared at least some of Vinge's assumptions about what would be technically possible, personally desirable, and socially problematic in cyberspace. How accurate were these collective visions?

On the technical side, ubiquitous networked computing has indeed arrived, at least in the US and other developed countries. Strong encryption is widely and legally available, though some restrictions remain. EEG-based interfaces are under development, mainly to assist people with impaired brain function,[9] and various other virtual reality interfaces have been devised including gloves, head-mounted displays, vehicle simulators, and projection rooms. While these are mainly used in research, engineering, and training rather than by the general public, other infrastructure and interface improvements such as faster CPUs, bigger and better-resolution displays, movement-detecting controllers (such as for the Nintendo Wii game), and protocols for displaying multimedia data online allow ordinary users to interact in graphically detailed 3D (if not immersive) environments. Geographical information has been integrated into computer systems so that, like Mr. Slippery, today's users can use satellite images to look down on their own physical locale. The only technical aspect of Vinge's story that seems nowhere near achievement is self-aware computer programs with their own desires and ability to act spontaneously.

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[7] Varma 2007.

[8] In contrast, contemporary movies such as Tron (1982) and Wargames (1983) did feature teens or young adults. Both plots depicted cyberspace as an extension of video games (a game designer trapped inside a computer and forced to engage in gladiator-style combat; a boy who mistakes a military program for a game). Unlike the network-based cyberspaces of Gibson, Vinge, or Brunner, the game-inspired virtual worlds of the movies focused on interacting with the computer, rather than with other people.

[9] Wolpaw et al 2002.

Culturally, the appeal of cyberspace as a magical world has proven durable. A whole series of online environments, from early text-based MUDs to more recent graphically-rich games, has drawn on the vocabulary of myth and fantasy. Early cyberfiction also accurately predicted a few online services, such as news (Vinge referred to "databases such as the *LA Times*", 252) and gambling (a feature of *Shockwave Rider*). But many social aspects of the Internet that loom large today were absent from early cyberfiction. Email, curiously, plays little part in these stories, even though it was one of the earliest popular real-world applications. E-commerce is a marginal activity; though some characters make purchases electronically, there is no sense that cyberspace might contain online storefronts, let alone consumer product reviews or auction sites that allow every user to become a merchant. Nor did the authors envision that cyberspace would have many corners devoted to individuals (homepages, social networking accounts, blogs), or that users would share content with strangers through mechanisms such as file sharing, YouTube, photo sharing, or wikis.

The point here is not to fault Brunner, Vinge, or Gibson for being unable to see into a future that few would have thought plausible in 1975 or even 1984. Rather, I suggest that these social features of cyberspace would have been particularly hard to envision because of the types of people the authors expected to inhabit it. In the early novels, cyberspace is dominated by computer experts; adults; mainly men. Given that demographic, one would not necessarily expect that shopping, trading pop songs, or posting photos of schoolmates and family would be important activities.

The outlaw sensibility of cyberpunk glorified the disaffected technical elite, but was never a realistic choice for the masses. "Crypto-anarchy" has not come to pass: the mere availability of strong encryption has neither caused the public to reject the rule of law *en masse* nor prevented governments from enforcing regulations.[11] Today's users of cyberspace define freedom and risk in other ways.

True Risks?

All of the early cyberfiction depicts the online world as a place of danger. I conclude with a consideration of how the perception of risk has changed in the three decades since *True Names* was written. Vinge's characters referred to government as "the Great Enemy," surpassed only by a rogue AI. Few people today seem to fear being attacked by self-aware software, and while government surveillance is still a concern for many users, a host of other online threats loom larger in American popular culture.

Media coverage portrays cybercrime and vandalism as common, motivated by economic gain, political agendas, or simply the desire to show off.[12] Some misdeeds, such as email scams, are old crimes using new technology; the Internet is simply a means to reach users foolish enough to hand over their money. Other offenses are specific to computing, such

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[11] See Goldsmith and Wu 2006.

[12] Wall 2008.

as viruses, denial of service attacks, or the transformation of home PCs into botnets. As a risk, online crime seems to have a similar status in popular culture as street crime: people are warned to protect themselves by (figuratively) buying better locks, avoiding questionable neighborhoods, and not talking to strangers.[13] While Vinge's heroes considered themselves "good" vandals, there are few if any latter-day Robin Hoods in cyberspace who have won public approval for their exploits.

Another set of anxieties centers around children, who were not envisioned online at all in early cyberfiction. Publicly debated risks range from pornography and pedophiles to cyber-bullying and "addiction" to gaming.[14] Sometimes youth themselves are depicted as a threat to law and order, notably in the case of music file-sharing. While free distribution of pop culture content can be treated purely as an economic crime (and certainly has been prosecuted as such by intellectual property owners), it can also be seen as a challenge to the very notion of information as property. Current debates over copyright and its protection, violation, or redefinition through technology reveal the uncertain and shifting boundaries between the rights of information creators and users.[15]

Finally, as Vinge observed, "we are back to worrying about true names again." Today's Internet users feel considerable anxiety over the misuse of personal information, including concerns with reputation, corporate abuse of data, and identity theft. Privacy advocate Daniel Solove argues that the current structure of the Internet leaves users' reputations vulnerable to malicious gossip or simply their own bad judgment, as indiscretions from their youth come back to haunt them.[16] Corporations had little presence in Vinge's story, which was written before the Internet had been commercialized; but now that companies collect enormous amounts of customer data, many users fear they will sell it to third parties, use it for targeted marketing, or allow it to be stolen through poor security practices. Identity theft is perhaps the ultimate example of how technology allows a person's identity to take on a reality separate from their physical body. In the US, one's Social Security Number and other financial identifiers are akin to a True Name: if it falls into the wrong hands, one's credit rating can be ruined, with financial and other consequences. Vinge's insight into the tension between having a public presence online and protecting one's privacy was prescient, even though the specific risks have changed.

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[13] CERT 2001.

[14] Tanner 2007.

[15] See, e.g., Lessig 2005.

[16] Solove 2008.

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