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"[Rheingold] draws on a bewildering range of disciplines to examine what life in such a world might be like....much food for thought for people who want to be informed about what's about to engulf them."
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–Paul Saffo, Director, Institute for the Future

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–Steven Johnson, author of *Emergence* and *Interface Culture*

"*Smart Mobs* is hot on the trail of a technology that is hot-wiring social networks around the world, with unexpected and fascinating implications for all of us."
–David Weinberger, author of
Small Pieces Loosely Joined and co-author of
The Cluetrain Manifesto

"I congratulate Howard Rheingold on his very thorough summary of one of the greatest transformations of human society—perhaps even more profound than the development of writing." –Sir Arthur C. Clarke

SMART MOBS

The Next Social Revolution

HOWARD RHEINGOLD

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Thomas] Hazlett proposes. But in light of the emerging technologies for sharing, even the spectrum sold as property would be subject to an important qualification: Other users would be free to "share" that spectrum if they followed a "listen first" protocol—the technology would listen to see whether a certain chunk of spectrum were being used at a particular time, and if it weren't it would be free for the taking.[92]

The regulatory regime that will shape the future of wireless technology is not the only crucial unsettled policy issue. Who will have control over the use of the cloud of personal information smart mob technologies transmit, as mobile and pervasive communications evolve and merge? In each of the converging technologies that constitute smart mobs, issues of control remain to be resolved.

- Many-to-many mobile communications, such as texting, empower cooperative bands of intercommunicants in urban spaces, whether they are teenagers in Tokyo or Helsinki, or as we'll see in the next chapter, political activists in Manila and Seattle.
- Wearable computing, open-source software, and encrypted communication provide a means of giving individuals more control over their personal data clouds.
- Tactics of distributed control, lateral cooperation, and governance through reputation create leverage in several different realms, from human communities sharing irrigation resources to supercomputer swarms attacking diseases.
- The Internet, highways, public streets, parks, beaches, scientific findings, works in the public domain, and the electromagnetic spectrum produce more value for more people when they are held in commons and self-managed to prevent tragedy than when they are divided as private property and managed by Hobbesian authority.

Only the earliest signs of future smart mob behavior are observable as the constituent technologies leave the laboratory and enter the product cycle, but important clues to the future of political action can be found in what happened in Manila and Seattle in 2001.

7

Smart Mobs: The Power of the Mobile Many

Bypassing the complex of broadcasting media, cell phone users themselves became broadcasters, receiving and transmitting both news and gossip and often confounding the two. Indeed, one could imagine each user becoming a broadcasting station unto him or herself, a node in a wider network of communication that the state could not possibly even begin to monitor, much less control. Hence, once the call was made for people to mass at Edsa, cell phone users readily forwarded messages they received, even as they followed what was asked of them.

Cell phones then were invested not only with the power to surpass crowded conditions and congested surroundings brought about by the state's inability to order everyday life. They were also seen to bring a new kind of crowd about, one that was thoroughly conscious of itself as a movement headed towards a common goal.

—Vicente Rafael, "The Cell Phone and the Crowd: Messianic Politics in Recent Philippine History"

Netwar—Dark and Light

On January 20, 2001, President Joseph Estrada of the Philippines became the first head of state in history to lose power to a smart mob. More than 1 million Manila residents, mobilized and coordinated by waves of text messages, assembled at the site of the 1986 "People Power" peaceful demonstrations that had toppled the Marcos regime.[1] Tens of thousands of Fil-

ipinos converged on Epifanio de los Santas Avenue, known as "Edsa," within an hour of the first text message volleys: "Go 2EDSA, Wear blck."[2] Over four days, more than a million citizens showed up, mostly dressed in black. Estrada fell. The legend of "Generation Txt" was born.

Bringing down a government without firing a shot was a momentous early eruption of smart mob behavior. It wasn't, however, the only one.

- On November 30, 1999, autonomous but internetworked squads of demonstrators protesting the meeting of the World Trade Organization used "swarming" tactics, mobile phones, Web sites, laptops, and handheld computers to win the "Battle of Seattle."[3]
- In September 2000, thousands of citizens in Britain, outraged by a sudden rise in gasoline prices, used mobile phones, SMS, email from laptop PCs, and CB radios in taxicabs to coordinate dispersed groups that blocked fuel delivery at selected service stations in a wildcat political protest.[4]
- A violent political demonstration in Toronto in the spring of 2000 was chronicled by a group of roving journalist-researchers who webcast digital video of everything they saw.[5]
- Since 1992, thousands of bicycle activists have assembled monthly for "Critical Mass" moving demonstrations, weaving through San Francisco streets en masse. Critical Mass operates through loosely linked networks, alerted by mobile phone and email trees, and breaks up into smaller, tele-coordinated groups when appropriate.[6]

Filipinos were veteran texters long before they toppled Estrada. Short Message Service (SMS) messaging was introduced in 1995 as a promotional gimmick.[7] SMS messaging, free at first, remained inexpensive. Wireline telephone service is more costly than mobile service, and in a country where 40 percent of the population lives on one dollar a day, the fact that text messages are one-tenth the price of a voice call is significant.[8] A personal computer costs twenty times as much as a mobile telephone; only 1 percent of the Philippines' population own PCs, although many more use them in Internet cafés.[9] By 2001, however, 5 million Filipinos owned cell phones out of a total population of 70 million.[10]

Filipinos took to SMS messaging with a uniquely intense fervor. By 2001, more than 70 million text messages were being transmitted among

Filipinos every day.[11] The word "mania" was used in the Manila press. The *New York Times* reported in 2001:

> Malls are infested with shoppers who appear to be navigating by cellular compass. Groups of diners sit ignoring one another, staring down at their phones as if fumbling with rosaries. Commuters, jaywalkers, even mourners—everyone in the Philippines seems to be texting over the phone . . . . Faye Slytangco, a 23-year-old airline sales representative, was not surprised when at the wake for a friend's father she saw people bowing their heads and gazing toward folded hands. But when their hands started beeping and their thumbs began to move, she realized to her astonishment that they were not in fact praying. "People were actually sitting there and texting," Slytangco said. "Filipinos don't see it as rude any more."[12]

Like the thumb tribes of Tokyo and youth cultures in Scandinavia, Filipino texters took advantage of one of the unique features of texting technology—the ease of forwarding jokes, rumors, and chain letters. Although it requires effort to compose messages on mobile telephone keypads, only a few thumb strokes are required to forward a message to four friends or everybody in your telephone's address book. Filipino texting culture led to a national panic when a false rumor claimed that Pope John Paul II had died.[13]

Many Filipino text message jokes and rumors were political. Vicente Rafael, professor at the University of California, San Diego, sees Filipino texting culture as inherently subversive:

> Like many third world countries recently opened to more liberal trade policies, the Philippines shares in the paradox of being awash in the latest technologies of communication such as the cell phone while mired in deteriorating infrastructures such as roads, postal services, railroads, power generators and land lines. With the cell phone, one appears to be able to pass beyond these obstacles. And inasmuch as such infrastructures are state run so that their breakdown and inefficiencies are a direct function of governmental ineptitude, passing beyond them also feels like overcoming the state, which to begin with is already overcome by corruption. It is small wonder then that cell phones could prove literally handy in spreading rumors, jokes, and information that steadily eroded whatever legitimacy President Estrada still had.[14]

The "People Power II" demonstrations of 2001 broke out when the impeachment trial of President Estrada was suddenly ended by senators linked to Estrada. Opposition leaders broadcast text messages, and within seventy-five minutes of the abrupt halt of the impeachment proceedings, 20,000 people converged on Edsa.[15] Over four days, more than a million people showed up. The military withdrew support from the regime; the Estrada government fell, as the Marcos regime had fallen a decade previously, largely as a result of massive nonviolent demonstrations.[16] The rapid assembly of the anti-Estrada crowd was a hallmark of early smart mob technology, and the millions of text messages exchanged by the demonstrators in 2001 was, by all accounts, a key to the crowd's esprit de corps.

Professor Rafael sees the SMS-linked crowd that assembled in Manila as the manifestation of a phenomenon that was enabled by a technical infrastructure but that is best understood as a social instrument:

> The power of the crowd thus comes across in its capacity to overwhelm the physical constraints of urban planning in the same way that it tends to blur social distinctions by provoking a sense of estrangement. Its authority rests on its ability to promote restlessness and movement, thereby undermining the pressure from state technocrats, church authorities and corporate interests to regulate and contain such movements. In this sense, the crowd is a sort of medium if by that word one means the means for gathering and transforming elements, objects, people and things. As a medium, the crowd is also the site for the generation of expectations and the circulation of messages. It is in this sense that we might also think of the crowd not merely as an effect of technological devices, but as a kind of technology itself. . . . Centralized urban planning and technologies of policing seek to routinize the sense of contingency generated in crowding. But at moments and in areas where such planning chronically fails, routine can at times give way to the epochal. At such moments, the crowd . . . takes on a kind of telecommunicative power, serving up channels for sending messages at a distance and bringing distances up close. Enmeshed in a crowd, one feels the potential for reaching out across social space and temporal divides.[17]

The Battle of Seattle saw a more deliberate and tactically focused use of wireless communications and mobile social networks in urban political conflict, more than a year before texting mobs assembled in Manila. A broad coalition of demonstrators who represented different interests but were united in opposition to the views of the World Trade Organization planned to disrupt the WTO's 1999 meeting in Seattle. The demonstrators included a wide range of different "affinity groups" who loosely coordinated their actions around their shared objective. The Direct Action Network enabled autonomous groups to choose which levels of action to participate in, from nonviolent support to civil disobedience to joining mass arrests—a kind of dynamic ad hoc alliance that wouldn't have been possible without a mobile, many-to-many, real-time communication network. According to a report dramatically titled, "Black Flag Over Seattle," by Paul de Armond:

> The cohesion of the Direct Action Network was partly due to their improvised communications network assembled out of cell phones, radios, police scanners and portable computers. Protesters in the street with wireless Palm Pilots were able to link into continuously updated web pages giving reports from the streets. Police scanners monitored transmissions and provided some warning of changing police tactics. Cell phones were widely used.
>
> Kelly Quirke, Executive Director of the Rainforest Action Network, reports that early Tuesday, "the authorities had successfully squashed DAN's communications system." The solution to the infrastructure attack was quickly resolved by purchasing new Nextel cell phones. According to Han Shan, the Ruckus Society's WTO action coordinator, his organization and other protest groups that formed the Direct Action Network used the Nextel system to create a cellular grid over the city. They broke into talk groups of eight people each. One of the eight overlapped with another talk group, helping to quickly communicate through the ranks.
>
> In addition to the organizers' all-points network, protest communications were leavened with individual protesters using cell phones, direct transmissions from roving independent media feeding directly onto the Internet, personal computers with wireless modems broadcasting live video, and a variety of other networked communications. Floating above the tear gas was a pulsing infosphere of enormous bandwidth, reaching around the planet via the Internet.[18]

From Seattle to Manila, the first "netwars" have already broken out. The term "netwar" was coined by John Arquilla and David Ronfeldt, two analysts for the RAND corporation (birthplace of game theory and experimental economics), who noticed that the same combination of social net-

works, sophisticated communication technologies, and decentralized organizational structure was surfacing as an effective force in very different kinds of political conflict:

> Netwar is an emerging mode of conflict in which the protagonists—ranging from terrorist and criminal organizations on the dark side, to militant social activists on the bright side—use network forms of organization, doctrine, strategy, and technology attuned to the information age. The practice of netwar is well ahead of theory, as both civil and uncivil society actors are increasingly engaging in this new way of fighting.
>
> From the Battle of Seattle to the "attack on America," these networks are proving very hard to deal with; some are winning. What all have in common is that they operate in small, dispersed units that can deploy nimbly—anywhere, anytime. All feature network forms of organization, doctrine, strategy, and technology attuned to the information age. They know how to swarm and disperse, penetrate and disrupt, as well as elude and evade. The tactics they use range from battles of ideas to acts of sabotage—and many tactics involve the Internet.[19]

The "swarming" strategies noted by Arquilla and Ronfeldt rely on many small units like the affinity groups in the Battle of Seattle. Individual members of each group remained dispersed until mobile communications drew them to converge on a specific location from all directions simultaneously, in coordination with other groups. Manila, Seattle, San Francisco, Senegal, and Britain were sites of nonviolent political swarming. Arquilla and Ronfeldt cited the nongovernmental organizations associated with the Zapatista movement in Mexico, which mobilized world opinion in support of Indian peasants, and the Nobel Prize–winning effort to enact an anti-landmine treaty as examples of nonviolent netwar actions. Armed and violent swarms are another matter.

The Chechen rebels in Russia, soccer hooligans in Britain, and the FARC guerrillas in Colombia also have used netwar strategy and swarming tactics.[20] The U.S. military is in the forefront of smart mob technology development. The Land Warrior experiment is scheduled to field-test wearable computers with GPS and wireless communications by 2003.[21] The Joint Expeditionary Digital Information (JEDI) program links troops on the ground directly to satellite communications. JEDI handheld devices combine laser range-finding, GPS location awareness, direct satellite telephone, and encrypted text

messaging.[22] Remember the DARPA-funded startup MeshNetworks from Chapter 6, the company whose technology enables military swarms to parachute onto a battlefield and self-organize an ad hoc peer-to-peer wireless network? Small teams of special forces, wirelessly networked and capable of calling in aircraft or missile strikes with increasing accuracy, were introduced by the United States and its allies in Afghanistan: netwar.

Examples later in this chapter demonstrate that smart mobs engaging in either violent or nonviolent netwar represent only a few of the many possible varieties of smart mob. Netwars do share similar technical infrastructure with other smart mobs. More importantly, however, they are both animated by a new form of social organization, the network. Networks include nodes and links, use many possible paths to distribute information from any link to any other, and are self-regulated through flat governance hierarchies and distributed power. Arquilla and Ronfeldt are among many who believe networks constitute the newest major social organizational form, after tribes, hierarchies, and markets. Although network-structured communications hold real potential for enabling democratic forms of decision-making and beneficial instances of collective action, that doesn't mean that the transition to networked forms of social organization will be a pleasant one with uniformly benevolent outcomes. Arquilla and Ronfeldt note the potential for cooperation in examples like the nongovernmental organizations that use netwar tactics for public benefit, but they also articulated a strong caution, worth keeping in mind when contemplating the future of smart mobs:

> Most people might hope for the emergence of a new form of organization to be led by "good guys" who do "the right thing" and grow stronger because of it. But history does not support this contention. The cutting edge in the early rise of a new form may be found equally among malcontents, ne'er-do-wells, and clever opportunists eager to take advantage of new ways to maneuver, exploit, and dominate. Many centuries ago, for example, the rise of hierarchical forms of organization, which displaced traditional, consultative, tribal forms, was initially attended, in parts of the world, by the appearance of ferocious chieftains bent on military conquest and of violent secret societies run according to rank—long before the hierarchical form matured through the institutionalization of states, empires, and professional administrative and bureaucratic systems. In like manner, the early spread of the market form, only a few centuries ago, was accompanied by a spawn of usurers, pirates, smugglers, and monopolists, all seeking to elude state controls over their earnings and enterprises.[23]

In light of the military applications of netwar tactics, it would be foolish to presume that only benign outcomes should be expected from smart mobs. But any observer who focuses exclusively on the potential for violence would miss evidence of perhaps an even more profoundly disruptive potential—for beneficial as well as malign purposes—of smart mob technologies and techniques. Could cooperation epidemics break out if smart mob media spread beyond warriors—to citizens, journalists, scientists, people looking for fun, friends, mates, customers, or trading partners?

Substitute the word "computers" for the words "smart mobs" in the previous paragraph, and you'll recapitulate the history of computation since its birth in World War II.

Lovegety and p2p Journalism

Organized conflict is undoubtedly a site of intensive cooperation. Humans enjoy cooperating to each other's benefit, as well, given the right conditions and payoff. Alexis de Tocqueville made an important observation in regard to early-nineteenth-century America:

> The best-informed inhabitants of each district constantly use their information to discover new truths which may augment the general prosperity; and, if they have made any such discoveries, they eagerly surrender them to the mass of the people. . . . Men attend to the interests of the public, first by necessity, afterwards by choice: what was intentional becomes an instinct; and by dint of working for the good of one's fellow-citizens, the habit and the taste for serving them is at length acquired.[24]

Elinor Ostrom and other students of common pool resource management (discussed in Chapter 2) have detailed the ways farmers, fishers, and foresters around the world devise ingenious social arrangements to balance cooperation and self-interest.[25]

Consider a few experiments on the fringes of mobile communications that might point toward a wide variety of nonviolent smart mobs in the future:

- "Interpersonal awareness devices" have been evolving for several years.[26] Since 1998, hundreds of thousands of Japanese have used Lovegety keychain devices, which signal when another Lovegety owner of the opposite sex and a compatible profile is within fifteen feet.[27] In 2000, a similar technology for same-sex seekers, the "Gaydar" device, was marketed in North America.[28] Hong Kong's "Mobile Cupid service" (www.sunday.com) sends a text description of potential matches who are nearby at the moment.[29]
- ImaHima ("are you free now?") enables hundreds of thousands of Tokyo i-mode users to alert buddies who are in their vicinity at the moment.[30]
- Upoc ("universal point of contact") in Manhattan sponsors mobile communities of interest; any member of "manhattan celebrity watch," "nyc terrorism alert," "prayer of the day," or "The Resistance," for example, can broadcast text messages to and receive messages from all the other members.[31]
- Phones that make it easy to send digital video directly to the Web make it possible for "peer-to-peer journalism" networks to emerge;[32] Steve Mann's students in Toronto have chronicled newsworthy events by webcasting everything their wearable cameras and microphones capture.[33]
- Researchers in Oregon have constructed "social middleware," which enables wearable computer users to form ad-hoc communities, using distributed reputation systems, privacy and knowledge-sharing agents, and wireless networks.[34]

In the fall of 2001, I visited the office of ImaHima in Tokyo's ultra-modern Ebisu Garden Place Tower. ImaHima founder, Neeraj Jhanji, was the only person in the office on a Saturday morning. The DoCoMo skyscraper I had visited the day before was visible through the window. Neeraj, twenty-nine, a native of India, remained in Tokyo after a stint with an international consulting firm. One sunny Saturday, walking alone in one of Tokyo's most popular and crowded districts, he wondered if any of his friends were nearby. "I looked at my phone and the answer seemed obvious," he told me.[35] Even without GPS location awareness, it would be possible to use the Internet to coordinate locations. At the time I spoke to Jhanji, ImaHima had won the prestigious Prix Ars Electronica, had been adopted as an official i-mode site, and had gained 250,000 users with a median age of twenty-five. ImaHima was planning to launch in European markets by 2002.[36]

Jhanji showed me how the service works. When you join, you fill out a profile and set up a buddy list similar to the kind used with Internet instant messaging; each person must give permission before someone else can know automatically where they are. You also list your favorite places. When you select the "update" link on your mobile's ImaHima menu, everyone on your buddy list knows, for example, that you are within a few blocks of Shibuya station and are free for lunch.

The just-in-time, just-in-place matchmaking service for strangers, an intriguing aspect of ImaHima, is also where the most caution is required. With young women in Tokyo being targeted on the street by solicitors for "hostess bars," no service could hope to attract any females without strict controls—nor would DoCoMo's strict policies allow a service to become a lucrative official i-mode site. "You can search through the list of your friends," Jhanji told me, "or you can ask permission to contact a stranger whose profile matches your request and who is nearby. But if you request permission to communicate and the other person denies your request, the system blocks you from communicating with that person again."

The ambience of the Manhattan location of Upoc differs sharply from the milieu of Ebisu Garden Tower. Upoc's building on lower Broadway is close enough to ground zero for the lingering stench to have been strong outside the building when I visited Upoc in November 2001. Upoc had used its own service as a virtual office in the days after the September attack. Upoc employee Alex LeVine sent a group SMS message to three dozen others employees immediately after he saw the second plane crash: "Do not go to work. Stand by for more directions."[37] Then he messaged nine employees already at work, telling them to evacuate. Although wireline telephone, cellular telephone, and email were all down, Upoc employees discovered that their text messaging service, based out of a server safely in New Jersey, stayed up and enabled them to regroup.

I met LeVine, Andrew Pimentel, and Upoc founder Gordon Gould in their office, a standard open-plan geek farm. It was heartening to see that at least a few rooms full of twenty-somethings in Aeron chairs still existed. Gould had been an enthusiastic participant in virtual communities. He knew the power of online social networks and noticed how today's teens have taken to mobile phones and pagers the way his generation had taken to computer keyboards. Upoc provides instant infrastructure for a smart mob, whether it is a group of shopping buddies, fans, families, political street theater, or affinities as yet undefined. The confusing clash of standards and services that has slowed the adoption of SMS services in the United States created an opportunity to provide a platform for mobile communities among users of different services. Register for Upoc on the Web, join an existing group, or start one of your own and invite your friends and family, and suddenly you can receive and broadcast text messages to your group, no matter what mobile telephone service they use or where they are located. Link up to your roving tribe from your desktop email and vice versa. More than 100,000 users have registered for hundreds of groups.[38]

I registered for an Upoc account and observed from afar for two weeks before I visited New York. I joined "nyc celebrity sightings," a mobile community of celebrity stalkers, and "nyc terror alert," which promised immediate messages in the case of terrorist attack. I also joined the "channel" for a youth entertainer named "lil bowwow" and received offers of tickets and opportunities to download lil bowwow's latest ringtone. After an afternoon of buzzing around California, feeling my phone buzz, and noting that Julia Roberts had been spotted in midtown Manhattan or that a fifteen-year-old lil bowwow fan in Brooklyn just got out of school, I switched to receiving my messages as email until I went to New York in person. Scanning the scores of messages exchanged every day in just a few groups made it clear that some kind of community ferment was underway.

"Communities started forming from the week we started testing the service," Gould told me.[39] Andrew Pimental, who had conducted Upoc's marketing research, added, "There are virtual cliques, groups of friends, enemies, grudges, gangs, fights, and double agents with multiple handles who spy in groups to make sure nobody is badmouthing them or their clique." Upoc members can set up groups in any of three ways—secret, private, or public. Anyone can join a public group. Private groups are listed in the directory, but people join by applying and can be expelled by the founder. Secret groups are not listed and are known only to their members.

I unexpectedly experienced the "nyc terror alert" in action. The next to last day of my stay in Manhattan, walking up Fifth Avenue toward a morning meeting, my pocket started buzzing. I looked at the screen of my mobile and learned that two minutes earlier, American Airlines flight 587 had crashed after takeoff from JFK. I immediately reserved a train ticket to Boston for the next day, in case the airports remained closed. It was another one of those living-in-the-future moments. I had become one of those people I had first observed at Shibuya Crossing a year and a half ear-

lier. My pocket buzzed again. Another plane crash? No. A celebrity spotted in an upscale deli downtown.

What if smart mobs could empower entire populations to engage in peer-to-peer journalism? Imagine the impact of the Rodney King video multiplied by the people power of Napster. What if people beamed WearComp video to the Web, offering continuous views of breaking events that hitherto have been available only from Newscorp, AOL-Time-Warner, and Disney? Would it be possible to turn the table on the surveillance society and counter the media monopolies? What would be the effect on public opinion if thousands of WearComp-equipped citizens webcast all they saw and heard? Wild as it sounds, mobile squads of citizen telejournalists have already surfaced. Whether today's experiments will even make it onto the radar of the media giants remains to be seen, but the first stirrings of p2p journalism have already been reported in Toronto and Tokyo.

In 2000, WearComp researcher, innovator, and evangelist Steve Mann launched "ENGwear, an experiment in wearable news-gathering systems conducted by students and researchers at the Humanistic Intelligence Lab at the University of Toronto."[40] In the spring of 2000, Mann and a group of his students, all wearing computers equipped with "EyeTaps," which broadcast everything they saw and heard to the Web, showed up at a demonstration in Toronto called by the Ontario Coalition Against Poverty (OCAP). Violence broke out. Mann reported, "We, along with the journalists and various television crews, ran for cover. However, unlike the reporters, my students and I were still broadcasting, capturing almost by accident the entire event. Whatever we saw before us was captured and sent instantly in real time to the World Wide Web, without our conscious thought or effort."[41]

Mann claims that the WearComp journalist-researchers who made their first appearance at the OCAP demonstration could be a model for a wider movement, which could influence as well as chronicle events:

> WearComp represents a solution to this legacy of suppressed creativity and confining imagination in an age where ever-fewer sources of information seem to reach us, even as the conduits of information grow exponentially. What my students and I undertook in deciding to "cover" the OCAP protest was an experiment in media diversification. This is the process by which we merge our cyborg narratives with the demands of a growing cyberspace that we should, and one day will, be able to interact with and control. Facilitating the individual's creation and broadcast of their own narratives and perspectives is an important part of wearable computing technology. . . .
>
> What my students and I did—and continue to do—is something far more important than just providing "home movies" and "alternative" images for viewing on the Internet. We are also engaging in a process of cultural reclamation, where the individual is put back into the loop of information production and dispensation.[42]

Justin Hall, the journalist who helped me interview Shibuya youth, recently reported that Tokyo's G3 videophones, like the one I carried around Tokyo, make it possible to send video to a Web site in real time: "With the technology in place," wrote Hall, "it's only a matter of time before an important amateur news video is directly distributed to the web, or to ten friends with video-mail in a news chain letter. When that happens, this new form of news distribution will become the news, and then ultimately, it will be no big deal."[43]

Hall reported that some of the videophones offered digital editing capabilities and that a new service in Japan made it possible to post photos and text on the Web directly from a mobile phone. People already use weblogging software to "blog" in real-time from conferences and conventions (Chapter 5), continuously updating their Web pages through 802.11b connections.[44] Putting cameras and high-speed Net connections into telephones, however, moves blogging to the streets. By the time this book is published, I'm confident that street bloggers will have constructed a worldwide culture.

Mobile Ad Hoc Social Networks

Imagine my excitement, many months into my smart mob odyssey, when I came across a research report titled "When Peer-to-Peer Comes Face-to-Face: Collaborative Peer-to-Peer Computing in Mobile Ad Hoc Networks," from the "Wearable Computing Group" at the University of Oregon.[45] The Oregon group, assembled by Professor Zary Segall and led by Gerd Kortuem, had designed a test bed for smart mobs around the same time I began to believe such a development was possible.

"Mobile ad hoc social network" is a longer, more technical term than "smart mob." Both terms describe the new social form made possible by the combination of computation, communication, reputation, and location

awareness. The *mobile* aspect is already self-evident to urbanites who see the early effects of mobile phones and SMS. *Ad hoc* means that the organizing among people and their devices is done informally and on the fly, the way texting youth everywhere coordinate meetings after school. *Social network* means that every individual in a smart mob is a "node" in the jargon of social network analysis, with social "links" (channels of communication and social bonds) to other individuals. Nodes and links, the elements of social networks made by humans, are also the fundamental elements of communication networks constructed from optical cables and wireless devices—one reason why new communication technologies make possible profound social changes.

The Wearable Computing Group specializes in exploring the community aspects of wireless, wearable, and peer-to-peer technologies. Kortuem agreed with my assessment when I called him to talk about the research at the University of Oregon. "When I talk about community," he told me, "I mean both the users who form social networks when they interact personally and communities of developers, like the open source community, where each member shares ideas and contributes to building something larger."[46] In Oregon, Toronto, Pittsburgh, Atlanta, Palo Alto, and Tokyo, small bands of researchers are beginning to walk around the same geographic neighborhoods while wearing intercommunicating computers.

Kortuem and colleagues realized that p2p computing and wireless networking technologies made it possible to design ad hoc networks of mobile devices to support the ad hoc social networks of the people who wear them. The fundamental technical unit cited by Kortuem and other wearable computing researchers has come to be known as the "personal area network," an interconnected network of devices worn or carried by the user. The concept was first described by Tom Zimmerman, now at IBM's Almaden Research Center, who had invented the VR "dataglove" while he was an MIT student.[47]

Kortuem and colleagues treat the personal area networks as building blocks of a dynamic community of networks with emergent capabilities of its own. The research is as much behavioral as it is computational, beginning with simple experiments matching properties of mobile computing networks with the needs of social networks. The community of personal area network users within geographic proximity, for example, could serve as a wireless mesh network, dynamically self-organizing a cloud of broadband connectivity as nodes came in and out of physical proximity, providing always-on Internet connections to members. Using Bluetooth and other short-range wireless technologies such as very-low-power wideband radio, individual members of the community could engage in more intimate and timely information exchanges when face to face, whereas WiFi technologies could provide the infrastructure for neighborhood-wide and Internet-wide communication:

> Mobile ad hoc systems provide opportunities for ad hoc meetings, mobile patient monitoring, distributed command and control systems and ubiquitous computing. In particular, personal area networks enable the creation of proximity-aware applications in support of face-to-face collaboration.
>
> Mobile devices like cell phones, PDAs and wearable computers have become our constant companions and are available wherever we go. . . . Personal area networks open the opportunity for these devices to take part in our everyday social interactions with people. Their ability to establish communication links among devices during face-to-face encounters can be used to facilitate, augment or even promote human social interactions.
>
> In some sense, an ad hoc mobile information system is the ultimate peer-to-peer system. It is self-organizing, fully decentralized, and highly dynamic.[48]

Short-range radio frequency links such as those used by Bluetooth chips and wearable computers create a sphere of connectivity within the immediate vicinity of the wearer. Paul Rankin, at Philips Research laboratory in England, wrote about the need for intermediary agents to negotiate transactions between the "aura" of one person and radio beacons in the environment, or another person's aura.[49] "Auranet" is what Jay Schneider, Kortuem, and colleagues named their "framework for structuring encounters in social space based on reputations and trust."[50] The wireless instantiation of a 12-foot information bubble around wearable computer users is a physical model of what sociologist Erving Goffman calls the "Interaction Order," the part of social life where face-to-face and spoken interactions occur.[51] Goffman claimed that the mundane world of everyday interactions involves complex symbolic exchanges, visible but rarely consciously noticed, which enable groups to negotiate movement through public spaces. Although people use the ways they present themselves to "give" information they want others to believe about themselves, Goffman noted that people also "give off" information, leaking true but uncontrolled information along with their more deliberate performance.

One form of information that people give off, called "stigma" by Goffman, is markings or behaviors that locate individuals in a particular social status. Although many stigma can have negative connotations, stigma can also mark positive social status. The information we give off by the way we behave and dress helps us coordinate social interaction and identify likely interaction partners. When the Interaction Order is formalized and modeled automatically in an Auranet, the social network and the technological network meet in a way that makes possible new capabilities such as automated webs of trust for ad hoc interactions—for example, assembling a carpool of trustworthy strangers when you drive downtown or seek a ride.

Kortuem et al., noting the lack of fully embodied "human moments" in purely virtual worlds, concentrated on ways to enhance the most basic sphere of human social behavior, the face-to-face encounters of everyday life. Indeed, the primary question asked by the Oregon researchers is the primary question regarding smart mobs: What can communities of wearable computer users do in their face-to-face encounters? At a technical level, the wearable devices can share bandwidth by acting as nodes in an ad hoc wireless network. The devices could exchange media and messages, similar to the way Napster and Usenet use links between individual nodes to pass data around. However, as soon as the members of the community allow their computers to exchange data automatically, without human intervention, complex issues of trust and privacy intervene—the unspoken norms of the interaction order. Kortuem et al. explored the social and technical implications of personal agent software, which filters, shields, and acts as a go-between for their users.

A number of social and technical barriers must be overcome in order for mobile ad hoc communities to self-organize cooperatively. Nobody is going to contribute their personal area network to a community internetwork unless they feel secure about privacy and trust—who snoops whom, and who can be counted on to deal honestly? Privacy requires data security, and security is complicated by wireless communications. Encryption techniques make secure wearable community infrastructure possible, but someone has to figure out how to build them. Trust means a distributed reputation system, which the Oregon group has prototyped. When you break down the interesting idea of mobile, ad hoc social networks into the elements needed to make it work in practice, a rich and largely undeveloped field for research opens.

Another experiment by the Eugene group mediates social encounters by comparing personal profiles automatically and alerting participants in a face-to-face encounter of mutual interests or common friends that they might not know about (a recommendation system for strangers).[52] Each social encounter of wearable computer users involving automatic exchanges of personal data, sharing of bandwidth, or passing of messages from others would necessarily involve individual computations of where each participant's self-interest lies in relation to a computation of the other party's trustworthiness. Kortuem et al. recognized this complex weighing of trust versus self-interest as an example of our old friend, the Prisoner's Dilemma, and designed an experimental system called WALID to test some of these issues, taking advantage of the fact that the Oregon wearable computing researchers lived and worked in the same general neighborhood in Eugene, Oregon:

> WALID implements a digitized version of the timeworn tradition of borrowing butter from your neighbor. You do a favor for others because you know that one day they will do it for you.
>
> With WALID two individuals use their mobile devices to negotiate about and to exchange real world tasks: dropping off someone's dry cleaning, buying a book of stamps at the post office, or returning a book to the local library.
>
> WALID employs personal agent software to find close-by community members and to negotiate the exchange of tasks. The agents maintain a user's task list, become fully aware of the locations and activities involved. When an encounter occurs, the agents produce a negotiation. If both users approve, a deal is struck.
>
> The role of the agent in a negotiation is to evaluate the value of favors and to keep scores. Having to run across town just to drop off someone's mail compares unfavorably with buying milk for someone if the grocery store is just a block away. Agents employ ideas from game theory to ensure that results of negotiations are mutually beneficial; they cooperate only if there is the opportunity to enhance the user's goals.[53]

In our telephone conversation, Kortuem noted that at the beginning of wearable computing research, the main goals involved either creating tools for professionals, such as maintenance and repair specialists, or creating tools to augment individuals, in the manner promoted by Steve Mann. "I came to realize," Kortuem told me, "that what is really interesting is not the technology of a specialized application at a job site, but what happens if ordinary people are empowered to use this technology and what effects

might emerge when technology penetrates society."[54] These words will be worth remembering when millions of people carry devices that invisibly probe and cloak, reach out, evaluate, interconnect, negotiate, exchange, and coordinate invisible acts of ad hoc cooperation that create wealth, democracy, education, surveillance, and weaponry from pure mind-stuff, the way the alchemy of inscribing ever-tinier patterns on purified sand invokes the same forces from the same place.

Swarm Intelligence and the Social Mind

Massive outbreaks of cooperation precipitated the collapse of communism. In city after city, huge crowds assembled in nonviolent street demonstrations, despite decades of well-founded fear of political assembly. Although common sense leads to the conclusion that unanimity of opinion among the demonstrators explained the change of behavior, Natalie Glance and Bernardo Huberman, Xerox PARC researchers who have studied the dynamics of social systems, noted that a *diversity* of cooperation thresholds among the individuals can tip a crowd into a sudden epidemic of cooperation. Glance and Huberman pointed out that a minority of extremists can choose to act first, and if the conditions are right, their actions can trigger actions by others who needed to see somebody make the first move before acting themselves—at which point the bandwagon-jumpers follow the early adopters who followed the first actors:

> Those transitions can trigger a cascade of further cooperation until the whole group is cooperating.
>
> The events that led to the mass protests in Leipzig and Berlin and to the subsequent downfall of the East German government in November 1989 vividly illustrate the impact of such diversity on the resolution of social dilemmas. . . . The citizens of Leipzig who desired a change of government faced a dilemma. They could stay home in safety or demonstrate against the government and risk arrest—knowing that as the number of demonstrators rose, the risk declined and the potential for overthrowing the regime increased.
>
> A conservative person would demonstrate against the government only if thousands were already committed; a revolutionary might join at the slightest sign of unrest. That variation in threshold is one form of diversity. People also differed in their estimates of the duration of a demonstration as well as in the amount of risk they were willing to take. Bernhardt Prosch and Martin Abram, two sociologists from Erlangen University who studied the Leipzig demonstrations, claim that the diversity in thresholds was important in triggering the mass demonstrations.[55]

Sudden epidemics of cooperation aren't necessarily pleasant experiences. Lynch mobs and entire nations cooperate to perpetrate atrocities. Decades before the fall of communism, sociologist Mark Granovetter examined radical collective behavior of both positive and negative kinds and proposed a "threshold model of collective behavior." I recognized Granovetter's model as a crucial conceptual bridge that connects intelligent (smart mob) cooperation with "emergent" behaviors of unintelligent actors, such as hives, flocks, and swarms.

Granovetter studied situations in which individuals were faced with either-or decisions regarding their relationship to a group—whether or not to join a riot or strike, adopt an innovation, spread a rumor, sell a stock, leave a social gathering, migrate to a different country. He identified the pivotal statistic as the proportion of *other* people who have to act before an individual decides to join them. Thresholds appear to be an individual reaction to the dynamics of a group.

One of Granovetter's statements yielded a clue to smart mob dynamics: "By explaining paradoxical outcomes as the result of aggregation processes, threshold models take the 'strangeness' often associated with collective behavior out of the heads of actors and put it into the dynamics of situations."[56] Smart mobs might also involve yet-unknown properties deriving from the dynamics of situations, not the heads of actors. Goffman's Interaction Order, the social sphere in which complex verbal and nonverbal communications are exchanged among individuals in real time, is precisely where individual actions can influence the action thresholds of crowds. Mobile media that can augment the informal, mostly unconscious information exchanges that take place within the Interaction Order, or affect the size or location of the audience for these exchanges, have the potential to change the threshold for collective action.

I started looking for ways to connect these congruent ideas operationally. How would they map onto an ad hoc social network of wearable computer users, for example? When my idea hunting brought me to "the coordination problem," a social dilemma that is *not* a Prisoner's Dilemma, separate ideas began to fit together into a larger pattern.

A coordination problem does not involve the Prisoner's Dilemma zero-sum game between self-interest and common resources but instead represents the quandary that confronts individuals who are ready to cooperate, but whose cooperation is contingent on the prior cooperation of others. Monitoring and sanctioning are important not simply as a way of punishing rule breakers but also as a way of assuring members that others are using common resources wisely. That is, many people are contingent cooperators, willing to cooperate as long as most others do (what Ostrom referred to as a "commitment problem"). Thus, monitoring and sanctioning serve the important function of providing information about others' actions and levels of commitment.

In *Rational Ritual: Culture, Coordination, and Common Knowledge,* Michael Suk-Young Chwe claims that public rituals are "social practices that generate common knowledge," which enables groups to solve coordination problems. Suk-Young Chwe writes: "A public ritual is not just about the transmission of meaning from a central source to each member of an audience; it is also about letting audience members know what other audience members know."[57] Everyone in a group has to know who else is contributing, free riding, and sanctioning in order to solve both free rider and coordination problems on the fly with maximum trust and minimum friction. This is the key to the group-cooperation leverage bestowed by reputation systems and many-to-many communications media.

Threshold models of collective action and the role of the Interaction Order are both about media for exchange of coordinating knowledge. Understanding this made it possible to see something I had not noticed clearly enough before—a possible connection between computer-wearing social networks of thinking, communicating humans and the swarm intelligence of unthinking (but also communicating) ants, bees, fish, and birds. Individual ants leave chemical trail markers, and the entire nest calculates the most efficient route to a food source from a hundred aggregated trails without direction from any central brain. Individual fish and birds (and tight-formation fighter pilots) school and flock simply by paying attention to what their nearest neighbors do. The coordinated movements of schools and flocks is a dynamically shifting aggregation of individual decisions. Even if there were a central tuna or pigeon who could issue orders, no system of propagating orders from a central source can operate swiftly enough to avoid being eaten by sharks or slamming into trees. When it comes to hives and swarms, the emergent capabilities of decentralized self-organization can be surprisingly intelligent.

What happens when the individuals in a tightly coordinated group are more highly intelligent creatures rather than simpler organisms like insects or birds? How do humans exhibit emergent behavior? As soon as this question occurred to me, I immediately recalled the story Kevin Kelly told at the beginning of *Out of Control,* his 1994 book about the emergent behaviors in biology, machinery, and human affairs.[58] He described an event at an annual film show for computer graphics professionals. A small paddle was attached to each seat in the auditorium, with reflective material of contrasting colors on each side of the paddle. The screen in the auditorium displayed a high-contrast, real-time video view of the audience. The person leading the exercise, computer graphics wizard Loren Carpenter, asked those on one side of the auditorium aisle to hold the paddles with one color showing and asked the other half of the audience to hold up the opposite color. Then, following Carpenter's suggestions, the audience self-organized a dot that moved around the screen, added a couple of paddles on the screen, and began to play a giant game of self-organized video Pong, finally creating a graphical representation of an airplane and flying it around the screen. Like flocks, there was no central control of the exercise after Carpenter made a suggestion. Members of the audience paid attention to what their neighbors were doing and what was happening on the screen. Kelly used this as an example of a self-conscious version of flocking behavior.[59]

Musician and cognitive scientist William Benzon believes that the graphical coordination exercise led by Carpenter and described by Kelly is similar to what happens when musicians "jam" and that it involves a yet unexplored synchronization of brain processes among the people involved:[60]

> The group in Carpenter's story is controlling what appears on the screen. Everyone can see it all, but each can directly affect only the part of the display they control with his or her paddle. In jamming, everyone hears everything but can affect only that part of the collective sound that they create (or withhold).
>
> Now consider a different example. One of the standard scenes in prison movies goes like this: We're in a cell block or in the mess hall. One prisoner starts banging his cup on the table (or on one of the bars to his cell). Another joins in, then another, and another, until everyone's banging away and shouting some slogan in unison. This is a simple example of emergent behavior.

But it's one that you won't find in chimpanzees. Yes, you will find them involved in group displays where they're all hooting and hollering and stomping. But the synchrony isn't as precise as it is in the human case.

And that precision is critical to my argument. That precision allows me to treat the human group as a collection of coupled oscillators. Oscillation is one of the standard and simplest emergent phenomena. Once a group has become coupled in oscillation, we can treat the group as a single entity. To be sure, there's more to music than simple oscillation. But oscillation is the foundation, the starting point, and all the elaboration and complexities take place within this framework.

In effect, in musical performance (and in dance), communication between individuals is pretty much the same as communication between components of a single nervous system. It's continuous and two-way, and it does not involve symbolic mediation. Think of Goffman's interaction order, but drop verbal communication from it. It is a public space that is physically external to the brains of participating individuals, but it is functionally internal to those brains.[61]

Kevin Kelly traced back the new theories regarding emergent properties to William Morton Wheeler, an expert in the behavior of ants.[62] Wheeler called insect colonies "superorganisms" and defined the ability of the hive to accomplish tasks that no individual ant or bee is intelligent enough to do on its own as "emergent properties" of the superorganism. Kelly drew parallels between the ways both biological and artificial "vivisystems" exhibit the same four characteristics of what he called "swarm systems":

- the absence of imposed centralized control
- the autonomous nature of subunits
- the high connectivity between the subunits
- the webby nonlinear causality of peers influencing peers[63]

Steven Johnson's 2001 book, *Emergence,* shows how the principles that Kelly extrapolated from biological to technological networks also apply to cities and Amazon.com's recommendation system: "In these systems, agents residing on one scale start producing behavior that lies on one scale above them: ants create colonies; urbanites create neighborhoods; simple pattern-recognition software learns how to recommend new books. The movement from low-level rules to higher level sophistication is what we call emergence."[64] In the case of cities, although the emergent intelligence resembles the ant-mind, the individual units, humans, possess extraordinary onboard intelligence—or at least the capacity for it.

At this point, connections between the behavior of smart mobs and the behavior of swarm systems must be tentative, yet several of the earliest investigations have shown that the right kinds of online social networks know more than the sum of their parts: Connected and communicating in the right ways, populations of humans can exhibit a kind of "collective intelligence." In the summer between my smart mob inquiries in Scandinavia and my expedition to Tokyo, my inquiries brought me to a fellow who seems to have discovered the underpinnings of group intelligence. Bernardo Huberman, formerly at Xerox PARC, now scientific director of Hewlett-Packard's Information Dynamics research laboratory, was doing intriguing research on the emergence of primitive forms of collective intelligence.

I visited Huberman in his office, located in the same Palo Alto complex as the CoolTown laboratory. Huberman is a master of thinking of new ways of looking at familiar phenomena, seeing computer networks as ecologies, markets as social computers, and online communities as social minds. Originally a physicist, Huberman presents his findings in pages of mathematical equations. When I visited him in his office, he seriously agreed that "the Internet enables us to building collective intelligence."[65] At PARC, he had directed investigations of "the ecology of computation." As soon as I told him about smart mobs, he jumped up and exclaimed, "The social mind!" And he dug out a chapter on "The Social Mind" that he had published in 1995. Huberman thought it useful to think of emergent intelligence as a social computation:

> Intelligence is not restricted to single brains; it also appears in groups, such as insect colonies, social and economic behavior in human societies, and scientific and professional communities. In all these cases, large numbers of agents capable of local tasks that can be conceived of as computations, engage in collective behavior which successfully deals with a number of problems that transcend the capacity of any individual to solve. . . . When large numbers of agents capable of symbolic-processing interact with each other, new universal regularities in their overall behavior appear. Furthermore, these regularities are quantifiable and can be experimentally tested.[66]

The interesting statement is the last one. There have been varieties of theories about the Internet as the nervous system of a global brain, but Huberman and colleagues have made clever use of markets and game simulations as computational test beds for experiments with emergent group intelligence. The fall that I visited Huberman, he and his colleagues had used "information markets" to perform experiments in emergent social intelligence and found that group forecasts were more accurate than those of any of the individual participants' forecasts.[67] In information markets, members trade symbolic currency representing predictions of public information. The Hollywood Stock Exchange, for example, uses the market that emerges from the trading of symbolic shares to predict box office revenues and Oscar winners. The HP research team makes the extraordinary claim that they have created a mathematically verifiable methodology for extracting emergent intelligence from a group and using the group's knowledge to predict the future in a limited but useful realm: "One can take past predictive performance of participants in information markets and create weighting schemes that will predict future events, even if they are not the same event on which the performance was measured."[68]

Decades ago, computer scientists thought that someday there would be forms of "artificial intelligence," but with the exception of a few visionaries, they never thought in terms of computer-equipped humans as a kind of social intelligence. Although everyone who understands the use of statistical techniques to make predictions hastens to add the disclaimer that surprises are inevitable, and one of the fundamental characteristics of complex adaptive systems is their unpredictability, the initial findings that internetworked groups of humans can exhibit emergent prediction capabilities are potentially profound.

Another research group that takes emergent group intelligence seriously is the laboratory at Los Alamos, where a group of "artificial life" researchers issued a report in 1998, "Symbiotic Intelligence: Self-Organizing Knowledge on Distributed Networks, Driven by Human Interaction."[69] The premise of this interdisciplinary team is based on the view proposed by some in recent years that human society is an adaptive collective organism and that social evolution parallels and unfolds according to the same dynamics as biological evolution.[70] According to this theory, which I will revisit in the next chapter, new knowledge and new technologies have made possible the evolution of the maximum size of the functioning social group from tribes to nations to global coalitions. The knowledge and technologies that triggered the jump from clan to tribe to nation to market to network all shared one characteristic: They each amplified the way individual humans think and communicate, and magnified their ability to share what they know.

The Los Alamos team, looking at some of the same characteristics of the Internet that Huberman and his colleagues investigated and citing a range of research that has only recently begun to emerge as a discipline, claim that "self-organizing social dynamics has been an unappreciated positive force in our social development and has been significantly extended, at least in scope, by new technologies."[71] The Los Alamos group cited evidence for their hypothesis that the self-organizing social systems that have driven human social evolution will be enhanced by self-organized, distributed, information and communication systems. The research conducted directly by the Los Alamos researchers reinforced Huberman et al.'s claim that groups of humans, linked through online networks, can make collective decisions that prove more accurate than the performance of the best individual predictors in the group. If it isn't a dead end, the lines of research opened by Huberman's team, the Los Alamos researchers, and others could amplify the powers of smart mobs into entirely new dimensions of possibility, the way Moore's Law amplified the powers of computer users.

Will self-organized, ad hoc networks of computer wearers, mediated by privacy-protecting agents, blossom into a renaissance of new wealth, knowledge, and revitalized civil society, or will the same technological-social regime provide nothing more than yet another revenue stream for Disinfotainment, Inc?

Or is that the wrong question? Given the direction of the technological, economic, and political changes I have touched on so far, I propose the following questions:

- What do we know now about the emergent properties of ad hoc mobile computing networks, and what do we need to know in the future?
- What are the central issues for individuals in a world pervaded by surveillance devices—in terms of what we can *do* about it?
- What are the long-term consequences of near-term political decisions on the way we'll use and be affected by mobile, pervasive, always-on media?

I hope that the understandings I've shared from my investigations of the past two years make it clear that smart mobs aren't a "thing" that you can point to with one finger or describe with two words, any more than "the Internet" was a "thing" you could point to. The Internet is what happened when a lot of computers started communicating. The computer and the Internet were designed, but the ways people used them were not designed into either technology, nor were the most world-shifting uses of these tools anticipated by their designers or vendors. Word processing and virtual communities, eBay and e-commerce, Google and weblogs and reputation systems *emerged.* Smart mobs are an unpredictable but at least partially describable emergent property that I see surfacing as more people use mobile telephones, more chips communicate with each other, more computers know where they are located, more technology becomes wearable, more people start using these new media to invent new forms of sex, commerce, entertainment, communion, and, as always, conflict.

8

Always-On Panopticon . . . or Cooperation Amplifier?

There is need to reflect upon and discuss which social practices and relationships need to be sheltered from the pressure effects of global, commercial networking. At a time in which people are frantically trying to get connected, we would do well to ask: when and where does it make sense to remain unconnected? While leaving intact many of the burdens of the industrial/automotive era, we have come perilously close to achieving complete slavery to email, digital work, and the wired and wireless apparatus that surrounds us.

—Langdon Winner, "Whatever Happened to the Electronic Cottage?"

New technologies arise that permit or encourage new, richer forms of non-zero-sum interaction; then (for intelligible reasons grounded ultimately in human nature) social structures evolve that realize this rich potential—that convert non-zero-sum situations into positive sums. Thus does social complexity grow in scope and size.

—Robert Wright, "Nonzero: The Logic of Human Destiny"

Maybe You Should Refuse It

If the citizens of the early twentieth century had paid more attention to the ways horseless carriages were changing their lives, could they have found ways to embrace the freedom, power, and convenience of automobiles