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March 2010

Online at https://mpra.ub.uni-muenchen.de/21181/
MPRA Paper No. 21181, posted 7. March 2010 04:36 UTC

The Economy of Surveillance

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Once upon a time economic historians searched for industrial revolutions. Now they scout the past for information revolutions. They have found many: in Victorian England, eighteenth century Sicily, ancien régime Paris, the early modern Atlantic, the ancient world.[1] But what do we mean by information?

Economics treats information as rational knowledge that guides action, a definition that goes back to the nineteenth century. In the twentieth century, information lost many of these older Enlightenment connotations. In 1948 Bell Labs engineer Claude Shannon synthesized theories of information as any transmission that reduced uncertainty and resolved ambiguous states.[2] A letter,

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[1] On information in the past generally see Naomi Lamoreaux, Daniel M. G. Raff, and Peter Temin. "Beyond Markets and Hierarchies: Toward a New Synthesis of American Business History," *American Historical Review* 108 (April 2003): 404-33. John J. McCusker, "The Demise of Distance: The Business Press and the Origins of the Information Revolution in the Early Modern Atlantic World," *American Historical Review* 110 (2005), 295-321; Antonino Blando, "Informazione e Buone Ragioni: La Politica Economica Del Grano Nella Sicilia Del XVIII Secolo," *Quaderni Storici* 42 (2007), 111-131. On the early modern world, see Carlo Belfanti, "Guilds, Patents, and the Circulation of Technical Knowledge: Northern Italy during the Early Modern Age," *Technology and Culture* 45 (2004) 569-589. On the ancient past, see Peter Temin, "Financial Intermediation in the Early Roman Empire," *Journal of Economic History* 64 (September 2004), 705-33, On the contemporary significance, see Carl Schapiro and Hal Varian, *Information Rules: A Strategic Guide to the Network Economy* (Harvard Business School Press, 1998).

[2] Bernard D. Geoghegan, "The Historiographic Conceptualization of Information: A Critical Survey," *IEEE Annals of the History of Computing* 30 (Jan-March 2008), 66-81.

telegram, email, and for that matter, novel, painting and sculpture were reduced to media of communication trying to convey an idea or message. There need be nothing inherently rational in the content of these signals. Nor did the subjective experiences of the communicator and receiver matter. These became merely "noise" interfering with the intended message.[3] This stripped down theory is not wrong, but it is incomplete. It hides the architecture of knowledge needed to give bare facts meaning. It ignores such matters as disinformation, propaganda, lies, slander, gossip and irony—in other words, quite a bit of human communication.

Economists usually think of information as clear signals that have meanings all parties understand.[4] A turn signal on a car works because we know what a blinking light on the back of an automobile means (at least that's the theory). Lack of understanding indicates poor information. But information can also be conceived of as a sign. Signs have unstable meanings; their states cannot be resolved by simply adding more signs. Instead, they must be interpreted through some system of meaning.[5] The economics of information largely ignores hermeneutics, or the problem of interpretation.[6]

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[3] Herbert Simon was particularly influential in introducing this concept of information to economics and management. Hunter Heyck, *Herbert A. Simon: The Bounds of Reason in Modern America* (Johns Hopkins University Press, 2005).

[4] Kenneth Lipartito, "Business Culture," in Geoffrey Jones and Jonathan Zeitlin eds., *The Oxford Handbook of Business History*, (Oxford University Press, 2008), 620. On how information systems construct meaning see Jeffrey Fear, *Organizing Control: August Thyssen and the Construction of German Corporate Management* (Harvard University Press. 2005), appendix A and also introduction.

[5] Shannon's information theory looks only at the quality of the channel and does not deal with semantics. Friedrich Hayek argued that markets provide clear signals to actors, But Hayek also argued that entrepreneurs are skilled actors, whose tacit knowledge is crucial to economic growth and efficiency. If prices are merely one dimensional signals, then creative entrepreneurship is unnecessary and innovation impossible. If entrepreneurs have tacit skills and knowledge and are capable of innovation, then prices must be more like signs, subject to reading and interpretation.

The problem of meaning, and the limitations of standard information theory more broadly, brings us to surveillance. Surveillance denotes the means and methods of extracting, organizing, stabilizing, interpreting and circulating information. Although it is not itself an act of interpretation, it is a system of organizing information in a prescribed manner to yield meanings. The meanings constructed, however, are not neutral and universal—they are strategic. In its primary definition, surveillance means observation or knowledge of someone, but with the strong connotation of control. One conducts surveillance on another (a one way, rather than reciprocal act) for some purpose or objective. The observer decides what counts, what is recorded, and how it will be used. Traditional economic thinking assumes simply that more and better information yields transparent, equal economic relationships. In this way surveillance should eliminate informational asymmetry between parties, prevent opportunism and increase exchange. But surveillance may do the opposite, making relations less symmetrical, putting up a one way rather than transparent screen, allowing one party to exploit another.

Consider a thought experiment. Through exacting surveillance one person gains perfect knowledge of another, who has absolutely no information on the first. The informed party has tremendous advantage in any exchange, even to the point of revealing just those things the uninformed wants to hear. In another context, this

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F. A. Hayek, "The Use of Knowledge in Society," *American Economic Review*, Vol. 35, No. 4 (Sep., 1945), 519-530.

[6] Martha S. Feldman and James G. March, "Information in Organizations as Signal and Symbol," *Administrative Science Quarterly* 26(2), 1981, pp. 171-186, discuss the reasons organizations gather so much information using similar ideas. My point here accords especially with their section on surveillance and strategic motivations.

would be called a confidence game, a means of control and manipulation. Perfect surveillance thus increases opportunism, allows minutely refined strategizing. It may also provoke as a natural reaction resistance and counter-surveillance, as each party strives for informational advantage over the other. The winner will be the one with the best surveillance tools. Thus, to appreciate the effects of surveillance, we must ask who is seeking information on whom, for what purposes, using what assumptions, categories and methods to watch, observe and know.

Surveillance has economic value because information is not a free resource waiting to be picked up, ready to be used. It must be appropriated and organized if it is to do work—and the tools of surveillance are designed to do just these things. The economy of surveillance reflects the decreasing costs of watching, observing and gathering, storing and using information, a reduction which has been occurring these past hundred and fifty years or so. This shift of the supply curve has lowered the cost of surveillance, and given those with access to its technology increasing advantage over those without. But while the direct costs of producing information about people has fallen, the social costs of this activity have risen. There are real consequences to living under ever refining optic of surveillance, externalities not captured in standard economic models. These costs have important ramifications for what life will be like in a world where surveillance grows cheaper, easier and more commonplace.

Origins

Although investigation, inquisition, interrogation, and watching, observing and no doubt peeping and gossiping have occurred throughout history, surveillance as a general, continuous, institutionalized practice is relatively new. Only about two hundred years ago were lives individualized, identified and recorded in ways we take as routine today. Until the seventeenth century, and much later in many parts of the world, people lived out their existence unseen and largely unaccounted for by the state, except in a few circumstances. Much of life, even economic life, was local, spent in face-to-face relationships. Although merchants and traders constructed more extended economic associations, these too were personal—networks of far-flung family members, or members of the same ethnic or religious group with whom one could do business. Abstract forms of knowing through written or numerical accounts were only partially reliable, when they were available at all, and did not penetrate deeply into individual lives. The Domesday Book recorded the land holdings of England's tenants-in-chief in the 11th century, but did not identify the majority of the population. Even for large estates it provided few details about their operations. In early modern Europe, private accounts and journals of economic activity were deeply embedded in the cultures of the communities that created them.[7]

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[7] V. H. Galbraith, *The Making of the Domesday Book* (Clarendon Press, 1961). In creating the Domesday Book, a fair amount of economic detail was gathered on people, land and livestock, but most of this was discarded when compiled into the book itself, a significant distinction when it comes to surveillance. On merchant accounts, see Daniel Rabuzzi, "Eighteenth-Century Commercial Mentalities as Reflected and Projected in Business Hand Books," *Eighteenth-Century Studies,* 29/2 (1995-96): 169-189; Natalie Zemon Davis, "Religion and Capitalism Once Again? Jewish Merchant Culture in the Seventeenth Century," in Sherry B. Ortner (ed.), *The Fate of "Culture": Geertz and Beyond*. **(**University of California Press, 1999), 56-84. See Mary Poovey, *A History of the Modern Fact:*

In the eighteenth century, information practices began to change, in some cases dramatically. States developed extensive apparatus for keeping track of populations, a consequence of territorial expansion and routine, extended economic relationships. Anthony Giddens argues that modern states are vast information collecting, storing and sorting machines. These capabilities, he notes, allowed them to increase their control across space and over time.[8] They aided administrative practice and provided a new medium of surveillance by allowing the encoding, storage and retrieval of data in new ways--through lists, dossiers, files. As the techniques of surveillance grow, states are able to penetrate more deeply into the day-to-day lives of people.[9]

Michel Foucault also finds the modern state connected to surveillance, though in a somewhat different manner. Where Giddens sees a growing capacity for external monitoring of people, Foucault emphasizes internalization, through new disciplinary institutions that regulate subjects into good citizens, workers, patients and pupils. Though discipline is internalized, surveillance is necessary to the process. Thus the master metaphor of the Panopticon, Bentham's utopian prison. Inmates never know when they are under the gaze of the warder. This uncertainty forces them to internalize the moral code of good behavior. Where Giddens stresses

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Problems of Knowledge in the Sciences of Wealth and Society (Chicago, 1998), 29-65 on how accounting came to represent accuracy and regulate credit in the early modern period.

[8] Giddens follows in the tradition of Harold Innis, who argued that light media—paper, electrical signals—are easily moved and conveyed, and thus permit a greater geographical span of control. Messages written on paper, for example, can be carried throughout the empire, in ways that messages written on stone cannot. Harold Innis, *Empire and Communications* (University of Toronto, 1974); *The Bias of Communications* (University of Toronto, 1951).

[9] Anthony Giddens, *A Contemporary Critique of Historical Materialism* (Berkeley, 1983), 91-97. Modern states using surveillance methods can develop a level of control approaching totalitarianism, something not possible even in the most despotic of old regimes.

continuous monitoring and recording of behavior, Foucault observes that, "surveillance is permanent in its effects, even if it is discontinuous in its action."[10]

Foucault also emphasizes the expressive potential of surveillance, in contrast to Gidden's focus on state monopoly of violence. Humans are shaped in accord with structures of knowledge and claims of truth, and not merely repressed. This too requires surveillance—to segment, categorize, rank, and separate individuals, so as to construct "an analytical grid that allows comparison, experimentation and intervention." These micro technologies of power, Foucault argues, are most effective when they are small, discreet and incremental, operating less through command and control and more through "regulation and norms." In this regard, surveillance is not just about the control of mass society, but the creation of individuality out of masses—the targeting of people, be it for therapy and incarceration or credit, insurance, advertising and sales campaigns.

Surveillance is a strategic power; it is used for control and discipline. But it also promotes social inclusion--sometimes whether we want it or not. In extending connections beyond physical presence, it enables, in the classic formulation of Georg Simmel, a "society of strangers."[11] We interact with others, though we do not know them in a direct, face-to-face sense or share with them ties of affinity. Where we know little personal and individual about others, we rely on impersonal data, lots of it, which we gather by surveillance. One might object to the loss of privacy implied

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[10] Michel Foucault, *Discipline and Punish: The Birth of the Prison*, Alan Sheridan trans., (Pantheon, 1977), 201.

[11] Georg Simmel, "The Stranger," in Kurt Wolff (ed.), *The Sociology of Georg Simmel* (Simon and Schuster, 1964).

here, but to be excluded from the files of society is even worse. Few social institutions account for illegal immigrants—the "undocumented." Lack of documentation makes it extremely difficult to obtain work, credit, housing and education, in short to participate in society.[12]

The Production of Surveillance

Both Giddens and Foucault take account of what can be called the economics of surveillance—the cost of getting, recording, classifying, storing and retrieving information. For Giddens, the falling cost of these activities increases the power of states to act at a distance and over time—to manage society. For Foucault disciplinary power must be achieved easily and at low cost, so that it may circulate widely and continuously.[13] It is precisely the nonchalance with which institutions operate, automatically, in self regulated fashion, and the ubiquity of discipline that distinguishes power in the modern sense from pre-modern forms. The production of surveillance to be pervasive yet unobtrusive, routine and integrated, yet specific and discriminating, requires a great deal of machinery and organization.

The history of writing and printing indicates how difficult it can be to assemble this machinery. Foucault and Giddens both identify writing as a tool for administration and control. But while writing seems fast, efficient and transportable, alone it may not increase surveillance. As Michael Clanchy argues,

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[12] One should avoid overuse of the word "trust" to describe the inclusive powers of surveillance, for trust carries equalitarian connotations, as in the traditional economic thinking about information and transparency. While surveillance permits social interaction among otherwise anonymous or weakly linked parties, this does not necessarily mean equality. A superior can benefit from surveillance in monitoring the work of a subordinate, instead of relying on trust.

[13] Paul Rabinow, ed., *The Foucault Reader* (Pantheon Books, 1984),138.

the power of the written word did not lie in the basic "technology" of inscribing, but instead required a host of related changes in knowledge and practice before written documents were accepted as the definitive source of information.[14] It is not enough to write things down, moreover. There must be a fast and efficient way to store and retrieve what is written. In the eighteenth and nineteenth centuries numerous new tools appeared to aide in use of the written word: indexes, handbooks, codices, concordances, glossaries, encyclopedias, standard contracts, account books, typewriters, carbon paper and filing cabinets.[15] Logs, charts, and tables reduced informational costs by permitting functionaries to quickly and consistency supply or access data. Standardized forms (and the all too familiar box to tick) specified the data to be collected, reducing the need for skill, expertise and judgment. Indexing, alphabetizing, and pagination assisted in quickly finding the information desired. Registers showed the location of records and provided an overview of their contents. By classifying, standardizing and codifying information, it became possible to create databases, or useful derivatives of raw information. By establishing protocols for connecting databases, it became possible track people and things over distances, across borders and through time using records alone.[16]

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[14] Michael Clanchy, *From Memory to Written Record: England 1066 – 1307* (Wiley-Blackwell, 1993). With regard to printing, contrast Elizabeth Eisenstein and Adrian Johns. See Elizabeth Eisenstein, "An Unacknowledged Revolution Revisited," *American Historical Review* 107 (February 2002), 87-105; Adrian Johns, "How to Acknowledge a Revolution," *American Historical Review* 107 (February 2002), 106-125; Eisenstein, "How to Acknowledge a Revolution: A Reply," *American Historical Review* 107 (February 2002), 126-28.

[15] Daniel Headrick, *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution*, 1700-1850 (Oxford, 2000). Some of these tools and techniques had existed earlier, but the means of representing knowledge were of a new scale.

[16] Pamela Sankar, "State Power and Record-Keeping: The History of Individualized Surveillance in the United States, 1790-1935," PhD diss, University of Pennsylvania, 1992, pp. 9-12

All of this happened, but it did not happen simply because of literacy or printing or any single tool, technology or technique. Some of the most important parts of the machinery of surveillance were the "linking devices" that changed accessibility to information already in place. In the 1890s, James Rand founded a company around a system for filing, storing, and retrieving written documents. He sold purpose built cabinets and extensive instruction manuals on the hows and whys of good filing. File cards had been shown superior to bound codices and loose papers by Melville Dewey, an advocate of the library card catalogue and inventor of the indexing system that bears his name. Rand's company merged with Dewey's Library Bureau, providing not only the hardware (cards, cabinets) but software, in the form of filing systems, and training in their use. As JoAnne Yates has shown, an industry dedicated to the file and storage of written information emerged.[17]

The last half century has added the ability to create, capture and manipulate sound, images, and text in digital form—a significant improvement to be sure, but not, I would argue, fundamentally out of trend with the previous century. This is not to underestimate the digital revolution, but to emphasize that surveillance requires a collection of techniques to work properly. The extent of surveillance cannot be judged by its most sophisticated feature alone.

Authors Kevin D. Haggerty and Richard V. Ericson believe that we should think in terms of a "surveillant assemblage" of heterogeneous objects. Machines, bureaucracies, and categories of knowledge come together to enable surveillance.

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[17] JoAnne Yates, *Control Through Communication: The Rise of System in American Management* (Johns Hopkins University Press, 1989). Also James Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Harvard University Press, 1986). For more on Rand and his operations, see the collections at the Hagley Museum and Library.

Thus, to take a contemporary example, cameras on the street, government ministries, private security agencies, classifications based on behavior (or ethnic and racial profiling), caches of past images, and sorting and matching software are all parts of an assemblage that makes Great Britain's enormous network of security cameras possible.[18]

In general, an assemblage must perform the following functions if it is to enhance surveillance: identification, memorialization, standardization, and classification. These are the operational protocols, the interfaces that allow scattered bits of data about people to gel into representational portraits that can be tracked over time and space. Not just technical matters, they are best seen as the social infrastructure of surveillance.

Unless one person can be distinguished from another—identified--surveillance has little value, no matter how refined the optic. If one is observed, but not identified, one is in a sense, invisible. As Foucault puts it, identity creates a "field of visibility." In a like manner, fixed identity makes tracking by information possible. Most European states began fixing identities in the early modern era, taking over these functions from churches, or incorporating parish records into a civil system. By the nineteenth century, many Western nations had worked out clear rules and standards for assigning names and addresses.[19] Over time the number of identifiers has grown. Passports, fingerprints, social security numbers,

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[18] Kevin D. Haggerty and Richard V. Ericson "The Surveillant Assemblage," *British Journal of Sociology* 51 (December 2000), 605–622.

[19] Jane Caplan and John Torpey, eds., *Documenting Individual Identity: The Development of State Practices in the Modern World* (Princeton University Press, 2001).

working papers, personnel files, credit histories, bank accounts, property and mortgage records all identify. Universal assignment of social security numbers at birth only came about (with much controversy) in the late 1960s in the United States. The social security number quickly became the favorite starting point of the identification matrix required for working, owing a home, borrowing money, and participating in society in other ways.

Identification makes us visible, but visibility is of limited significance if the information quickly disappears. Surveillance needs a memory. Memorialization adds the dimension of time to surveillance, building archive that reaches into the past and projects into the future. Early promoters of fingerprinting, for example, wanted to construct a record or case file on individuals who ran afoul of the law. Such record keeping was central to their project of policing society--either by reforming criminals through careful attention to their case histories, or by incarcerating repeat offenders for longer and longer periods of time. Fingerprints both identified subjects and left a record that could be checked in the future.

The epitome of memorialization in the bureaucracy of surveillance is the dossier. In simplest terms, a dossier is a bundle of papers or documents with a label. The power of the dossier derives from its heterogeneous nature—it may contain anything one wants to know of a subject. This also makes it unwieldy to use, but what the dossier lacks in facility it makes up for with completeness. Presumably almost anything about a life could be reconstructed if the dossier were thick enough.

It is not necessary, though, that files grow thicker in one central place for memory to operate. Dispersal can have the same effect—protecting memory by

keeping information in different places. Over the past fifty years, the cost of dispersing information—in essence communications—has gone down dramatically. To take one striking example, a "fact" about a person, truthful or not, that makes its way on to the internet may never be erased, as it is repeated in website after website, turning up in search after search.

At their most advanced, files are easily accessed, well maintained and up-to-date. When names and addresses existed only in parish baptismal files, they had little surveillance value. Even if these records established identities, they could not be easily accessed, and they were not updated. Thus name changes or movement away from place of birth threw a cloak of invisibility over subjects. One of the first things that states seeking greater knowledge over people did was to centralize files and issue identification papers that had to be updated or filed again after every move.[20]

Even when people carry fixed identities and have up-to-date files, the gears of surveillance can slip, the wheels bog down. The more information that is available, the more difficult it may be to retrieve what is desired, to sort the useful and valuable from the irrelevant. When files about people exist, but cannot be located or are expensive to call up, then people once again become invisible to those seeking to follow and monitor them. Standardization and categorization help to overcome the problem of information overload.

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[20] For examples, see Caplan and Torpey, *Documenting Individual Identity*, "Part One: Creating Apparatus of Identification."

Bureaucracies work by enacting a set of relatively simple and repeatable rules and routines. Much as we hate red tape, far worse is a bureaucracy where the rules are uncertain, the routines missing. Picture yourself standing in line at your local department of motor vehicles. Now picture yourself there with no clear rules for obtaining your license, no form to fill out, indeed, no lines for queuing. The infamous standardized forms that are the depressingly common feature of any bureaucratic experience—in the hospital, in school, or at work—are ways of extracting and standardizing information.[21]

Standards structure data, separating the signal from the noise, or more exactly, determining what is signal, what noise. In the same way they render us visible and tractable subjects when used in the context of surveillance. When we give answers to questions on the form, we come under the scrutiny of those who wrote the questions and designed the form. We become visible to them by our answers. Even failure to answer puts us under the light, for we become an anomaly, standing out from the crowd. In either case, we reveal ourselves in ways useful to those seeking to know.

The final piece of the social infrastructure of surveillance is classification. Like standardization, classification structures data. It acts as a grid "that transforms undifferentiated behavior into appropriable artifacts, or information."[22] In policing the extreme example is racial or ethnic profiling. But even the division of people for more benign purposes enacts a classification scheme: the targeting of social groups

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[21] On a related matter, see Atul Gawande, "The Checklist," *The New Yorker*, December 10, 2007.

[22] Sankar, "State Power and Record Keeping," p. 79.

by advertisers, the division of the credit market into high and low risk segments. By the grid of classification we are known and seen.[23]

These social tools of surveillance multiply the power of any one surveillant technique. Without identification, it becomes difficult to link information to subjects, no matter how powerful the processing device. Without a dossier, information exists only in the immediate present. Without standardization and classification it is hard to know who should be observed (making observation expensive) or what should be done with the information obtained.

Interlocking social, intellectual and physical apparatus also gives surveillance a momentum. The more that life entails production of personal documentation, the more artifacts there are to operate on. Imaginative administrators of organizations are constantly seeking new uses for personal data in ways that extend what they can know and see.[24] The resulting system of surveillance is not nearly so top down as those imagined in classic stories about totalitarianism. Orwell's *1984* is rooted in the technology of the World War II era—a telescreen run by a central government bureaucracy. Today's assemblages cut across the private and public sectors, and survey many aspects of behavior, but only at certain times. Despite the density of the network, one comes under its gaze only at fleeting moments. The very flexible, heterogeneous nature of an assemblage, however, means that it can grow and branch in ways not totally planned or predicted.

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[23] Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things Out: Classification and its Consequences* (MIT Press, 1999). Beniger, *The Control Revolution*, 16, makes a similar point about governing "people as things," is a way to reduce the information needed to control them.

[24] James B. Rule, Douglas McAdam, Linda Stearns, and David Uglow, " Documentary Identification and Mass Surveillance in the United States," *Social Problems* 31 (December, 1983), 222-234.

This sort of unplanned (in the top down sense) surveillance growth took place in the United States in the 1970s. Government agencies added new computer functionality to their mainframes, which had been installed earlier to take care of routine, but labor intensive record keeping and accounting tasks. Motivated by a combination of executive branch initiatives and inner bureaucratic decisions, agencies began to share and link files. Their initial thought was to improve services to their clients--recipients of social security, welfare, or veterans benefits. The linking, however, provoked an unexpected backlash—it was the era of Watergate--and prompted federal investigations into the question of privacy. Eventually, in 1974, Congress passed the Privacy Act, designed to rein in government surveillance. But the law did little to stop the linking and matching of files, as agencies simply made it a matter of internal policy to share data with each other. Short of continual oversight of routine operations, it is extremely difficult for law and legislation to check this sort of bureaucratic surveillance, when the technology and operations are built right into the organizational structure.[25] The whole episode also shows how even when the manifest purpose of an information technology is narrow, it can have latent potential that managers will capitalize on when they seek to maximize the efficiency and utility of expensive equipment.

Privacy and The Costs of Surveillance

[25]The records of the U.S. Privacy Commission hearings can be found in the Willis Ware Collection, Charges Babbage Institute, University of Minnesota, Minneapolis, MN. In subsequent investigations of private surveillance, the Commission determined that no further legal protection of privacy was warranted, although private organizations had begun using the same techniques.

In one regard, surveillance is like any other product or service: it has costs and it yields benefits. But just as some goods have external effects that harm the natural environment, so surveillance spins off externalities that degrade the social environment. A full accounting of surveillance should include the costs borne by those from whom information is taken.

The economics of information acknowledges some production costs. They are internalized when information is treated as property, protected by patents and copyrights. But surveillance does not generally involve matters of intellectual property. Although forms of information may be owned (recordings, databanks, graphics, novels), information about oneself generally is not protected, or is protected only in specific instances.[26] Photographers may not sell your picture without your say-so, but anyone can mine public data to gather information about your address, your car registration, your date of birth, your marital status, and the like. The fact that this information is about you does not give you a right of property over it. Financial data enjoys greater protection, but applying for a loan, using a credit card or obtaining a mortgage enters your information into the credit surveillance network, which largely works by sharing data across different institutions: from banks to credit card companies, to credit reporting bureaus, to insurance firms. Although this information intercourse is not frictionless—there are certain requirements of consent, possibly certain privacy laws to negotiate—

[26] In 1896, the courts ruled that compiled information belongs to sellers not buyers or subjects. Ladd v. Oxnard, 75 *Federal Reporter* 703.

participation in the economy at all but the cash level generally requires that one give consent early and often.

The discreet bits of information themselves are less the issue than the ability to combine and connect them to form new information. Privacy laws are weakest here, particularly when private information given by consent is matched to publicly available data for which no consent is necessary. Information so gathered, stored, and manipulated may be used in decisions about loans, to design marketing and advertising campaigns, in background checks for employment. Although the data may have been obtained freely, once it is structured for these purposes, it can be deemed proprietary and hence protected by law.

All this, according to Richard Posner, is largely a good thing. Privacy in the economic sense, he argues, is concealment of information. When information is withheld or concealed, people act opportunistically or fraudulently, undermining contracts and inhibiting the workings of the market. By this logic surveillance, which increases the circulation of information about people, yields greater transparency and reduces risk, promoting market exchange.[27]

Posner's argument rests on the traditional assumptions about information. More information is good, thus anyone seeking to restrict information must be doing something bad. He overlooks the strategic nature of surveillance. Though opportunism may result when someone restricts information about his or her intentions, as argued above it may also arise when one party has thoroughly

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[27] Richard A. Posner, "The Economics of Privacy," *The American Economic Review*, 71 No. 2, Papers and Proceedings of the Ninety-Third Annual Meeting of the American Economic Association. (May, 1981), 405-409.

surveyed the other, and obtained an informational advantage. Seen in this light, privacy may maintain rather than break information symmetry and promote rather than subvert fairness in market exchange.

Those who see no problem with increased surveillance also tend to ignore the costs borne by those surveilled. Consider mistakes, or inaccurate information. The surveiller or the surveillee (or both) may suffer the consequences of bad information, as for example in denying credit to someone who should have received it. But who pays for correcting errors—for verification? In theory, firms should have incentive to avoid mistakes and perform verification, since they bear some of the direct costs of misinformation, in the form of Type I or Type II errors. But their stake in accuracy is limited to the cost of a mistake in a discreet transaction. It thus may actually be less expensive for them to suffer individual mistakes than to verify every case. The falling cost of data processing increases a firm's client population, and hence reduces the weight of any one error in the portfolio. With a sufficiently large population, errors will be randomly distributed. For subjects, on the other hand, costs extend beyond a single transaction. The falsehood lodges in their surveillance dossier and follows them onward. They suffer reputational damage.

The past fifty years have seen tremendous decreases in the cost of information processing, but has there been equal progress in verification? There is reason to believe not. Much verification has to be done case by case—the exceptions, not the mass processed rule. Verification also raises thorny epistemological issues. If your initial observation was wrong, how many more observations should you make to be sure you are right? Uncertainty is particularly

bedeviling when information and verification of information comes through the sharing of files among organizations—banks, credit card companies, credit reporting bureaus—which employ different standards.[28]

Damage to reputation attaches to the individual, but there are also social costs of surveillance The Panopticon, recall, was powerful not because one was constantly under scrutiny, but because one never knew. In a like manner, Orwell reckoned the power of the Thought Police derived from the population's fear that every word, deed, idea and feeling would be known. As he brilliantly observed, one had to work hard to avoid Thought Crime by suppressing logic, missing obvious analogies, and avoiding clear evidence. Without privacy, one lives in a state of insecurity, a condition oppressive to the individual, but destructive of social capital more broadly.

The danger to social life from surveillance was recognized by the end of the nineteenth century, as new, more powerful techniques of observation and recording emerged. Under the influence of Louis Brandeis, privacy shifted from protection of property and assets to protection of the social environment.

Changes in the technology of surveillance motivated Brandeis's 1890 *Harvard Law Review* essay "The Right to Privacy," penned with his law partner

[28] One way of mitigating the externalities of surveillance, it might be argued, lies in compensating those to whom harm is done. Remedy would be found in tort law, the protection of one's reputation as a valuable asset. Courts are an expensive and cumbersome way to correct misinformation and protect reputations, however, and given these costs only the wealthy are in a position to use them. To the extent that reputation has an economic value—and hence the damages against reputation can be measured in financial terms—the poor or less than famous are unlikely to reap much of financial compensation even if victorious at trial.

Samuel Warren. [29] The immediate influence on their work was the shabby exposure of Warren's personal life in the press. Mass circulation newspapers, enabled by reductions in printing costs with rotary steam presses and new typesetting machines, quickly took advantage of other innovations, notably photography, photoengraving and telegraphy, to bring scenes of everyday life into the homes of more people than ever before. Cheap printing of newspapers, electrical transmission of the news, national wire services, and easy reproduction of photographs made the printed news an item of mass consumption on a national scale. The penny press relied on a large circulation, appealing to the widest audience, using the juiciest stories to attract an avid readership, which provided the basis for high advertising revenues. Competition among big city dailies motivated newspapers to display all sorts of details about people's lives. Fast, cheap and efficient methods of communications assured that much of the nation would hear about it. Of course, the surveillance net cast by newspapers was selective--only certain details of certain lives in certain circumstances merited attention. Only the things that would help to sell papers. A murder or sex scandal yes, a mundane event in the life of an average soul, no. But for those details that fit the mesh of surveillance, newspapers, photographs and related apparatus sent information traveling farther and wider than gossips ever had.

Leaving aside any direct economic loss suffered by victims of unwanted attention, Brandeis argued that people had a right to their thoughts, feelings,

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[29] On the history of this famous document see "The Right to Privacy in Nineteenth Century America," *Harvard Law Review*, Vol. 94, No. 8. (June, 1981), 1892-1910.

sentiments, and emotions. The powerful machinery of the press collapsed the space for quite repose and reflection. There might be nothing new about gossip, but its speed, scale and intensity through the circulation of publicity had deep social consequences. It "lower[s] social standards…belittles and perverts...by inverting the relative importance of things, thus dwarfing the thoughts and aspirations of a people. No enthusiasm can flourish, no generous impulse can survive under its blighting influence."[30] Surveillance in modern life, driven by not just technology but the economics of large scale production, degraded the public sphere and threatened civic life. It took away the possibility of secure interaction among people who knew and trusted each other—Brandeis's cherished alternative to the modern world of mass society and large scale production.[31]

Despite Brandeis's efforts to calibrate a new right of privacy for the age of publicity, law has proved a weak barrier against the tidal surge of surveillance. Even today, it is the sand in the gears of the system that limits surveillance's social and personal costs. We live in a moment of grace from total surveillance because the cost of collecting data has fallen faster than the cost of sorting it out. This imbalance creates a fragile bubble of anonymity.

The history of information processing suggests that if inefficiency is protecting privacy, privacy will not be long for this world. Inventors and users of data have strong incentive to develop techniques that lower not just the collecting

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[30] Louis Brandeis and Samuel Warren, "The Right to Privacy," *Harvard Law Review,* Vol. IV, No. 5 (December 15, 1890), 193-220, quoted at p. 196.

[31] Gerald Berk, "Whose Hubris? Brandeis, Scientific Management and the Railroads," in Kenneth Lipartito and David Sicilia, eds., *Constructing Corporate America: History, Politics, Culture* (Oxford University Press, 2004), 120-146.

costs, but the storing, sorting and using costs of information as well. This includes resistance by those from whom information is collected. As Foucault presciently observed, surveillance is most powerful when it is simple, ordinary and unobtrusive. Large and obvious methods of gathering information draw the most fire from critics, creating incentives for the production of small and obscure methods.

Surveillance, Privacy and Credit

All these tendencies in the history of marketplace surveillance are clear in the example of credit reporting. Credit agencies today maintain perhaps the most extensive private files on the lives of ordinary people. They manage a mesh of surveillance that touches almost all aspects of our economic lives. As a case study of how economic surveillance grows, credit reporting is particularly illuminating for two reasons. First, it follows the process of spatial expansion, which as Giddens notes is often the motive behind surveillance. Secondly, it shows that while surveillance collects information, it does not promote in any simple sense objectivity, rationality or transparency.

The word credit comes from the Latin for trust. Trust is often based on complex webs of social relations: blood ties, religious affinity, ethnic identity, community solidarity. But surveillance extends itself because these traditional ties are no longer adequate, or at least must be supplemented to deal with the increased speed, complexity and geographical extent of economic relationships. While some have argued that credit reporting renegotiates trust in an impersonal world, I would argue that it replaces the emotional connections that once bound people in relations

of trust with a putatively rational means of calculating risk. Such calculation depends heavily on surveillance, or the ability to penetrate the mind of others and make their behavior predictable and governable. It is a form of control, not a measure of trust.

In the United States, credit reporting first appeared in the 1840s, a moment of market growth and expansion. In the nineteenth century (and until the 1970s) agencies used investigation to verify character and regulate the extension of capital. Agents sought out information on those seeking money and wrote reports that were sold to merchants, bankers and other would-be lenders. Early credit agencies, however, did not so much replace traditional ethnic, family and community methods of establishing trust, as build off of them.[32] Indeed, as Scott Sandage has noted, nineteenth century credit reports frequently did little more than codify gossip and repeat stereotypes and clichés.[33] A typical negative report from the 19th century might read "drunk and of no account." This was easily understood as "you do not want to lend money to this person." Why bother with euphemisms when the object to was give the lender the same sense of the person they might form if they had met them face to face? Even positive reports mapped the stereotypes of the time. One credit agent from New Orleans entered this in his report about a partnership of two

[32] The connection between local culture and the systematic methods of credit bureaus is made by Rowena Olegario, *A Culture of Credit: Embedding Trust and Transparency in American Business*. (Cambridge, MA: Harvard University Press, 2006), 119-138.

[33] Scott Sandage, *Born Losers: A History of Failure in America* (Harvard University Press, 2005).

Jewish brothers: "Both are Jews, keen & wide awake (as much so as any other two of that mysterious people that the sunlight has ever shown upon.)"[34]

Still, if the reports themselves did not offer content or comment that was particularly new or innovative, collectively they fed into a reporting apparatus that presented this old content in ways accessible to those living far from potential borrowers (or living in different social contexts). Their value came in the arrangement of information in a centralized set of books or ledgers with standardized protocols for use and access. Organization transformed local gossip and prejudice into systematized intelligence. Gradually, credit reporting established correlations between observed behavior or traits and likelihood of repayment.

People of the time quickly realized that this new organization of knowledge marked a departure from traditional social relations. They saw not trust but an "American Inquisition." *Hunt's Merchant's Magazine* warned the public, "A thousand folios include a page or two or more about you and your affairs, without your knowledge or your consent. Go where you may to purchase goods, a character has preceded you, either for your benefit or your destruction."[35] Critics lambasted the 'diabolical Jesuitism" of a system that inquired into "the associations, the business, the family, and the personal habits of every man engaged in trade."[36] Others

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[34] Quoted in Rowena Olegario, "That Mysterious People": Jewish Merchants, Transparency, and Community in Mid-Nineteenth Century America, *Business History Review*, Vol. 73, No. 2 (Summer, 1999), 161-189.

[35] *Hunt's Merchant's Magazine and Commercial Review* (New York), 1853, quoted in Josh Lauer, "From Rumor to Written Record: Credit Reporting and the Invention of Financial Identity in Nineteenth-Century America," *Technology and Culture* 49 (April, 2008), 301-24.

[36] George G. Foster, *New York Naked* (New York: DeWitt & Davenport, [185?]), 119, quoted in Lauer, "From Rumor to Written Record."

bemoaned the lack of safeguards for accuracy and the high likelihood of incompetence by poorly paid agents.

Supporters countered that honest businesspeople had nothing to fear, employing the time honored justification of surveillance that sweeps up the innocent and guilty alike. The founder of the first American credit bureau, Lewis Tappan, argued that he was simply doing the same thing "as merchants usually employ—only on an extended plan—to ascertain whether persons applying for credit are worthy of the same and to what extent."[37] It was, however, the extension and systematization that made all the difference. Herein lay the most profound criticism—not that the information was incorrect, but that it established a single national standard of behavior, ignoring the complexity of local conditions. How, skeptics wondered, could a single system "be devised . . . to overcome, or accurately anticipate, conditions and circumstances so complex and variable?"[38] The answer was that credit reporting determined what counted and why. It did not extend the lines of trust based on first hand knowledge and experience—a personal relationship—but rather instituted a system of monitoring and control that standardized and regularized behavior. The power of inscribing and interpreting lay with the surveillers, whose level of information grew relative to the surveilled.[39]

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[37] "Mercantile Agency," New-York City and Co-Partnership Directory for 1843 & 1844 (New York: John Doggett, Jr., [1843]), n.p., quoted in Lauer, "From Rumor to Written."

[38] Thomas F. Meagher, *The Commercial Agency "System" of the United States and Canada Exposed* (New York, 1876), 6-7.

[39] Those seeking credit may well have benefited by being seen and revealed. As I noted earlier, surveillance has a dual valence, and to be left out may be worse than being pulled in. But several important court cases in the nineteenth century challenged the power and authority of credit agencies to determine who was deserving of credit. See Beardsley vs. Tappan, U.S. Supreme Court; Billings vs. Russell, Supreme Jud. Court, Mass.; Ormsby vs. Douglass, Court of Appeals, N.Y.; The

Reform of credit reporting did not focus on issues of strategy and power, however, but rather aimed to promote greater accuracy, fairness and objectivity. In one sense, of course, this was just. Through the 1960s and 70s credit investigators continued to construct their files through investigation, routinely questioning landlords about the drinking (or drug use) habits of young men with long hair, or asking neighbors about the private lives of women who had male guests in their rooms.[40] A few nosy neighbors might be enough to get a credit card revoked, an insurance policy cancelled. Such subjectivity came in for strong criticism. Women denied credit because they lacked work histories or were presumed to be dependents of their husbands, and African Americans suffering prejudices about their character spurred legislation in the 1970s aimed at fair and open credit.

Credit agencies responded by emphasizing the objective nature of information derived from computer databases. By the mid 1970s, credit reporting relied far less on character or background and almost completely on a pattern of life revealed by one's transactions history. Computers and communications technologies were making it possible to collect more information on more people from more places than ever before. Banks and credit card companies used these early computer networks to keep track of their customers' financial records and verify charges. Such data, in machine readable form, was soon being used by new

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Commonwealth vs. Stacey, Court of C.P., Pa, reprinted in *Reports of the Four Leading Cases against the Mercantile Agency for Slander and Libel* (New York: Dun, Barlow and Co., 1873).

[40] For a classic example, see Millstone Testimony, 3 August 1976, Credit Card and Payment Authorization Services Files, Privacy Commission Hearings, Willis Ware Collection, Charles Babbage Institute, Box 4, folder 22.

"automatic" or computer and statistics based credit agencies, such as Retail Credit Corporation (today Equifax), and other companies that would grow into its competitors, Transunion and Experian.[41] These credit agencies in turn benefited from the criticism directed at traditional investigative or "gumshoe" operations, which reported local prejudice and gossip into their files. The information that determined risk was now strictly behavioral: one's pattern of financial activity, updated on a daily, even hourly basis, rather than some stable, if highly subjective notion of character and worth.

As the history of credit reporting shows, the answer to criticisms of surveillance has frequently been, more surveillance. Or a different form of surveillance. When fair credit laws undermined traditional evaluation practices, companies moved to their new, impersonal systems. When laws banned the use of race and gender, other categories were deployed to regulate credit. But credit based on a pattern of transactions, continually updated by the latest data from credit card companies, banks and the like, also set up a much denser and more extensive network of surveillance.

The new credit surveillance did not, as supporters claimed, produce pure, uninflected information either. To operate, surveillance always needs a grid or frame with which to filter information. If it is not drinking habits, hair length, religion, race or gender, it must be something else: payment history, use and amount of available credit, number of loans. One becomes known through one's place in a grid of behavioral categories. Once the predictive quality of such

[41] This change can be followed in the Credit Card and Payment Authorization Services Files, Privacy Commission Hearings, Willis Ware Collection, Charles Babbage Institute.

categories has been established, they become hard to escape and nearly invisible as devices of social regulation.

For example, when race was considered a legitimate category for making insurance and lending decisions, African Americans were shunted into less desirable housing and had more difficulty securing loans. The elimination of race from the surface of credit reporting did not mean that race disappeared, however, only that it was submerged into other categories.[42] Decisions about credit, insurance and mortgages made through complex algorithms still included categories that correlated with race, such as address, income level, existing credit level, or past financial behavior. Yet race itself never appeared in the new models, making it actually harder to eliminate from decisions. When the old, subjective models took race and other social variables explicitly into account the effects of prejudice were obvious. The new models offered a pretence of objectivity that nonetheless mapped all sorts of hidden social categories. In the end, surveillance has no value if it cannot discriminate or aid decision making in some way.

Surveillance and the Information Economy

Surveillance is integral to the modern economy. It appears most prominently in the most informationally rich sectors, such as banking, insurance, and advertising, or among the most information intensive business functions—financing, accounting, comptrolling, marketing. In fact, if firms are conceived of as organizations for

[42] See Louis Hyman, "Debtor Nation: How Consumer Credit Built Postwar America," PhD diss. Harvard University, 2007.

processing and circulating information, surveillance inheres in the very constitution of the corporation. Decentralized managerial structures break down tasks to measurable, calculable units, thus permitting executives to monitor performance and assign responsibility for outcomes to individuals—the heads of the divisions.[43] The lean production methods developed in Japan and transferred around the world increased efficiency by continually identifying and eliminating slack in the system—a better means of surveillance on the line.[44]

Recent attempts to rethink organizational structures in the age of information sometimes miss or obscure the crucial role of surveillance. For example, in one of the most sweeping statements about the implications of a "post modern, post Fordist" world dominated by information, Manuel Castells predicts an end to centralized bureaucracy and the liberation of workers from dull, supervised routine. The new network technology, Castells writes, eliminates the drudgery and leaves only the work that requires "analysis, decision and reprogramming capabilities in real time…"[45] It is not clear, however, that any of this means less surveillance. "Worker empowerment" rests on information systems that give managers tremendous knowledge of what each worker is doing at each moment of

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[43] Similarly, one can see a rationalization process on the factory floor in the early twentieth century that increased mangers' field of vision and revealed, through the flow of work, bottlenecks and abnormalities. Lindy Biggs, *The Rational Factory: Architecture, Technology and Work in America's Age of Mass Production* (Johns Hopkins University Press, 1996).

[44] James P. Womack, Daniel T. Jones, Daniel Roos, *The Machine that Changed the World* (Macmillan, 1990), 101.

[45] Manuel Castells, *The Networked Society* (Blackwell, 1996), 214, 258. For a popular version, see Bill Gates, *The Road Ahead* (Penguin, 1996). For a scholarly overview, see Jonathan Zeitlin, "Productive Alternatives: Flexibility, Governance, and Strategic Choice in Industrial History," in Franco Amatori and Geoffrey Jones (eds.) *Business History Around the World* (Cambridge University Press, 2002), 62-80.

the day. One is empowered to act precisely because what one does can be instantly assessed.[46] Creating a global culture that can be accessed by global corporations requires the sort of penetration into everyday life on a global scale that Giddens argues took place on a national scale in the age of the nation state. This is not a bureaucracy-free utopia, but a new modality of the modern system of control and calculation that emerged two centuries ago.

Conclusion

Economies may run on information, but as the study of surveillance shows, we only get information through the tools and methods we construct ourselves. Information may reduce uncertainty, but there is no certain way to know how good our information is, a tension that prompts still more surveillance. The result is what might be termed the epistemological conundrum of the market. How do we know when we know enough?

In theory surveillance should follow the same economic laws as operate for other resources: at some point the cost of knowing exceeds its value. Historically, however, forces have conspired to push the cost of knowing quite low. Better technology, ineffective privacy laws, no ownership rights in one's personal data, and plenty of free public information--free information that can be made proprietary once it is encoded in a database--all lower the cost of knowing. Meanwhile, demand is driven by the unceasing tensions of uncertainty. With the cost of supplying

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[46] Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (Basic Books, 1988). For a critique, see Paul Thompson, "Fantasy Island: a Labour Process Critique of the 'Age of Surveillance,' " *Surveillance and Society* 1 (2003), 138-51. For an updated version that makes the connection between knowledge and control clear, see Michael Hammer and James Champy, *Reengineering the Corporation: A Manifesto for Business Revolution* (HarperBusiness, 1994). Zuboff herself has apparently recanted on her earlier, positive view of information technology and work.

surveillance falling and demand potentially unlimited, the economy of surveillance will yield more and more surveillance.

Modern societies have a strong tendency to push personal space and privacy to the margins in their obsession with reducing risks, rooting out uncertainty, and verifying every act. Theories of information which hold that more information promotes rational decision making and transparency provide intellectual support for this tendency. The proposition that we might be better off by giving up trying to know more is a difficult one for intellectuals to accept. What are the consequences if we do not yield, if we let surveillance grow of its own accord? Leave aside for now the political dangers of a state with limitless access to our personal information, considerable though these are. Turn instead to the externalities of information gathering, to the uncounted social costs of the technology of surveillance.

Recall that a prime costs of information is storage and retrieval. One sees, observes and senses all sorts of things all the time but little of this is remembered, and of what is remembered, even less is used. No matter how delicate the sensory mechanism, no matter how powerful the information processing, it is impossible to eliminate the opportunity cost of attention. Beyond a certain point, there is simply too much to notice, too much to attend to. Here is where surveillance operates, by imposing an order, grid or classification scheme to sort the interesting from the irrelevant. Surveillance calls attention to some things by ignoring others. Although this clarifies our attention by separating the noise from the signal, it does not produce transparency, commonly understood as a clear window on reality. As

philosopher Alfred North Whitehead warned, "there is a danger in clarity, the danger of overlooking the subtleties of truth."

Like any complex system, the technology of surveillance may fail to tell us what we need to know, even when operating according to specifications. Two decades ago, sociologist Charles Perrow warned that complex systems, no matter how well designed, will predictably fail, though at unpredictable moments--what he termed "normal accidents."[47] They fail from conditions or interactions that could not be anticipated during the design phase. It is impossible to head off these failures because we only get from the system the information it was designed to yield. This leaves us blind when the unanticipated occurs. We cannot see beyond the controls to the complex reality they are meant to represent. Attempts to correct the problem, to reduce risk and uncertainty through better surveillance, are futile. The information we use to see and monitor is derived from the system components themselves.

In this vein, we might ask, is today's credit market meltdown due to a failure of oversight and surveillance, or is it the unbidden but predictable result of surveillance? Better capital market optics allowed lenders to extend credit and capital to more people in more ways than ever before. Doing so also connected and synchronized markets though the spread of information techniques and financial algorithms. Using tools of surveillance, financiers were able to build a bigger, more complex, and more fragile system, exactly the conditions that Perrow warns will lead to unanticipated catastrophe.

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[47] Charles Perrow, *Normal Accidents: Living With High-Risk Technologies* (Basic Books, 1984).

This is one danger of surveillance—a clarity that hides the subtleties of truth. A second has to do with the link between knowledge and power. Surveillance, as I have noted, is not bilateral, but strategic: the collection and deployment of information by one party against another. The response to strategic uses of information is frequently to increase surveillance all around. If the mortgage market collapses through vendor opportunism or if companies like Enron are able to hide their operations behind a thicket of misinformation, then we automatically assume that greater surveillance and accountability are called for. This impulse feeds the surveillant assemblage, but by enabling further surveillance, it also creates opportunities down the road for yet more strategic behavior. Someone structures the surveillance system, and someone in turn is placed under surveillance. Each party has an interest in what is revealed, and each has incentive to focus the optic in ways that suit its interests.

It is tempting to think we will surmount these problems with better data and more sophisticated monitoring techniques. But trying to escape the informational black hole with raw surveillance power would only send us around the same loop. And it would rapidly degrade the social environment. As surveillance critic Philip Agre argues, too much information drawing people too close together stifles diversity—essentially the criticism directed at the inquisitorial aspects of credit reporting a century ago.[48] As the grid of surveillance draws tight, one must account for each and every action Take this far enough and we will be issuing quarterly

[48] Philip E. Agre, "The Market Logic of Information," *Knowledge, Technology, and Policy* 13 (2000), 67-77.

reports on our own lives. In such an environment—the economic equivalent of 1984—opportunities for originality and innovation would cease. Anything outside the grid, anything that could not be accounted for, would be deemed illegitimate and ruthlessly eliminated.

Surveillance makes life more predictable and calculable. It synchronizes behavior and provides a platform for social interaction in a modern, anonymous world. These are useful things, but the belief that ever more surveillance can overcome the incompleteness of information or the partiality of abstraction is a dangerous delusion. It will only shut us out of what Agre calls "the radical strangeness and challenge of the real world." And it will lead to the sort of system breakdowns and strategic opportunism that are entirely to be expected in a world awash in too much information.