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Information and Reality at the Turn of the Century

Albert Borgmann

Our ability to command information grows every day. We wake up to the news on the radio, read the paper during breakfast, are immersed in signs and advertisements as we make our way to the office, sit down and fire up our computers—that really opens the floodgate of information—return home, turn on the television set and let waves of information wash over us until we go to bed.

Many people say they get much pleasure from cruising and surfing on this sea of information. But, at times, we feel like the sorcerer's apprentice, unable to contain the powers we have summoned, and afraid of drowning in the flood we have loosened. Where does all this information come from and what is it doing to reality?

In earlier times, information arose from the interplay of three factors, a messenger, a recipient, and a message. Paul Revere was the messenger, the Patriots were the recipients, and "The English are coming," was the message. The dove with the olive branch was the messenger, Noah the recipient, and the message was "The waters are receding." Even today, smoke is the messenger, the pilot of the spotter plane the recipient, and "There is a fire in section 36" is the message. A rock-lined cavity can be the messenger, a historian the recipient, and the message: "This is the root cellar of an abandoned homestead."

The general pattern is always *x informs y about z*. X is the messenger, but we also call x the sign, the signal, the symbol, or the vehicle. Y is the recipient or the receiver, the audience, the listener, the reader, the viewer, the spectator, or the investigator. And z is the message, the information, the news, the intelligence, the meaning, or the content conveyed by the messenger or the signal. This basic triad of factors had an engaging sturdiness and intelligibility. It incorporated distinctions that may have been grist for abstruse philosophical mills; but they were clear and serviceable enough for lay people.

We can call this the core meaning of information.¹ It is *information about reality*. In its simplest form, it is a natural phenomenon relevant to animals as well as to humans. A scent carried by the wind is information to a bear that carrion is to be found down by the creek. Information is a difficult phenomenon, not because its origin is mysterious, but because, throughout human history it has

¹ Fred I. Dretske, *Knowledge and the Flow of Information* (Cambridge: MIT Press, 1981), 41–47.

been evolving in tiny steps from something simple and natural to something exceedingly complex and technical.

The fire ring you left at a campsite a few years ago informs you, in a natural and incidental way, that this is a good spot to put up your tent. But if it took you a while to find it again and you want to avoid going in circles next time, you might pile up a few rocks where you have to leave the trail and head down to the creek. While the rocks around the fire ring compose an incidental and nearly natural sign, the rocks in the pile constitute an intentional and conventional sign.

The first conventional signs in human history were reminders, tallies on bones or sticks, and collections of pebbles or shells, to keep track of the phases of the moon or animal kills, or sheep, or goats. Pebbles were followed by clay tokens; these by incisions and impressions on clay tablets; and those, again, in succession by logographs, syllabaries and letters. These signs served, and some of them still serve, to set down information about the past. But they also can bring nearer what is distant in space, edicts from the king, reports of disasters, and news of life everlasting. Of course, information about things past and distant events does not literally convey those things and events to the here and now. A record of a bushel of grain delivered to the granary is not the same as the bushel of grain, itself. Nor is a royal edict the same as the majestic presence of the king. It takes comprehension to gather the message from the sign and to grasp the impact of the message on the here and now.

The ability to comprehend a message and integrate it into one's immediate world is, except for one's native language, an arduously acquired and ever incomplete skill. But once acquired, more or less, comprehension makes for an incomparably more comprehensive and comprehensible world. Reality no longer trails off rapidly in the mists of distance and past, but becomes perspicuous as far as information and comprehension can reach.

Information, however, not only can illuminate what is distant in time and space, but also what is remote in conception and imagination; and what would remain a distant possibility without the aid of conventional signs. Complex social arrangements, monumental buildings, and artful pieces of music would be inconceivable without the information laid down, e.g., in the texts of covenants, drawings of cathedrals, and scores of cantatas. This no longer is *information about reality* but *information for reality*; information for making a community, a building, or music. But here again, the steps from *information about* to *information for* reality and back are small. In the sketchbook of the medieval master mason, Villard de Honnecourt, plans that inform us about the existing cathedral of Laon are mingled with plans for churches that were never executed.² Gregorio Allegri wrote a score for the mass *Miserere*, to be performed in the Sistine Chapel only and, therefore, kept secret. But

² The Sketchbook of Villard de Honnecourt, ed. by Theodore Bowie (Westport, CT: Greenwood, 1982), 88–91, 106–7.

when the fourteen-year-old Mozart, on having heard the mass once, wrote down the score from memory, it was information about rather than for the performance of the music.

While *information about* reality chiefly requires comprehension and renders the world more perspicuous, *information for* reality calls for realization and makes for a more prosperous world. By realization, I mean the process of translating information into reality. To realize a covenant is to make it come alive in practices and celebrations. To realize a blueprint is to construct a building conforming to it. And to realize a musical score is to perform it.

Realization, too, requires the acquisition of demanding skills; the particular literacies of rabbis, artisans and musicians, among many others. But again, when these skills are mastered, the world becomes incomparably richer; adorned with festive customs, material structures and musical events that are intricate and magnificent beyond what human imagination, without information and notation, could have conceived and carried out.

Information about and for reality used to mediate between humanity and reality to produce a distinctive kind of world. The central feature of this world was a focal area of nearness that was understood against a comprehensible background of farness. Information about reality, even today, tells us of faraway things and events; but it does not transport them into our midst. They remain distant, yet they inform and illuminate what is present. If, on a hot and windy August afternoon in the Rockies, you see smoke billowing up like thunderheads behind the farthest ridge on the horizon; the smoke conveys information about a raging wildfire; but it does not carry the fire, itself, into your immediate world. The focal area of your life is still safe. The fire is distant though the fire danger is close.

Similarly, when you stumble upon a collapsed root cellar from early in this century, you learn of a way of life where perishables used to be entrusted to the coolness of the ground. Yet root cellars remain a thing of the past. They are part of the background that defines your way of life where food is stored in freezers and refrigerators. And so it is with letters from distant friends and colleagues; with journals and memoirs of homesteaders; and with tipi rings and cairns left by the Salish and Kootenai Indians. Information about reality keeps, or used to keep, the farness of space and time distinct from the nearness of those persons and things that make up the focal area of our lives. Yet information makes farness comprehensible, and provides an illuminating background for what is here and now.

While *information about reality* renders our world perspicuous in its order of nearness and farness, *information for reality* is the source of a distinctively prosperous culture. Such prosperity requires submission to a definite kind of discipline. Discipline is needed, first, to acquire the skills of reading texts, following plans,

and playing musical scores; and then to submit continually to the text of a covenant, the specifications of a blueprint, and the notes of sheet music. The reward of such discipline is a franchise in a magnificent culture. If you are given the culture without being instructed in the requisite discipline, the culture is not truly yours. You are dependent on others for the realization of the founding information of the culture. But if you are skilled, you can fully and freely appropriate your inheritance.

In addition to discipline and competence, a world built on information for reality engenders a vigorous sense of continuity, community and intimacy. Jewish people trace their community back for some four thousand years. Their tradition would not be so astoundingly continuous and vigorous had it not been for a writer, now commonly called J, who set down the story of Abraham and Sarah a few hundred years later.³ But to realize the promise God made to Abraham, one needs not only an unbroken tie to the founding event, but also a community of people with whom to enact the tradition.

Similarly, the music which Bach left us requires not only discipline and competence, but also fellow singers and players. And more is needed yet. Since information for reality is never more than an instruction or a recipe, we must gather from the tangible reality around us the materials and ingredients necessary for the realization of a text, a plan, or a score. To realize musical scores, we need instruments. To realize a blueprint, we need building materials. The realization of texts, particularly of poetry and fiction, is the most subtle. But it, too, calls for us to draw on our experiences with the tangible world. In any case, to realize information for reality, we have to be intimate with the visible, audible, palpable shapes of our immediate world; with the strings, mouthpieces and keys of instruments; with the stones and timbers of construction; and with the faces and gestures we recall when we read a poem.

Traditionally, information has been about and for reality. But through the technological developments of the past century and a half, information, though still about and for reality, also has begun to rival reality, itself; and has emerged virtually *as reality*. The culture of technology, in general, is animated by a pervasive and evident desire for more copious and refined consumption. Yet the implementation of this project looks more like bricolage than the execution of a grand design. Rather than follow the twists and turns of the transformation of information, I will trace the conceptual path that leads from information about and for reality to information as reality.

I begin with the landmark that has defined a crucial stretch of this path, viz., Claude Shannon's paper of 1948, "The Mathematical Theory of Communication," and Warren Weaver's comments of 1949.⁴ Shannon's paper is strictly a technical accomplishment, but it was thought right away to be a cultural milestone.

3 For background and a fanciful view of J, see Harold Bloom, *The Book of J* (New York: Grove Weidenfeld, 1990).

4 Claude E. Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana: University of Illinois Press, 1949).

The excitement it generated is obvious in Weaver's remarks. Shannon's work served as a catalyst of powerful cultural elements that were ready to react. Weaver's reaction, in particular, is emblematic in what it had to say about the rising cultural force of information.

The rise of this force has inundated and begun to wash out the structure of the world that was built on the traditional information about and for reality. The threat to its central feature, the focal area of nearness surrounded by a comprehensible background of farness, was signaled by Weaver when he erased the distance between nearness and farness. Nearness used to be marked by the immediate presence of things and persons, as opposed to the farness of distant things and persons that were represented through the information we had about them. But, for Weaver, our access to persons, at any rate, is always through information; whether a person is near or far.

"In oral speech," Weaver said, "the information source is the brain, and the transmitter is the voice mechanism producing the varying sound pressure (the signal) which is transmitted through the air (the channel)."⁵ Was Weaver simply making a technical point which, as one critic has charged, was not technically warranted?⁶ Roughly half a century later, Deborah Tannen tells us about her colleague, Ralph:

E-mail deepened my friendship with Ralph. Though his office was next to mine, we rarely had extended conversations because he is shy. Face to face, he mumbled, so I could barely tell he was speaking. But when we both got on e-mail, I started receiving long, self-revealing messages; we poured our hearts out to each other.⁷

Tannen calls e-mail "a souped-up conversation." Apparently, it brings people closer to each other than a traditional f2f (face to face) conversation can. The contrast between nearness and farness has evaporated. It is an irrelevant circumstance that Ralph's and Deborah's offices are on the same floor. They might as well be on different continents.

Underlying this particular illustration is the general view that humans are in touch with the world through information, and through information only. The mountain peak across the valley is visual information; the wind in the trees is acoustic information; and a caress from your loved one is tactile information. In this sense, everything out there, all of reality, has always been information.⁸

Though this view is a powerful undercurrent in our culture, there also is a more particular connection between information and reality, where reality is simply not revealed or claimed to be information, but information arises as a rival and pretender to the throne of traditional reality. The rise of this particular pretension is closely

5 Ibid., 98.

6 David Ritchie, "Shannon and Weaver: Unraveling the Paradox of Information," *Communication Research* 13 (1986): 283-7.

7 Deborah Tannen, "Gender Gap in Cyberspace," *Newsweek* (16 May 1994): 52.

8 See Robert Wright, *Three Scientists and Their Gods* (New York: Harper, 1988), 21-38.

bound up with a threat to the discipline and competence the world of traditional information used to require.

On this issue, Weaver is divided. Like Shannon, he holds to a distinction between the signal and the message; between the vehicle and the content of information.⁹ That seems to make eminently good sense, since the two traditionally have been so disparate from one another. A thin plume of smoke curling up from the Rocky Mountains on a breezy August afternoon is, all by itself, a slight and innocent signal. But the message it conveys is awful: within a few hours there might be a roaring wildfire.

It is similar with the messages that are conveyed by conventional signs or signals. There is a huge disparity between the mere 20 column inches of print that a report of a forest fire occupies in a newspaper, and the many acres of incinerated grass and charred trees the report informs us about. As e-mail illustrates, the austere signals of the alphabet can carry weighty messages even today. As long as signal and message, or vehicle and content of information, remain distinct; the need to learn how to gather the message from the signal or the content from the vehicle, and achieve competence in appropriating one's cultural heritage, will persist. But the traditional discipline is in jeopardy.

Signal and message contrast much like quantity and quality. Message and quality are subjective and elusive, while signal and quantity are objective and measurable.¹⁰ Some people believe that the life of the spirit is essentially, and will forever be, beyond quantification and objectification. But a more aggressive and confident view of the matter holds that quality is simply unanalyzed quantity; and that all qualities, when analyzed all the way down to their basic constituents, will turn out to be objective and measurable quantities.

The crucial contribution Shannon made to technological culture was his definitive underscoring of information as a quantity measurable in bits, by showing that the basic unit of information could be used to demonstrate interesting theorems about the coding and transmission of information. Weaver sensed that differences in the quality of information are superficial and ultimately irrelevant; and that it really doesn't matter "what kinds of symbols are being considered—whether written letters or words, or musical notes, or spoken words, or symphonic music, or pictures."¹¹ In this spirit, he might have proposed to erase the distinction between the message and the signal, or the content and the vehicle of information, by analyzing the message or content into just so many bits of information. But he might as well have offered a thimble to someone trying to drain a pond. At the time, the technology available could not command and control of a sufficient number of bits.

Let me illustrate the problem as well as the solution that eventually emerged. Imagine I tell you the Baroque Consort will give a performance tonight and you ask, "What's the first piece on the program?" and I answer: "Bach's Cantata No. 10." The symbols

9 Shannon, and Weaver, *Mathematical Theory*, 3 and 100. See also Seth Finn and Donald F. Roberts, "Source, Destination, and Entropy: Reassessing the Role of Information Theory in Communication Research," *Communication Research* 11 (1984): 456.

10 Donald M. Mackay, *Information, Mechanism and Meaning* (Cambridge: MIT Press, 1969), 17.

11 Shannon and Weaver, 114.

I have strung together to reply carry about 175 bits of information, and so would the letters if I were to point silently to the first item on the program. "Bach's Cantata No. 10" is the signal or the vehicle. But what does it convey? In one sense, nothing less than an entire cantata of some 25 pages of sheet music and some 20 minutes of performance; a church cantata for four soloists, choir, trumpet, two oboes, basso continuo, and strings. But how many people could bring to mind Bach's music in all its details when they hear "Bach's Cantata No. 10"? Perhaps no more than a few dozen among the more than five billion people alive today. Of course, there is a gradation and division of competence when it comes to recalling music. To determine what "Bach's Cantata No. 10" should convey to an educated mind is a difficult and contentious task. E. D. Hirsch lists *Johann Sebastian Bach*, but not *cantata*, as an item literate Americans should know.¹² In any case, "Bach's Cantata No. 10" is an example both of the great disparity that is possible between signal and message; between an extremely austere vehicle of 175 bits and an abundantly rich content of baroque music; and of the inverse proportion between the magnitude of the signal and the magnitude of the competence needed fully to comprehend the message.

Now assume that, instead of pointing to an item on the program, I were to hand you the score and text of the cantata for you to peruse. This information comes to perhaps 164,000 bits, a vehicle richer than the entry on the program by a factor of about a thousand. The distance between signal and message has been decreased, and so have the demands on the competence needed to gather the content from the vehicle. All that is needed now are musical literacy and a command of German. But in contemporary culture, these are still forbidding requirements and, accordingly, the signal and message are still separated by a prohibitive abyss.

Moreover, even for competent readers of the score, there is a significant gap between it and the presence of the cantata in an actual performance. Much of that which still must be decided and filled in to have a performance is left blank in the score; including matters such as tempo, phrasing, pitch, the particular choice of instruments and singers, and more. How many bits would it take to have everything spelled out to the last detail? In a dubious but still enlightening sense, it would take about 1.2 billion bits, a signal about seven million times larger than the entry on the program, and seven thousand times larger than the score and text.¹³

You can find these billion-plus bits recorded in binary notation on a compact disk. Many would say that, at this level of richness, the signal has all but caught up with the message and perhaps even surpassed it. What you have on the disk is the music itself. And if the gap between vehicle and content has not shrunk to zero, the demands on the competence required to bring the music to life certainly have. It takes less than a minute to show someone how to use a CD player.

12 E. D. Hirsch, *Cultural Literacy: What Every American Needs to Know* (Boston: Houghton, 1987).

13 There is no hard and fast way of measuring the amount of information of a given item in bits. For alphanumeric text, I have followed ASCII. For Bach's musical notation, I have assumed 12 bits per note. For the CD, I have assumed 54 million bits per minute.

CDs not only suggest that, in contemporary culture, the line between information and reality has become questionable as Weaver had hinted; they demonstrate outright what Weaver had claimed explicitly, viz., that all information is fundamentally alike. The compact disk can contain all kinds of information indifferently; whether it consists, as Weaver has it, of "written letters or words, or musical notes, or spoken words, or symphonic music, or pictures." But this account still leaves us with a fuzzy picture of information as reality. Sound recordings, after all, have existed for more than a hundred years. Is it not a mere matter of technical convenience whether the sound is recorded in analog or digital form? The crucial point is that information in analog form, such as photographs, films, or vinyl records really isn't emancipated from reality and, like a satellite in low orbit, is in constant danger of falling back into reality. Moving analog information in and out of storage media is a relatively slow process; and it is irreversibly deteriorated as it moves through time and the mechanics of copying. Its internal structure is as viscous as honey, and difficult to manipulate and control.

Traditional writing and print, of course, are digital and therefore mobile, durable and crisp; where analog information is inert, corruptible and fuzzy. But writing also is an extremely austere vehicle of information. It was the wedding of binary digitality with electronics that, in time, provided the union of control and abundance of information.

A digitalized electronic recording of a cantata gives us a richer rendition of the music than an analog recording but, beyond that, digitalized electronic information can move at the speed of an electric current or of light. It retains its fidelity with immutable perfection from copy to copy; and, possessing a sharply articulated internal structure, it can easily and speedily be analyzed, sorted and modified any way you please. Digital electronic information has emancipated itself from the poverty of traditional digital information, and from the heaviness and caducity of reality. Thus, it hovers as an omnipresent and unblinking virtual reality above the slow and weary actual reality.

What has been the cultural effect of this new kind of information? Again, Weaver caught the rising wave of excitement. He underscored a phenomenon which is inherent in all information, but was not clearly grasped until the question of the amount of information was raised and answered in bits. In one sense, information signals behave like any normal vehicle or container. If you have two buckets, you can carry twice as much water as if you had one. On two pages, you can say twice as much as on one. But the vehicles or containers of information have the peculiarity that, when their capacity for amount is doubled, their capacity for variety is squared. So if on a page you can say a thousand different things, then on two pages you can say not just twice a thousand, (i.e., two

thousand different things), but a thousand times a thousand (i.e., a million different things).

Weaver calls the availability of variety “freedom of choice” and, in his view, a steady increase in the vehicles of information leads to an explosive growth in freedom of choice.¹⁴ Not very many people of the information age may be aware of this fine point of information theory. But the realization that the growth of information brings with it an explosion of possibilities is widespread. Of course, this development has simply benefited information about and for reality.

The Internet can serve as the emblem of the digital and electronic improvement of information about reality. By now, it is a truism that it furnishes us with information about persons and things that would be difficult to obtain without the net. Moreover, the Internet provides for the collective exchange of information by way of bulletin boards, lists, conferences, etc., that would be impossible without it. More generally, computers and databases furnish information that you would not think of looking for without them, e.g., information on how many places down you rank from the most frequently cited scholar in your field.

Less frivolous information, uniquely obtainable from computers, also is available. One example is information on precisely how air flow builds up drag around the pod of a jet engine, when the pod is placed under the wing or when it is ahead of the wing; and when it is round and when it is pear-shaped. Such information about airflow naturally becomes essential in designing of an airplane.¹⁵

The Boeing 777 can serve as an emblem of the power of digital electronic information for reality. Supercomputers are playing a crucial role in its development. Computerized information has largely replaced blue prints and mockups, and it has suffused the very thing in its final shape. The 777 no longer is guided by Newtonian levers and wires, but by information relayed from the pilot or a computer to servomechanisms.¹⁶

Such achievements are, undoubtedly, occasions for admiration with regard to the virtuosity that has gone into the conception and construction of the information technology. As for the end use this technology is put to, there again are occasions for gratitude. But when it comes to the overall cultural effect of it, the result lies somewhere between the trivial and the troubling.

To begin with the Internet, most of what flows through it, as far as I can tell, is overwhelmingly flimsy. There is much throat clearing, half-hearted criticism, throwing out of suggestions, crashing obviousness, and instruction by the moderately knowledgeable of the totally ignorant. The tone oscillates between the obsequiously laudatory and the rudely offensive, with much blandness in between. The Internet, for the most part, is a dump of wasted time.

14 Shannon and Weaver, 100–1.

15 Albert M. Erisman and Kenneth W. Neves, “Advanced Computing for Manufacturing,” *Scientific American* (October 1987), 163–64.

16 See the April 1994 issue of *Aviation Week and Space Technology*, devoted to the Boeing 777.

Wasting time is not a uniquely late 20th century phenomenon, of course. Does electronic information technology have a specific impact on culture? It does, and its influence flows from information as reality down to information about and for reality. Information as virtual reality has inherited the enormous pliability and preternatural perfection of digital electronic information. The norm of pliability and perfection that is enshrined in virtual reality has cast a shadow on information about and for reality, and thereby rendered persons less personable and reality less real.

To return to Deborah Tannen's colleague as an example, Ralph has not actually been cured of his shyness nor has Deborah actually learned how to "break the ice." Both have used the Internet to create versions of themselves virtually possessing the virtues they actually lack and no longer have any reason actually to acquire. One hears anecdotes of virtual beginnings having actually happy endings. But veterans of virtual reality, as David Bennahum has well put it, "are wary—they've been burned too often by net friendships that collapsed once the stuff of real life came in."¹⁷

As for the bearing that the norm of pliability and perfection has on information for the shaping of reality, consider once more the Boeing 777. What is striking in historical perspective is the slackening of the power to shape things over the last thirty or forty years. To a lay person, the manifest differences between the 777 and the 707 of a generation ago are slight. The same must be said of buildings, highways and cars. The crucial changes have not been in shape, but in sophistication.

The latter is astounding and admirable in its own right, to be sure, and, other things being equal, beneficial to humanity and ecology. In the case of the 777, the end result will be cheaper, quieter and more commodious flights. But notice the end effect of this result. The sense of passage from place to place will be further attenuated, and so will be the distinction between nearness and farness.

Information as virtual reality has its own and direct effects on culture. It serves utility in design, manufacturing, medicine, and science. But it serves consumption as well, and saps everyone's vigor in dealing with the actual world. It is no respecter of class or education. Some it traps with keyboards and texts; others with buttons and pictures.

To put the drift of information technology briefly and starkly, information at the turn of the century tends to enfeeble persons and attenuate things. Luddism, of course, is not the answer. Information cannot and should not be wished away. But it has to be counter-balanced. We must regain the actuality of people and the nearness of things, and turn from information as reality to information and reality.

17 David Bennahum, "Fly me to the MOO: Adventures in Textual Reality," *Lingua Franca* (May/June 1994), 26.