



Being Analog

Carol Wilder (wilderc@newschool.edu)
The New School, NY

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As we rush headlong into the digital future, postmodern life is swirling with change, from work cultures and personal communication technologies, to business and economic models, to definitions of community and even notions of identity and self. It is truly an age of information, albeit Baudrillard may have had a point in claiming "we live in a universe where there is more and more information, and less and less meaning." (1983a, p. 95) Nature writer Bill McKibben agrees, arguing that while in a narrow sense "we live in an 'age of information,' where there has been an information 'explosion' and an information 'revolution,'" in many ways the opposite is true. "We also live," he writes, "in a moment of great ignorance. . .An unenlightenment. . .An age of missing information." (1992, p. 9)

But what is "missing" in mediated culture? What might be lost as life moves in ever enfolding and expanding circles of simulation and virtuality? One does not have to be anti-technology to agree with Neil Postman that "technological change is. . .ecological. . .A new technology does not add or subtract something. It changes everything." (1993, p. 18) But what changes? "Are we now living life on the screen or in the screen?" asks Sherry Turkle (1995 p. 21) Should we share Negroponte's enthusiasm about "being digital" (1996)? Or Postman's skepticism? Or can we take another perspective -- let's call it "being analog" -- in search of McKibben's missing information?

Until what seems like about five minutes ago, the concepts of analog and digital were known only to scientists and scholars, but suddenly they have become part of the daily general discourse about communication technologies. For this reason alone, it might be useful to explore how the analog/digital notions have evolved, the reach of their powers of description and explanation, and their relationship to each other in an ecological view of today's communication environment.

1.

Let's begin with a very practical example. The Media Studies program at my university teaches both theory and production across a wide range of media: audio, video, film, photography, computer graphics, and multimedia. What this means, among other things, is that we have a lot of stuff -- production gear as old as forty years (especially in film) and as new as tomorrow's delivery. We are currently planning a state-of-the-art multimillion dollar audio, video, and multimedia facility and we are poised to invest several million dollars in new equipment.

This situation has led naturally to long, complex, and sometimes contentious discussions about how and where to invest our precious dollars. Early on, there were two somewhat polarized camps, divided roughly between those who envisioned the new facility as exclusively digital with a Star Wars/Star Trek feel, and those who believed in a role for the traditional analog technologies like the clunky but functional flatbeds used for seventy years to edit film. "Flatbeds Forever" became the cry of the

film folks who, by the way, eventually lost the argument and are being left behind in a separate analog film production facility, at least for the time being.

Many intriguing personal, practical, and philosophical questions were raised during the great analog/digital debate, having to do with everything from economics to aesthetics to epistemology.

Some questions were pedagogical or pragmatic. For instance, does it matter to the media production learning process if a video student is trained to edit first and only on a computer with its ease of change and infinite choices? Or should one first learn on a linear/analog system where choice and change are more constrained by the technology and where more editing occurs above the eyebrows than behind the screen? Does it make any difference if an audio student learns first to cut tape with a razor blade made up of atoms that can also cut oneself, or if that "razor blade" is an icon made up of bits and displayed on a computer screen? While it seems inevitable that digital technology in some form will prevail in the end, during this transitional period these interesting questions can be asked.

Some of the questions raised during the analog/digital debates were more whimsical. For instance, at one point I wondered why my teenage son -- denizen of the digital age -- covets my old analog vinyl records? Why has the New York subway system encountered such resistance as they try to move riders from using analog brass tokens to digitized Metrocards? Why is the U.S. one of the last countries in the world to resist metric measurement, clinging instead to good old anthropomorphic analog pounds and feet? Why did the first O.J. Simpson jury acquit him, despite the overwhelming digital evidence of the DNA testing results, while the second jury in the civil trial convicted him based partly on a telling analog shoeprint? Why do people who spend time online with each other want more physical contact, not less? Why do I love the Coney Islands and Tivolis and Santa Cruz Beach Boardwalks of the world, and loathe the Great Americas and Disneylands? And what, if anything, do these comparisons have in common?

Even in the practical realm, not everyone is enamored with nonlinear editing. In "Faster Isn't Always Better," in *Variety's On-Production* magazine (Vol 5, No 6) Christopher Grove reported the mixed feelings that TV and movie industry professionals have about the new digital nonlinear disc-based editing systems and their implications for the art of editing. Film editor Sheldon Kahn ("One Flew Over the Cuckoo's Nest," "Out of Africa") told him "I'm worried about what's happening to the next generation of editors." Kahn cut his films the traditional way -- on a Moviola and a flatbed with the help of assistant editors and an apprentice. And it's from the ranks of the assistants and apprentices that editors like Kahn himself emerged, after learning their craft from the editors they worked for. But the role of apprentice is disappearing, says Kahn, and the role of the assistant editor has been so changed by digital editing that the former training ground has, in the view of many, been compromised." Kahn recently "cut" his first film digitally ("Space Jam"), and didn't even hire an apprentice. Instead, his two assistants spent their time digitizing footage for Kahn to cut. "They're great at what they do," he adds, "but it's not editing."

Jack Turner, another veteran editor, said "ten years ago I'd give my assistant a scene to cut to see how they'd do or ask them to sit in on an edit session with me and let them ask questions. But there's no time for that now."

If one of the hallmarks of the postmodern age is technological optimism bordering on euphoria (Smart, p.19), digital media technologies certainly lead the way. Upbeat depictions of the cyberfuture such as Douglas Rushkoff's *Media Virus* and Negroponte's *Being Digital* and any issue of the gaudy *Wired* magazine paint a world of such buzz and excitement only a fool or a fogey could demur. But wait -- even

Negroponte writes that "the world, as we experience it, is a very analog place. From a macroscopic point of view, it is not digital at all but continuous. Nothing goes suddenly on or off, turns from black to white, or changes from one state to another without going through a transition." (p. 15)

2.

So what might we be losing, or losing sight of, in this rush to a digital one-size-fits-all future? Could it be that some of McKibben's "missing information" lies in "being analog." To find an answer, I went back to the earliest -- and in many ways most profound -- discussions I recalled about the concepts of analog and digital, found in the proceedings of the Macy Conferences on Cybernetics. The Macy Conferences were a remarkable series of ten meetings from 1946-1953 which included many of the intellectual giants of the era: mathematicians John Von Neumann, Walter Pitts, Norbert Wiener, anthropologists Margaret Mead and Gregory Bateson, engineers Heinz Von Foerster, Claude Shannon, and Julian Bigelow, neuropsychiatrist Warren McCulloch, social psychologist Alex Bavelas, and others. Altogether, one of the most remarkable assemblages of thinkers in this century.

At the eighth Macy Conference in 1951, physiologist Ralph Gerard presented a paper on "Some of the Problems Concerning Digital Notions in the Central Nervous System." Gerard was attempting to show that the digital and analog mechanisms of the brain are equally important. Gerard explained that "an analogical system is one in which one of two variables is continuous on the other, while in a digital system the variable is discontinuous and quantized." (p. 13) He points out that the prototype of an analog mechanism is the slide rule, where "a number is represented as a distance and there is continuity between greater distance and greater number." On the other hand, the prototype of a digital mechanism is the abacus, "where the bead on one half of the wire is not counted at all, while that on the other half is counted as a full unit." This is a reflection of the binary expression of the digital metaphor -- on or off, one or zero, nothing in between. (We have Leibniz to thank for the binary number system, based on powers of 2, which allows any binary digit -- or "bit" -- to be transmitted electronically by the presence or absence of an electrical current.)

Similarly, Gerard gives the example of the analog rheostat that dims or brightens continuously, versus the on/off digital light switch. More fundamentally, he suggests that the chemical aspect of neural functioning, much of the electrical action of the nervous system, and brain waves themselves are analogical, while "the nerve impulse is digital in character." (p. 13)

Gerard's remarks led to a lively discussion that reveals both the richness and confusion surrounding the analog/digital concepts even in these early days. Norbert Wiener dates the concepts from "about 1940" and McCulloch adds that "they used to be called logical machines or analogical machines before the word 'digital' appeared." Von Neumann suggests that "one must say that in almost all parts of physics the underlying reality is analogical. . . The digital procedure is usually a human artifact for the sake of description." Somewhat later Bigelow injects "I think that somebody ought to make the very platitudinous remark that it is impossible to conceive of a digital notion unless you have as a reference the notion of a continuous process by which you are defining your digit: that is to say, the slide rule has continuous length and it has on it numbers which are digital." (p. 35)

Gregory Bateson suggests that "it would be a good thing to tidy up our vocabulary," introducing the concept of "coding," which leads McCulloch to "the question whether information be continuously or discretely coded." (p. 50) Lawrence Frank wonders "if we have the same situation as that pointed out years ago by Eddington when he said that physics was classical on Monday, Wednesday, and Friday and quantum on

Tuesday, Thursday, and Saturday. We are not confronted with irreconcilably opposed viewpoints when we realize that there are two ways of recording events which exhibit both discreteness and continuity." In other words, digital and analogic metaphors are complementary forms of representation, which acquire meaning only in relation to each other. Each works at a different level of description, as in the continuous analogic reality of a child's fever that can be measured with either the back of a mother's hand or with a digital device.

3.

The Macy Conference participants agreed on the mutuality and usefulness of the analog/digital metaphor as a form of description for computing and neuroscience. Gregory Bateson went one step further in applying the concepts to coding in human communication. Acknowledging his debt to Macy Conference colleagues, Bateson wrote a tour de force essay on "Information and Codification" in 1951. "Codification," he wrote, "is the term used by communication engineers for the substitution of one type of event for another, such that the event substituted shall in some sense stand for the other." (Ruesch & Bateson, p. 169) Bateson identified 3 types of codification as it relates to information: analogic, digital, and Gestalten, suggesting that "apart from the central nervous system, there is a possibility that the whole moving body may be used as analogic component." Further, "it is probable, for example, that some people empathize the emotions of others by kinesthetic imitation. In this type of thinking, the body would be an experimental analogue, a model, which copies changes in the other person, and the conclusions from such experimental copying would be derived by the more digital central nervous system which receives proprioceptive cues." (171) Thus we move here from the world of physics and neurophysiology into the realm of the body as a medium for human communication coded both digitally and analogically.

Some years later (1966) while studying John Lilly's dolphins in Hawaii, Bateson returned to the notions of analogic and digital communication, posing the fascinating question: "How does it happen that the paralinguistics and kinesics of men from strange cultures, and even the paralinguistics of other terrestrial mammals, are at least partly intelligible to us, whereas the verbal languages of men from strange cultures seem to be totally opaque?" (1972, p. 374) Because, he answers, language is digital and paralinguistics are analogic. The correspondence between words and things is almost entirely arbitrary, while kinesics and paralinguistics bear a functional relationship to what is signified. "Verbal language," writes Bateson, "is almost (but not quite) purely digital. The word 'big' is not bigger than the word 'little.' . . . On the other hand, in kinesic and paralinguistic communication, the magnitude of the gesture, the loudness of the voice, the length of the pause, the tension of the muscle and so forth -- these magnitudes commonly correspond (directly or inversely) to magnitudes in the relationship that is the subject of discourse." (1972, p. 374) Thus, the analogic significations of gesture and inflection offer something much closer to a universal language than the digital representations of words.

4.

In *Pragmatics of Human Communication* (1967), Watzlawick, Beavin, and Jackson expand upon Bateson's application of analog/digital to nonverbal and verbal communication, declaring that analogic communication means most simply "virtually all nonverbal communication," including "posture, gesture, facial expression, voice inflection, the sequence, rhythm, and cadence of the words themselves, and any other nonverbal manifestation of which the organism is capable, as well as the communication clues unfailingly present in any context in which an interaction takes place." (p. 62) (Bateson is referenced by the authors at this point.)

Further, again expanding upon Bateson, Watzlawick, Beavin and Jackson feature the crucial notion that analogic communication is our primary means to communicate messages about relationship. "Indeed," they write, " wherever relationship is the central issue in communication, we find that digital language is almost meaningless." (p. 63) Of equal interest is their point about the difficulties of translation between analogic and digital modes. "Not only can there be no translation from the digital into the analogic mode without great loss of information" they write, "but the opposite is extraordinarily difficult: "to talk about relationships requires adequate translation from the analogic into the digital mode of communication." (p. 66)

Who has not had this experience, where words fail, or -- worse -- where words contradict a nonverbal message that permeates the context with its power. Much of what is paradoxical in human communication derives from this juxtaposition of messages in different modes. Digital content messages may or may not conform to analogic relationship messages, as when I say "I love you" while at the same time pushing you away.

Watzlawick, Beavin and Jackson summarize that "humans communicate both digitally and analogically. Digital language has a highly complex and powerful logical syntax but lacks adequate semantics in the field of relationship, while analogic language possesses the semantics but has no adequate syntax for the unambiguous definition of the nature of relationships." (p. 67) Even here, it is clear that digital and analogic modes are complementary and, taken together, create a more complete and contextualized message when considered together -- What Bateson referred to as the "Gestalt" mode of codification.

5.

To this point, we have come across a curious array of definitions and exemplifications of analog and digital: from slide rule vs abacus, to rheostat vs light switch, to brain wave vs nerve impulse, to nonverbal vs verbal communication, to continuously coded vs discontinuously coded information. It has become apparent that analog/digital carry both precise meanings at the level of physiological, chemical, and electrical processes and broadly metaphorical meanings when applied to human communication and behavior. In order to explore the limits of a postmodern multiplicity of meanings, I engaged friends and colleagues in an exercise to expand upon the standard examples, the result of which is reported here as the dozens of pairs listed in the following table. (Which you can surely add to.) What struck me was how easy it was for people entirely unfamiliar with the analog/digital concepts to pick up on the gist of this list after being given only a few examples. And, yes, while the list itself is "binary," I was taken with how many stories of the digital age these pairs tell.

ANALOG	DIGITAL
Body	Mind
Hand	Fingers
Female	Male
Life	Death
Qualitative	Quantitative
Space	Time
Atoms	Bits
Yes	No

Primary Process	Secondary Process
Id	Superego
Love	Hate
Dreaming	Waking
Symbol	Syllogism
Icon	Explanation
Likeness	Name
Picture	Word
Pathos	Logos
Nonverbal	Verbal
Semantics	Syntactics
Context	Code
Relationship	Content
Process	Product
Analog Watch	Digital Watch
Film	Video
Linear Editing	Avid
Dial Phone	"Touch Tone" Phone
Fax	Email
Vinyl Records	CDs
Subway Token	Metrocard
Hotel Door Key	Hotel Door Card
Imperial Measure	Metric Measure
Bank Teller	ATM
Weeds	Flowers
Marijuana	Cocaine
Motorcycle	Range Rover
Harley	Kawasaki
65 Mustang	97 Acura
New Yorker	People
Big Mac	Chicken McNuggets
Ballet	Tap Dancing
Elevator	Stairs
Valentine's Day	Fourth of July
Swimming	Jogging

Bill	Hillary
Hot	Cool
Greek	Latin
Mime	Monologue
Coney Island	Disneyland
Bruno Magli Shoeprint	O.J. DNA Evidence
Rolodex	Database
Rheostat	Light Switch
"Old" Times Square	"New" Times Square
Right Brain	Left Brain
Tuning Knobs	Button
Gears	Switches
Classroom	Distance Learning
GUI	UNIX
Steps to an Ecology of Mind	Pragmatics of Human Communication
Plato	Aristotle
Later Wittgenstein	Early Wittgenstein
(Phil. Investigations)	(Tractatus)
Actual	Virtual
Night	Day

For instance, I reflected upon my teenage son's fascination with vinyl when I heard Charles Osgood report on the CBS Evening News that people "yearn for analog sound in this digital age." (2/23/97) Osgood said that the demand for vinyl records has doubled in the past few years, quoting the French technoartist Freon as praising the "tactile quality," the feel, and even the "imperfections" of vinyl. Analog sound is often characterized as "warmer" or "fuller." My son says that DJs often prefer vinyl because it can be manipulated more freely to scratch, crossfade, backcue, and mix. Audio expert Barry Salmon tells me that analog vacuum tubes and tuning knobs (as opposed to buttons) are also hugely popular among audiophiles. In fact, by the process of "analog emulation" a digital recording can be "warmed up" by running it through a process with tubes in order to add back the distortion characteristic of analog recording! Salmon distinguishes between the analog "world of the aesthetic" and the digital "world of the efficient," arguing that in the world of audio there is a yearning for tactile experience and imperfection as opposed to "digital isolation."

I also looked around recently at a meeting of new media mavens to observe that nearly all of them were wearing analog rather than digital watches. If the purpose is purely to tell the most precise time, doesn't digital make more sense? Or is something else operating in this choice? For me, it's that I tell time by space and not by numbers, so the visual representation made by the position of the two hands is only one piece of information for me to process instead of the three or more numerals on a digital readout. I also think digital watches are ugly. In fact, a friend recently pointed out that my watch even has roman numerals, making it about one step removed from a sundial!

On another front, I've been intrigued by how difficult it has been for the New York City Metro Transit Authority to switch the millions of subway riders from brass tokens to plastic metrocards with a magnetic strip. Anyone who has held a brass token in one hand and the flimsy card in the other shouldn't wonder for long about why the smooth, substantive brass is favored. Also -- it's trustworthy. One token, one revolution of the turnstile, while sliding the Metrocard as often as not results in a message to "slide again." And you have the confidence of knowing that one token gets you one ride. You can't tell without a special scanner how many rides (if any) are left on a Metrocard. Somehow, the card is just one more step removed from the physical process of getting through the turnstile.

And speaking of resistance to change, all of the technologically advanced countries of the world apart from the U.S. have adopted the metric system, first used in France in 1799. Despite the fact that the English Units of Measurement system still used in the U.S. is much less practical than the metric system, repeated attempts to legislate a change through the U.S. Congress have failed. Opponents of change cite the great expense to industry and potential confusion of the public as primary reasons, but whatever the case the U.S. remains almost alone as an "analog nation." Give us "pounds" and "feet" instead of those disembodied "kilos" and "metres."

On a broader plane, consider the distinctions between amusement parks that have evolved as a part of their geosocial landscape -- such places as Coney Island, Asbury Park, Santa Cruz Beach Boardwalk, and Copenhagen's Tivoli, and the imposed, context-free entertainment malls of Disneyland, Epcot, and Great America. Baudrillard, "the first high tech social theorist" (Best & Kellner, 128), is well known for his provocation that "Disneyland is presented as imaginary in order to make us believe that the rest is real, when in fact all of Los Angeles and the America surrounding it are no longer real, but of the order of the hyperreal and simulation." (1983b, p. 25) To Baudrillard, its manufactured consciousness and experience is the apotheosis of hyperreality, where the model creates the perception of the "real" rather than the other way around to a point where the distinctions between what is "real" and what is simulated simply disappear. No longer do we have a community creating an environment through which to express its playfulness, but rather an environment created in order to manufacture an experience for a community that simulates playfulness. This can be seen as the difference between the Santa Cruz experience of strolling the boardwalk, walking down to the beach, having a beer, going on a ride or two (or not) as you please, and the Disneyland all-or-nothing experience of paying a small fortune to enter the gated wonderland where all of the decisions have been made for you except for where to spend the rest of your money.

Another provocative example has to do with the effects of digital technology on communication and education. The rise in electronic communication and learning frightens many teachers, who imagine that their role will change beyond recognition or disappear altogether as administrators find more "cost effective" ways of "delivering" educational "product." The digitization of education has indeed been swift and profound, yet some of the early results indicate that the unexpected consequence of online learning and communication is that it makes people want to see more of each other in the physical world, not less. A New York Times report on "Face-to-Face Meetings Fill in Cyberspace Gaps" quoted MIT Architecture Dean William Mitchell saying "the more electronic communication expands and diversifies our circle of contacts, the more we're going to want to add the dimension of face-to-face." (p. A12) This was confirmed by a large Media Theory class I taught last year that met both on site weekly and on line through The New School's cybercampus. Instead of replacing the need for physical contact, the virtual experience dramatically both increased and enhanced it. And there was no question that at the end of the term, the "gestalt" of the combined onsite/online learning environments became much more than the sum of its

parts.

And remember the once-riveting O.J. Simpson trials? They provide one final example that pushes the envelope of analog/digital illustrations, but I believe it is worth making despite some obvious vulnerability to criticism. While the "not guilty" verdict in the criminal trial vs the "guilty" verdict in the civil trial were no doubt largely a function of both race and racism, consider for a moment the relative persuasiveness of two crucial pieces of evidence; one digital, one analogic. The key evidence in the criminal trial that linked O.J. Simpson to the murders of Nicole Brown Simpson and Ron Goldman was the DNA match between Simpson and blood samples collected at the crime scene. The chance of a DNA match between two people is more than 1 in 150 million. This means, statistically speaking, that there was only one other person beside Simpson in the entire U.S. whose DNA matched that of the blood found at the scene. Yet the jury was perhaps more impressed by the "bloody gloves" that didn't seem to fit, and found Simpson "not guilty." In the civil trial, on the contrary, the saying went "the shoes fit, so they wouldn't acquit." This referred to the fact that a footprint found at the crime scene was identified to be that of a Bruno Magli size 12 shoe. Despite Simpson's claim that he had never owned such "ugly-ass" shoes, the civil jury was presented with 31 photographs from two different photographers showing Simpson wearing what looked for all the world like these very shoes, of which 299 were sold in the U.S. This puts the statistical "shoe" odds several hundred times more in Simpson's favor compared to the DNA evidence, but the analog footprint seemed to have a far more persuasive effect.

6.

Having taken these examples to the limit, we might ask: what is it about the analog that is so seductive, so persuasive, so "real"? In scanning the "analog/digital" list, the analog side for me exerts measurably more pull and evokes more feeling, reminiscent of Sandy Stone's depiction of "the war between desire and technology" being played out as we negotiate the cultural meanings of the "technological prosthetics" of our time. (1995, p. 171) Stone could have been writing about the relationship of digital and analogic examples arrayed here when she pointed to "the contested zone at the boundaries between the machine assemblages of commodification, simulation, political power, and the inexpungible human desire for sociality and love." (p. 171)

Perhaps because the analogic refers to a continuous mapping or coding of experience, it evokes something closer to sensation, authenticity, and wholeness. At the Attic Greek roots, *ana* (equivalent) *logos* (structure of reality) refers to a correspondence, a resemblance, a proportionate reckoning. As a level of description, it is closer than digital coding to the physical world, closer to corporeality, more kinesthetic, tactile, more -- dare I say -- "real." The digital level of description, so technologically fundamental to the virtual worlds we now create behind the screen, represents a more abstracted disembodied consciousness, which is at once more expansive and less visceral. The digital does indeed unleash the full power of McLuhan's technological "extensions of man," but as Turkle points out, "virtuality need not be a prison. It can be the raft, the ladder, the transitional space, the moratorium, that is discarded after reaching greater freedom." (p. 263)

Finally, it is in the relationship between digital and analogic modes of description and experience where feeling and imagination grow and flourish: that third region Bateson called "Gestalt codification." (p. 171) The analog/digital pair in the end is itself both as digital as binary opposites and as analog as the relationship between them; as intertwined as the desire and technology of our actual and virtual lives and the new era they are creating. It is here in the interstices of digital/analogic representation that we might explore and nurture a perspective beyond the surface obsessions and fragmentations of deconstructivist postmodernism, an emerging view that Charlene Spretnak calls "ecological postmodernism," grounded in process, relationship, context,

Being Analog

CAROL WILDER

"The world," a wit once said (I think it was Robert Benchley) "is divided into two groups of people: those who divide the world into two groups of people and those who don't." Benchley was having fun, but the point he makes is an important one—there is something in the human mind that seems to make sense of things by finding polar oppositions. Saussure explained this by arguing that concepts have no meaning in themselves and are purely differential. It is the relationships that concepts have with other terms in the system in which they are embedded that are critical. That is, the mind finds meaning essentially by making polar oppositions. Think here of Seven-Up, the "un-cola." Think here of binary or on or off, one or zero, with nothing in between.

The opposition that Carol Wilder sees as paramount in today's postmodern world is the one between analog and digital, between a world of degrees of difference and one of total differences. She mentions a nature writer, Bill McKibben, who argues that we live in "an age of missing information." She also discusses the work of Gregory Bateson who pointed out something interesting: *We can understand the body language of people from different cultures even if we don't understand their language because, as Bateson put it, "language is digital and paralinguistics are analogic."*

Wilder also mentions the work of a group of researchers who argue that "wherever relationship is the central issue in communication, we find that digital language is almost meaningless. "That is because relationships tend to be ambiguous and complicated with varying degrees of feeling among the people involved, and not simply hot or cold. *We are talking here about rheostats, where lights can be dimmed or made brighter, not light switches, where the light switch is either on or off.*

She mentions an exercise she conducted with friends to find the various sets of paired oppositions that were subsumed under the dominant opposition, analog and digital. She came up with a huge list of things that were digital and of their opposites, such as:

<i>ANALOG</i>	<i>DIGITAL</i>
Body	Mind
Qualitative	Quantitative
Vinyl records	CDs

and in some cases came up with somewhat enigmatic opposites such as:

Harley	Kawasaki
65 Mustang	97 Acura

Then she ties her discussion of digital and analog to postmodernism, and discusses an emerging view, "ecological postmodernism," that Wilder says, is "grounded in process, relationship, context, complexity, community, and the body."

ARTHUR ASA BERGER

(Section Break)

As we rush headlong into the digital future, postmodern life is swirling with change, from work cultures and personal communication technologies, to business and economic models, to definitions of community and even notions of identity and self. It is truly an age of information, albeit Baudrillard may have had a point in claiming "we live in a universe where there is more and more information, and less and less meaning" (1983a, 95). Nature writer Bill McKibben agrees, arguing that while in a narrow sense "we live in an 'age of information' where there has been an information 'explosion' and an information 'revolution'," in many ways the opposite is true. "We also live," he writes, "in a moment of great ignorance ...An unenlightenment...An age of missing information" (1992, 9).

But what is "missing" in mediated culture? What might be lost as life moves in ever enfolding and expanding circles of simulation and virtuality? One does not have to be anti-technology to agree with Neil Postman that "technological change is ...ecological ...A new technology does not add or subtract something. It changes every- thing" (1993, 18). But what changes? "Are we now living life on the screen or in the screen?" asks Sherry Turkle (1995, 21). Should we share Negroponte's enthusiasm about "being digital" (1996)? Or Postman's skepticism? Or can we take another perspective-let's call it "being analog"-in search of McKibben's missing information?

Until what seems like about five minutes ago, the concepts of analog and digital were known only to scientists and scholars, but suddenly they have become part of the daily general discourse about communication technologies. For this reason alone, it might be useful to explore how the analog/ digital notions have evolved, the reach of their powers of description and explanation, and their relationship to each other in an ecological view of today's communication environment.

Let's begin with a very practical example. The Media Studies program at my university teaches both theory and production across a lot of stuff-production gear as old as forty years (especially in film) and as new as tomorrow's delivery. We are currently planning a state-of-the-art multimillion dollar audio, video, and multimedia facility and we are poised to invest several million dollars in new equipment.

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Many intriguing personal, practical, and philosophical questions were raised during the great analog/ digital debate, having to do with everything from economics to aesthetics to epistemology.

Some questions were pedagogical or pragmatic. For instance, does it matter to the media production learning process if a video student is trained to edit first and only on a computer with its ease of change and infinite choices? Or should one first learn on a linear/analog system where choice and change are more constrained by the technology and where more editing occurs above the eyebrows than behind the screen? Does it make any difference if an audio student learns first to cut tape with a razor blade made up of atoms that can also cut oneself, or if that "razor blade" is an icon made up of bits and displayed on a computer screen? While it seems inevitable that digital technology in some form will prevail in the end, during this transitional period these interesting questions can be asked.

Some of the questions raised during the analog/digital debates were more whimsical. For instance, at one point I wondered why my teenage son—denizen of the digital age—covets my old analog vinyl records? Why has the New York subway system encountered such resistance as they try to move riders from using analog brass tokens to digitized Metrocards? Why is the U.S. one of the last countries in the world to resist metric measurement, clinging instead to good old anthropomorphic analog pounds and feet? Why did the first O.J. Simpson jury acquit him, despite the overwhelming digital evidence of the DNA testing results, while the second jury in the civil trial convicted him based partly on a telling analog shoeprint? Why do people who spend time online with each other want more physical contact, not less? Why do I love the Coney Islands and Tivolis and Santa Cruz Beach Boardwalks of the world, and loathe the Great Americas and Disneylands? And what, if anything, do these comparisons have in common?

Even in the practical realm, not everyone is enamored with non-linear editing. In "Faster Isn't Always Better," in *Variety's On-Production* magazine (vol. 5, no. 6) Christopher Grove reported the mixed feelings that TV and movie industry professionals have about the new digital nonlinear disc-based editing systems and their implications for the art of editing. Film editor Sheldon Kahn ("One Flew Over the Cuckoo's Nest," "Out of Africa") told him "I'm worried about what's happening to the next generation of editors." Kahn cut his films the traditional way—on a Moviola and a flatbed with the help of assistant editors and an apprentice. And it's from the ranks of the assistants and apprentices that editors like Kahn himself emerged, after learning their craft from the editors they worked for. "But the role of apprentice is disappearing," says Kahn, "and the role of the assistant editor has been so changed by digital editing that the former training ground has, in the view of many, been compromised." Kahn recently "cut" his first film digitally ("Space Jam"), and didn't even hire an apprentice. Instead, his two assistants spent their time digitizing footage for Kahn to cut. "They're great at what they do," he adds, "but it's not editing."

Jack Turner, another veteran editor, said "ten years ago I'd give my assistant a scene to cut to see how they'd do or ask them to sit in on an edit session with me and let them ask questions. But there's no time for that now."

If one of the hallmarks of the postmodern age is technological optimism bordering on euphoria (Smart, p. 19), digital media technologies certainly lead the way. Upbeat depictions of the cyberfuture such as Douglas Rushkoff's *Media Virus* and Negroponte's *Being Digital* and any issue of the gaudy *Wired* magazine paint a world of such buzz and excitement only a fool or a fagey could demur. But wait— even Negroponte writes that "the world, as we experience it, is a very analog place. From a macroscopic point of view, it is not digital at all but continuous. Nothing goes suddenly on or off, turns from black to white, or changes from one state to another without going through a transition" (p. 15).

2

So what might we be losing, or losing sight of, in this rush to a digital one-size-fits-all future? Could it be that some of McKibben's "missing information" lies in "being analog"? To find an answer, I went back to the earliest—and in many ways most profound—discussions recalled about the concepts of analog and digital, found in the proceedings of the Macy Conferences on Cybernetics. The Macy Conferences were a remarkable series of ten meetings from 1946-1953 which included many of the intellectual giants of the era: mathematicians John Von Neumann, Walter Pitts, Norbert Wiener, anthropologists Margaret Mead and Gregory Bateson, engineers Heinz Von Foerster, Claude Shannon, and Julian Bigelow, neuropsychiatrist Warren McCulloch, social psychologist Alex Bavelas, and others. Altogether, one of the most re-markable assemblages of thinkers in this century.

At the eighth Macy Conference in 1951, physiologist Ralph Gerard presented a paper on "Some of the Problems Concerning Digital Notions in the Central Nervous System." Gerard was attempting to show that the digital and analog mechanisms of the brain are equally important. Gerard explained that "an analogical

system is one in which one of two variables is continuous on the other, while in a digital system the variable is discontinuous and quantized " (p. 13). He points out that the prototype of an analog mechanism is the slide rule, where "a number is represented as a distance and there is continuity between greater distance and greater number." *On the other hand, the prototype of a digital mechanism is the abacus, "where the bead on one half of the wire is not counted at all, while that on the other half is counted as a full unit. "This is a reflection of the binary expression of the digital metaphor--on or off, one or zero, nothing in between. (We have Leibniz to thank for the binary number system, based on powers of 2, which allows any binary digit--or "bit"--to be transmitted electronically by the presence or absence of an electrical current.)*

Similarly, Gerard gives the example of the analog rheostat that dims or brightens continuously, versus the on/off digital light switch. More fundamentally, he suggests that the chemical aspect of neural functioning, much of the electrical action of the nervous system, and brain waves themselves are analogical, while "the nerve impulse is digital in character" (p. 13).

Gerard's remarks led to a lively discussion that reveals both the richness and confusion surrounding the analog/digital concepts even in these early days. Norbert Wiener dates the concepts from "about 1940" and McCulloch adds that "they used to be called logical machines or analogical machines before the word 'digital' appeared. "Von Neumann suggests that "one must say that in almost all parts of physics the underlying reality is analogical...The digital procedure is usually a human artifact for the sake of description." Somewhat later Bigelow injects "I think that somebody ought to make the very platitudinous remark that it is impossible to conceive of a digital notion unless you have as a reference the notion of a continuous process by which you are defining your digit; that is to say, the slide rule has continuous length and it has on it numbers which are digital" (p. 35).

Gregory Bateson suggests that "it would be a good thing to tidy up our vocabulary," introducing the concept of "coding," which leads McCulloch to "the question whether information be continuously or discretely coded" (p. 50). Lawrence Frank wonders "if we have the same situation as that pointed out years ago by Eddington when he said that physics was classical on Monday, Wednesday, and Friday and quantum on Tuesday, Thursday, and Saturday. We are not confronted with irreconcilably opposed viewpoints when we realize that there are two ways of recording events which exhibit both discreteness and continuity." In other words, digital and analogic metaphors are complementary forms of representation, which acquire meaning only in relation to each other. Each works at a different level of description, as in the continuous analogic reality of a child's fever that can be measured with either the back of a mother's hand or with a digital device.

3

The Macy Conference participants agreed on the mutuality and usefulness of the analog/ digital metaphor as a form of description for computing and neuroscience. Gregory Bateson went one step further in applying the concepts to coding in human communication. *Acknowledging his debt to Macy Conference colleagues,* Bateson wrote a tour de force essay on "Information and Codification" "in 1951." "Codification," he wrote, "is the term used by communication engineers for the substitution of one type of event for another, such that the event substituted shall in some sense stand for the other" (Ruesch & Bateson, p. 169). Bateson identified 3 types of codification as it relates to information: analogic, digital, and Gestalten, suggesting that "apart from the central nervous system, there is a possibility that the whole moving body may be used as analogic component." Further, "it is probable, for example that some people empathize the emotions of others by kinesthetic imitation. *In this type of thinking, the body would be an experimental analogue, a model, which copies changes in the other person, and the conclusions from such experimental copying would be derived by the more digital central nervous system which receives proprioceptive cues*" (p. 171). Thus we move here from the world of physics and neurophysiology into the realm of the body as a medium for human communication coded both digitally and analogically.

ANALOG	DIGITAL
Body	Mind
Hand	Fingers
Female	Male
Life	Death
Qualitative	Quantitative
Space	Time
Atoms	Bits
Yes	No
Primary Process	Secondary Process
Id	Superego
Love	Hate
Dreaming	Waking
Symbol	Syllogism
Icon	Explanation
Likeness	Name
Picture	Word
Pathos	Logos
<i>Nonverbal</i>	<i>Verbal</i>
Semantics	Syntactics
Context	Code
Relationship	Content
<i>Process</i>	<i>Product</i>
Analog Watch	Digital Watch
Film	Video
Linear Editing	Avid
Dial Phone	"Touch Tone" Phone
Fax	Email
Vinyl Records	CDs
Subway Token	Metrocard
Hotel Door Key	Hotel Door Card
Imperial Measure	Metric Measure
Bank Teller	ATM

ANALOG	DIGITAL
Weeds	Flowers
Marijuana	Cocaine
Motorcycle	Range Rover
Harley	Kawasaki
'65 Mustang	'97 Acura
New Yorker	People
Big Mac	Chicken McNuggets
Ballet	Tap Dancing
Elevator	Stairs
Valentine's Day	Fourth of July
Swimming	Jogging
Bill	Hillary
Hot	Cool
Greek	Latin
Mime	Monologue
Coney Island	Disneyland
Bruno Magli Shoeprint	O.J. DNA Evidence
Rolodex	Database
Rheostat	Light Switch
"Old" Times Square	"New" Times Square
Right Brain	Left Brain
Tuning Knobs	Button
Gears	Switches
Classroom	Distance Learning
GUI	UNIX
Steps to an	Pragmatics of
Ecology of Mind	Human Communication
Plato	Aristotle
Later Wittgenstein	Early Wittgenstein
(Phil. Investigations)	(Tractatus)
Actual	Virtual
Night	Day

Some years later (1966) while studying John Lilly's dolphins in Hawaii, Bateson returned to the notions of analogic and digital communication, posing the fascinating question: "How does it happen that the paralinguistics and kinesics of men from strange cultures, and even the paralinguistics of other terrestrial mammals, are at least partly intelligible to us, whereas the verbal languages of men from strange cultures seem to be totally opaque?" (1972, 374) Because, he answers, language is digital and paralinguistics are analogic. The correspondence between words and things is almost entirely arbitrary, while kinesics and paralinguistics bear a functional relationship to what is signified. "Verbal language," writes Bateson, "is almost (but not quite) purely digital. The word 'big' is not bigger than the word 'little.' ... On the other hand, in kinesic and paralinguistic communication, the magnitude of the gesture, the loudness of the voice, the length of the pause, the tension of the muscle and so forth—these magnitudes commonly correspond (directly or inversely) to magnitudes in the relationship that is the subject of discourse" (1972, 374). Thus, the analogic significations of gesture and inflection offer something much closer to a universal language than the digital representations of words.

4

In *Pragmatics of Human Communication* (1967), Watzlawick, Beavin and Jackson expand upon Bateson's application of analog/digital to non-verbal and verbal communication, declaring that analogic communication means most simply "virtually all nonverbal communication," including "posture, gesture, facial expression, voice inflection, the sequence, rhythm, and cadence of the words themselves, and any other nonverbal manifestation of which the organism is capable, as well as the communication clues unfailingly present in any context in which an interaction takes place" (p. 62). (Bateson is referenced by the authors at this point.)

Further, again expanding upon Bateson, Watzlawick, Beavin and Jackson feature the crucial notion that analogic communication is our primary means to communicate messages about relationship. "Indeed~" they write, "wherever relationship is the central issue in communication, we find that digital language is almost meaningless" (p.63). Of equal interest is their point about the difficulties of translation between analogic and digital modes. "Not only can there be no translation from the digital into the analogic mode without great loss of information" they write, "but the opposite is extraordinarily difficult: "to talk about relationships requires adequate translation from the analogic into the digital mode of communication" (p. 66)

Who has not had this experience, where words fail, or--worse-- where words contradict a nonverbal message that permeates the context with its power. Much of what is paradoxical in human communication derives from this juxtaposition of messages in different modes. Digital content messages may or may not conform to analogic relationship messages, as when I say "I love you" while at the same time pushing you away.

Watzlawick, Beavin and Jackson summarize that "humans communicate both digitally and analogically. Digital language has a highly complex and powerful logical syntax but lacks adequate semantics in the field of relationship, while analogic language possesses the semantics but has no adequate syntax for the unambiguous definition of the nature of relationships" (p. 67). Even here, it is clear that digital and analogic modes are complementary and, taken together, create a more complete and contextualized message when considered together—what Bateson referred to as the "Gestalt" mode of codification.

5

To this point, we have come across a curious array of definitions and exemplifications of analog and digital: from slide rule vs abacus, to rheostat vs light switch, to brain wave vs nerve impulse, to nonverbal vs verbal communication, to continuously coded vs discontinuously coded information. It has become apparent that analog/ digital carry both precise meanings at the level of physiological, chemical, and electrical processes and broadly metaphorical meanings when applied to human communication and behavior. In order to explore the limits of a postmodern multiplicity of meanings, I engaged friends and colleagues in an exercise to expand upon the standard examples, the result of which is reported here as the dozens of pairs listed in the following table. (Which you can surely add to.) What struck me was how easy it was for people entirely unfamiliar with

the analog/digital concepts to pick up on the gist of this list after being given only a few examples. And, yes, while the list itself is "binary," I was taken with how many stories of the digital age these pairs tell.

For instance, I reflected upon my teenage son's fascination with vinyl when I heard Charles Osgood report on the CBS Evening News that people yearn for analog sound in this digital age" (Feb. 23, 1997). Osgood said that the demand for vinyl records has doubled in the past few years, quoting the French technoartist Freon as praising the "tactile quality, the feel, and even the "imperfections" of vinyl. Analog sound is often characterized as "warmer" or "fuller." My son says that DJs often prefer vinyl because it can be manipulated more freely to scratch, crossfade, backcue, and mix. Audio expert Barry Salmon tells me that analog vacuum tubes and tuning knobs (as opposed to buttons) are also hugely popular among audiophiles. In fact, by the process of *analog emulation a digital recording can be "warmed up" by running it through a process with tubes in order to add back the distortion characteristic of analog recording!* Salmon distinguishes between the analog "world of the aesthetic" and the digital "world of the efficient arguing that in the world of audio there is a yearning for tactile experience and Imperfection as opposed to "digital isolation."

I also looked around recently at a meeting of new media mavens to observe that nearly all of them were wearing analog rather than digital watches. If the purpose is purely to tell the most precise time, doesn't digital make more sense? Or is something else operating in this choice? For me, it is that I tell time by space and not by numbers, so the visual representation made by the position of the two hands is only one piece of information for me to process instead of the three or more numerals on a digital readout. I also think digital watches are ugly. In fact, a friend recently pointed out that my watch even has roman numerals, making it about one step removed from a sundial!

On another front, I've been intrigued by how difficult it has been for the New York City Metro Transit Authority to switch the millions of subway riders from brass tokens to plastic metrocards with a magnetic strip. Anyone who has held a brass token in one hand and the flimsy card in the other shouldn't wonder for long about why the smooth, substantive brass is favored. Also-it's trustworthy. One token, one revolution of the turnstile, while sliding the Metrocard as often as not results in a message to "slide again." And you have the confidence of knowing that one token gets you one ride. You can't tell without a special scanner how many rides (if any) are left on a Metrocard. Somehow, the card is just one more step removed from the physical process of getting through the turnstile.

And speaking of resistance to change, all of the technologically advanced countries of the world apart from the U.S. have adopted the metric system, first used in France in 1799. Despite the fact that the English Units of Measurement system still used in the U.S. is much less practical than the metric system, repeated attempts to legislate a change through the U.S. Congress have failed. Opponents of change cite the great expense to industry and potential confusion of the public as primary reasons, but whatever the case the U.S. remains almost alone as an "analog nation." Give us "pounds" and "feet" instead of those disembodied "kilos" and "metres."

On a broader plane, consider the distinctions between amusement parks that have evolved as a part of their geosocial landscape-such places as Coney Island, Asbury Park, Santa Cruz Beach Boardwalk, and Copenhagen's Tivoli, and the imposed, context-free entertainment malls of Disneyland, Epcot, and Great America. Baudrillard, "the first high tech social theorist" (Best & Kellner, p. 128), is well known for his provocation that "Disneyland is presented as imaginary in order to make us believe that the rest is real, when in fact all of Los Angeles and the America surrounding it are no longer real, but of the order of the hyperreal and simulation." (1983b, 25) To Baudrillard, its manufactured consciousness and experience is the apotheosis of hyperreality, where the model creates the perception of the "real" rather than the other way around to a point where the distinctions between what is "real" and what is simulated simply disappear. No longer do we have a community creating an environment through which to express its playfulness, but rather an environment created in order to manufacture an experience for a community that simulates playfulness. This can be seen as the difference between the Santa Cruz experience of strolling the boardwalk, walking down to

the beach, having a beer, going on a ride or two (or not) as you please, and the Disneyland all- or-nothing experience of paying a small fortune to enter the gated wonderland where all of the decisions have been made for you except for w here to spend the rest of your money.

Another provocative example has to do with the effects of digital technology on communication and education. The rise in electronic communication and learning frightens many teachers, who imagine that their role will change beyond recognition or disappear altogether as administrators find more "cost effective" ways of "delivering" educational "product." The digitization of education has indeed been swift and profound, yet some of the early results indicate that the unexpected consequence of online learning and communication is that it makes people want to see more of each other in the physical world, not less. A New York Times report on "Face-to-Face Meetings Fill in Cyberspace Gaps" quoted MIT Architecture Dean William Mitchell saying "the more electronic communication expands and diversifies our circle of contacts, the more we're going to want to add the dimension of face-to-face" (Feb. 23, 1997, p. A12). This was confirmed by a large Media Theory class I taught last year that met both on site weekly and on line through The New School's cyber campus. Instead of replacing the need for physical contact, the virtual experience dramatically both increased and enhanced it. And there was no question that at the end of the term, the "gestalt" of the combined onsite/online learning environments became much more than the sum of its parts.

And remember the once-riveting O.J. Simpson trials? They provide one final example that pushes the envelope of analog/ digital illustrations, but I believe it is worth making despite some obvious vulnerability to criticism. While the "not guilty" verdict in the criminal trial vs the "guilty" verdict in the civil trial were no doubt largely a function of both race and racism, consider for a moment the relative persuasiveness of two crucial pieces of evidence; one digital, one analogic. The key evidence in the criminal trial that linked O.J. Simpson to the murders of Nicole Brown Simpson and Ron Goldman was the DNA match between Simpson and blood samples collected at the crime scene. The chance of a DNA match between two people is more than 1 in 150 million. This means, statistically speaking, that there was only one other person beside Simpson in the entire U.S. whose DNA matched that of the blood found at the scene. Yet the jury was perhaps more impressed by the "bloody gloves" that didn't seem to fit, and found Simpson "not guilty." In the civil trial, on the contrary, the saying went "the shoes fit, so they wouldn't acquit." This referred to the fact that a footprint found at the crime scene was identified to be that of s Bruno Magli size 12 shoe. Despite Simpson's claim that he had never owned such "ugly-ass" shoes, the civil jury was presented with 31 photographs from two different photographers showing Simpson wearing what looked for all the world like these very shoes, of which 299 were sold in the U.S. This puts the statistical "shoe" odds several hundred times more in Simpson's favor compared to the DNA evidence, but the analog footprint seemed to have a far more persuasive effect.

6

Having taken these examples to the limit, we might ask: what is it about the analog that is so seductive, so persuasive, so "real"? In scanning the "analog/ digital" list, the analog side for me exerts measurably more pull and evokes more feeling, reminiscent of Sandy Stone's depiction of "the war between desire and technology" being played out as we negotiate the cultural meanings of the "technological prosthetics" of our time (1995, p. 171). Stone could have been writing about the relationship of digital and analogic examples arrayed here when she pointed to "the contested zone at the boundaries between the machine assemblages of commodification, simulation, political power, and the inexpungible human desire for sociality and love" (p. 171).

Perhaps because the *analogic refers to a continuous mapping or coding of experience*, it evokes something closer to sensation, authenticity, and wholeness. At the Attic Greek roots, *ana* (equivalent) *logos* (structure of reality) refers to a correspondence, a resemblance, a proportionate reckoning. As a level of description, it is closer than digital coding to the physical world, closer to corporeality, more kinesthetic, tactile, more--dare I say--"real." The digital level of description, so technologically fundamental to the virtual worlds we now create behind the screen, represents a more abstracted disembodied consciousness, which is at once more

expansive and less visceral. The digital does indeed unleash the full power of McLuhan's technological "extensions of man; ' but as Turkle points out,"virtuality need not be a prison. It can be the raft, the ladder, the transitional space, the moratorium, that is discarded after reaching greater freedom" (p.263).

Finally, it is in the relationship between digital and analogic modes of description and experience where feeling and imagination grow and flourish; that third region Bateson called "Gestalt codification" (p. 171). The analog/ digital pair in the end is itself both as digital as binary opposites and as analog as the relationship between them; as inter- twined as the *desire and technology of our actual and virtual lives* and the new era they are creating. It is here in the interstices of digital/ analogic representation that we might explore and nurture a perspective beyond the surface obsessions and fragmentations of deconstructivist postmodernism, an emerging view that Charlene Spretnak calls "ecological postmodernism," grounded in process, relationship, context, complexity, community, and the body (p. 73). This is reminiscent of Stone's impassioned conclusion that "in the space between [desire and technology lies the path to our adventure at the dawn of the virtual age, the adventure which belongs to our time and to ours alone" (p. 183). "Being analog" is *only a start, and only a part of the story, but taken seriously it may provide one more aperture to "missing information"* in an age that so clearly calls for the collective wisdom an ecological vision may hold.

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