Digital Keywords

A Vocabulary of Information
Society and Culture

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Analog
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Sometime in the 1980s, the terms *analog* and *analogue* began to wildly proliferate, a trend that continued into the 1990s. *Analog* is a shortened version of the word *analogue,* consistent with the American trend of shortening English words (and the proliferation of American English on the internet), a practice I continue in this entry by treating the two words as one. It appeared in technical discussions, but also more broadly in cultural journalism, in humanistic writing, and in everyday talk. We would expect as much with words like *digital* or *computer*, given the expansion of computing in everyday life, and the flood of personal computers to hit the market in that decade. But the growth in references to *analog* and *analogue* in the 1990s is telling as well.[1]

It is also the moment that *analog* comes to fully take on its most pervasive contemporary meaning. As Derek Robinson writes in his keyword entry on the term:

> The term "analog" has come to mean smoothly varying, of a piece with the apparent seamless and inviolable veracity of space and time; like space and time admitting infinite subdivision, and by association with them connoting something authentic and natural, against the artificial, arbitrarily truncated precision of the digital (e.g., vinyl records vs. CDs). This twist in the traditional meaning of "analog" is a linguistic relic of a short-lived and now little-remembered blip in the history of technology. (Robinson 2008, 21)

Robinson goes on to give a history of analog computing. But in this entry, I will argue that the proliferation of *analog*'s meaning as "not-digital" or "separate from computers" emerges more from

a set of reactions to digital technology than from the engineering field itself. Put another way, an expanded notion of *the analog* as a condition, which now approaches common sense in a whole range of fields—engineering, computer science, media studies, journalism, music fandom, various media arts and humanities—became a useful rhetorical tool for both promotional and critical discussions of digital technology.

The most recent linguistic innovations around the idea of the analog—as the point of contact with the digital and that which lies entirely outside of it—has led to a largely unexamined conceptual expansion of the analog domain in journalism and scholarship alike. There are at least two major problems with this definition. First, *analog* denotes a specific technical process, where one quality is used to represent another. A violin is not an analog technology, but a synthesizer is because of the defined relationships on which its system is based, such as control voltage and oscillator pitch. Second, the entire world outside of digital processing is not analog, because analog represents a particular technocultural relationship to nature. Nature may well be conceived as *having* analogs within it, but it cannot *be* analog.

The idea of *analog* as *everything not-digital* is in fact *newer* than the idea of *digital*. And as I argue below, expanding the idea of *analog* to cover everything that is *not-digital* comes with a cost, because it effectively diminishes the variety of the world as it elevates conceptions of the digital. It mixes very well with all sorts of digital boosterism because it rhetorically figures the primary point of comparison—whether historical, ontological, aesthetic, institutional, or in some other dimension—as between digital technologies and *everything else in the world*. I cannot imagine a more hyperbolic way of figuring digital technologies. The language of *analog as the not-digital world* is also taken up for critique as well as celebration, but it has a similar figurative effect: inflating "the analog" to "the world" limits the options we have for describing natural, cultural, and technological history to one kind of periodization (analog/digital, or maybe preanalog/analog/digital), when in fact there are many different ways to narrate history, and each comes with a different set of purposes. Making "the digital" a historical villain delivers no greater analytical payload than painting

it as a hero.[2] This is not to say we cannot generalize about digital technologies, operations, or even culture. Only that if it is counterpoised to an infinitely expanded notion of "the analog," we lose the analytical power of both terms.

To understand the historical meaning of *analog*'s proliferation, we need to get a sense of both the broader meaning of the term and the specific historical meanings that it took on during the 1970s and 1980s. The *Oxford English Dictionary* etymology has the word entering English from the French *analogue*, meaning "a thing that has characteristics in common with another thing." As evidenced by the web of cross-references in the *OED*, the word clearly belongs to a family: *analogous*, *analogon*, *analogate*, all of which descend from Greek and Latin terms for analogy, which later takes on a sense of proportion as well (*OED*, s.v.).

In the *OED*'s account of *analogue*, there appear to be two distinct historical threads that occasionally meet and imitate one another: a natural science thread from chemistry and biology that renders it as a noun, and a technology thread that descends from computing but quickly exceeds it, which is more likely to render it in adjectival or adverbial form. The accompanying table presents some representative definitions from the *OED*'s *analogue* entry. The *OED*'s entries are often somewhat late compared to common usage, but the conservative dates are at least schematically useful. The left column implies morphological relation or structural homology. Social classes in different countries can be analogues of one another; individuals can be analogues of one another; words or phrases can be analogues of one another. Even the soy-based meat and cheese products of the 1966 entry imply a structural replacement in the diet of one biochemical form with another. It is not an accident that across the space of a century, the interface between media ideas and food chemistry ideas moves from technological reproduction and preservation to synthesis and replacement. Where in the nineteenth century ideas about the preservative power of sound recording borrowed their language from canning and embalming (Sterne 2003, 292–301), in the twentieth century, ideas of artificial sound synthesis limn sound creation with food creation. In both fields, a processed world emerges; and the shared cultural histories of signal processing and food processing have yet to be written.

Representative Definitions from the *OED*'s *Analogue* Entry

1808: an extant species corresponding to fossil form 1817: a part of an organism similar in form or function to another part 1835: an animal group having similarities to another unrelated group 1837: a chemical compound with a molecular structure similar to another 1837: a thing or person analogous to another 1966: a synthetic food product manufactured to represent something in nature	1941: a computer that operates with continuously variable qualities that are analogues of qualities being computed 1947: making use of analog computers or signals (media) 1950: analog-to-digital conversion 1959: recording (but only within engineering contexts) 1969: electronic device 1972: timepiece 1976: musical instrument 1979: audio recording (in discussions of music) 1987: the traditional form of something that has computer mediated-counterpart 1993: old-fashioned

The earliest meanings in the right column begin from the same supposition as in biology and chemistry, but jump into the fields of engineering and computation. Analog computing uses variable qualities (of electricity, of water, etc.) to represent the qualities that are being computed. Designers of early machines chose a physical apparatus "whose operations were *analogous* to" the calculations it was meant to perform (Goldstine 1993, 39). In this way, the "analog" is a representation of a thing in the world. As Paul Edwards has noted, the output of analog computers was often "exactly the sort of signals needed to control other machines (e.g., electrical voltages or the rotation of gears)" (Edwards 1996, 67). It is also worth notice that in this early period, analog computers were at least as often referred to as "electronic" computers to distinguish them from human—often women—computers whose job it was to compute (Light 1999). Derek Robinson emphasizes simulation rather than interconnection: from the 1930s on, analog computers "were used by scientists and engineers to create and explore simulation models, hence their name: a model is something standing in analogical relationship to the thing being modeled" (2008, 21).

As Wendy Chun has shown (2011, 104–31), computers are conceived through and built on analogy, in both their hardware and

their software. As the discourses of cybernetics developed analogical ways of describing animals and machines, engineers took up this language to describe and imagine the computing devices they were building. Of course, digital technologies have all sorts of models within them, from the skeuomorphs in software interfaces to signal processing math that is meant to imitate older analog devices like synthesizers. But the connections between digital technologies and all the technologies that came before them run at least as deep as the differences. For instance, like some analog computers, most digital computers use voltages to represent numbers (0 or 1): they measure when the voltage passes a threshold, usually 3.3 or 5 volts (though from a standpoint of theoretical computer science, a computer does not have to be a machine that uses voltages to calculate). Modern computers like PCs and laptops operate within the tightest voltage parameters possible, in part because their designers aim to make the variable voltages coursing through them conform as much as possible to the abstractions of binary code. But they also conform to an older standard: Bob Moog's analog synthesizers *also* operated within a range of 0–5 volts (Pinch and Trocco 2002). Similarly, the regulated spinning platter of the hard drive descends from flat disc records and sewing machines, and like those devices, the hard drive needs a mechanism to maintain a consistent spinning speed, and a head mounted on an arm (chew on those metaphors for a moment) to read the data on the spinning disc, somewhat like an old tape deck, gramophone, or optical soundtrack on a strip of celluloid film. It is thus possible to understand a hard drive, and the computer around it, as a mechanism as much as we would understand it as somehow primarily digital (Kirschenbaum 2008). We could say the same for one of the two primary interfaces for computers for much of their history: much has been made of the screen as an interface, but the keyboard is *also* a skeuomorph, taken from an older technology, and a body-wrecking skeuomorph at that (Jain 2006). In these ways, and countless others, so-called digital media are more similar to than different from the devices that came before them.

Starting with the *OED* entries from the 1950s on, *analog* begins to signal something else: that which is *not-digital*, a category initially defined by its point of contact with digital computing that

eventually comes to be defined in terms of its noncontact with digital computing. These senses of the term shape how "the analog" comes to be thought. The concept of analog-to-digital conversion is agnostic about how the analog signal is encoded before it reaches the converter.[3] By the 1970s, *analog* is no longer about points of contact with digital technologies, but about contrasts from digital technologies. An analog timepiece is simply not a digital watch—it could be any kind of watch or sundial. An analog audio recording could be made with cylinder, tape, or vinyl; it is simply not digital. The last two entries reveal the extent of this tendency to generalize. "Designating the traditional form of something that has a digital or computer mediated counterpart" generalizes the "not-digital" definition to cover a host of practices that once had nothing to do with digital technologies but now have everything to do with digital processing: retouching photographs, mapmaking, playing games, and writing down notes. In other words, a category as large as "the analog" may group together processes and practices that have as little to do with one another as each does with its supposed relative in the digital domain.[4]

The last definition is called "colloquial" and refers to people "unaware of or unaffected by computer technology or digital communications; outdated, old-fashioned": using tape measures instead of laser measures; traditional grammar and spelling; "technophobes" who don't adopt the latest digital technologies.

These last definitions are the closest to the most common usages of the term in media studies, but they also have a particular lineage. For the 1987 definition, the *OED* cites Stewart Brand's 1987 *The Media Lab: Inventing the Future at MIT*. Brand wrote the book after spending a year at the Media Lab in 1985–86 at Nicholas Negroponte's invitation (Negroponte no doubt hoped that Brand would write the book).[5] Brand's uses of *analog* in the book span several senses. He uses the "not digital" definition early on:

> Telephones, radio, TV and recorded music began their lives as analog media—every note the listener heard was a smooth direct transform of the music in the studio—but each of them is now, gradually, sometimes wrenchingly, in the process of becoming digitized, which means becoming computerized.

> You can see the difference in the different surfaces of long-
> playing records and compact disks: the records' grooves are
> wavy lines; the far tinier tracks of CDs are nothing but a se-
> quence of distinct pits. Analog is continuous, digital is dis-
> crete. (Brand 1987, 18)

Brand is in fact wrong about the continuous/discrete comparison—
his example works with vinyl records or optical sound-on-film but
not with sirens, magnetic tape, or player pianos. But his larger usage
is common for the time and is repeated later in the book in his dis-
cussion of ISDN network lines (versus "older analog equipment"
from the telephone company). He quotes Richard Bolt using the
even older noun version of analog as substitute: "The [computer]
screen is the analog of the room which you and I now share" (144).

The *OED* latches onto the last usage I can find in the book
(not counting the index): he quotes Media Lab member Richard
Schreiber saying, "It became obvious that digital retouching could
be made absolutely undetectable—as opposed to analog retouch-
ing (dodging, airbrushing, etc.), which you can almost always see if
you look very carefully. If you have a picture represented by a dis-
crete set of numbers, you may not be able to tell that that was not a
natural image" (221). In the context of the book, this use of *analog*
is not so far from the others, though it does hint at a semantic shift.
Both sound recording and mapmaking are technological, and both
can be done in ways other than digital. But the nature of their "not-
digital" character is quite different. They are not *analog* in the same
way. This is an important distinction for us, but of course it was not
an important distinction for the engineers at the Media Lab, or for
Brand. They were interested in the point of contact between things
that lived outside computers and things that lived inside them. *The
Media Lab* is about digitization (or, rather, the possible future of
digitization), and so all concerns pass through that filter. As a con-
cept, *the analog* expands and blurs in order to give definition to the
digital. And it is clear from reading Brand that these various uses
of *analog* were already in wide circulation in the engineering and
computer science fields of the 1980s. As a term, *analog* circulates
freely in the Media Lab depicted in *The Media Lab*. In picking up
his definition, the *OED* is late to the party.

If we take the late 1980s usage on its own terms, it is hard not to hear echoes of Walter Benjamin—*analog* is that which withers in the digital age; or even Ferdinand de Saussure—digital is digital because it is not analog. Because all of the *OED*'s entries for its last two definitions of *analog* come from various forms of digital boosterism and new technology journalism—Brand, *Wired Magazine*, *Lifehacker*, newspaper technology columns—these formulations makes sense. But as a category and as a kind of intellectual shadow, *the analog* has expanded far beyond digital boosterism and journalism. Just as *the digital* becomes imaginable as a cultural condition, so too does *the analog*, hence the new noun construction (as opposed to *the analog of* something). If *analog* refers both to things that come into contact with digital technology—probably to be transduced by it—*and* to things outside the domain of digital technology that *do not* come into contact with it, the term expands to cover the whole of reality. This is a problem inasmuch as the word conflates specific technological condition or operation with reality itself. Ted Friedman, quoting critics of compact discs, summarizes the logic this way: "the real world is analog. . . . Digital, by offering the fantasy of precision, reifies the real world. This complaint can be extended to a more global critique of computer culture: the binary logic of computing attempts to fit everything into boxes of zeros and ones, true and false" (Friedman 2005, 43).

We can find this in cultural theories of technology as well. A year before Brand's book came out, and likely influenced by some of the same engineering and computer science thinking, Friedrich Kittler compared the operations of analog sound recording to reality itself. Contrasting Edison's cylinder phonograph to sheet music, Kittler wrote, "Transposition doesn't equal time-axis manipulation. If phonographic playback speed differs from its recording speed, there is a shift not only in clear sound but in entire noise spectra. What is manipulated is the real rather than the symbolic. Long-term acoustic events such as meter and word length are affected as well" (Kittler 1999, 35). At first look, it appears that Kittler is using Lacanian terminology, distinguishing between the symbolic order and the real. For Lacan, the symbolic order is the space of language, representation, meaning, and subject formation, whereas the real is that which resists or exceeds representation (Lacan 1998). Kittler's

point here is thus a posthumanist one: sound recording operates on a plane outside of the human subject or interpretation.

And yet there is also a literalism to his interpretation of the machine. Two pages later, Kittler suggests that media directly rely on the laws of physics and physiology (37). Although Kittler does not use the word *analog* anywhere in this discussion, his approach to analog technology appears to follow the logic described by Derek Robinson, as a regime of continuously varying technologies that more accurately access or at least limn reality: in Kittler's world, the cylinder phonograph conforms to the laws of physics. This is a very different "real" from Lacan's, and Kittler's elision of the two accomplishes precisely the intellectual synthesis that allows media theorists to treat analog technologies as closer to nature.

A more explicit philosophical argument for this position can be found in Brian Massumi's *Parables for the Virtual*. He writes that

> the analog is *process*, self-referenced to its own variations. It resembles nothing outside itself. . . . Sensation, always on arrival a transformative feeling of the outside, a feeling of thought, is the being of the analog. It is matter in analog mode. This is the analog in a sense close to the technical meaning, as a continuously variable impulse or momentum that can cross from one qualitatively different medium into another. Like electricity into sound waves. Or heat into pain. Or light waves into vision. Or vision into imagination. Or noise in the ear into music in the heart. Or *the outside coming in*. (Massumi 2002, 135, emphasis in original)

He contrasts the analog as a general mode of being with the digital, which is a highly restricted mode, "a numerically based form of codification (zeroes and ones). As such, it is a close cousin to quantification. Digitization is a numeric way of arraying alternative states so that they can be sequenced into a set of alternative routines. Step after ploddingly programmed step. Machinic habit" (137).

In both Kittler and Massumi we find an odd historical proposition—that analog machines are somehow closer both to the way the human senses work, *and* to the operations of reality itself, than the technologies that preceded or succeeded them.

Viewed with a bit of historiographic distance, this is at once an un-surprising and a fascinating claim. It is unsurprising because the human sciences' most common figurations of reality, the senses, and interfaces all emerged concurrently with the media these terms are used to describe. Conversely, the emergence of techni-cal media in the nineteenth century provided a platform for new descriptions of reality, the senses, and interfaces, many of which are still in use today. As Kittler himself points out, sound record-ing and cinema emerge alongside modern physics and physiology (see also Hankins and Silverman 1995; Canales 2009). The claim is fascinating because it proposes a truly radical periodization. The claim that analog media are closer to nature proposes an approx-imately hundred-year period in human history—roughly from the last quarter of the nineteenth century to the last quarter of the twentieth—when the senses and the world were somehow in more harmonious alignment with the workings of media than at any time before or since. The premise behind this is that analog technologies were both preceded and succeeded by technologies of writing—writing and scores in the nineteenth century, and computer code in the twentieth century. That periodization is the philosophical kernel of analog nostalgia. When critics use some permutation of *analog* to apply a hermeneutic of suspicion to *the digital*, they are making an argument about roughly one hundred golden years in human history.

This reading of the analog is, of course, retrospective. In its time, technologies that we now describe as analog (usually after the fact) were more likely to be understood as jarring or artificial: think of Bergson on film, Freud on the phonograph, or Gunther Anders on television. Sonic or visual characteristics now affectionately de-scribed as warm and organic were described as cold and mechan-ical (Pinch and Trocco 2002; Hilderbrand 2009a). And the senses themselves continue to have a history after the nineteenth century, where they are understood as consisting of discrete operations as often as they are understood of consisting of continuous (Mills 2011; Moore 2003). In other words, the harmony and universality of *the analog* is itself imaginable only under certain historical con-ditions: the media era we now call "the analog era" and the co-terminous moment in the history of science when the senses—and

reality itself—were imagined through wave metaphors. By the mid-twentieth century, both conditions were on the decline.

The idea that analog media are more like the senses or more accurately limn the world's workings requires some retrospective imagination. For instance, waves are a particularly loaded figure of speech for describing the world. As Tara Rodgers (2011) argues, the wave metaphor for sound is ancient in origin. Talk of sound as waves was not properly the domain of Newtonian physics; rather, Newtonian physics is one application of a set of metaphors with considerably richer cultural history, one in which acousticians would have been bound up. Rodgers shows that classic acoustics texts like those of John William Strutt (Baron Rayleigh) and John Tyndall made use of common maritime themes of exploration, discovery, and control, as well as classic modernist tropes of masculine mastery over feminine nature. In the twentieth century, maritime figures shaped the description of sound synthesis and signal processing technologies, in press releases, technical diagrams, and sometimes on the instruments themselves. Rodgers ends her chapter on the wave metaphor with an argument that there are more feminist ways to conceive of and represent waves. But no matter which approach we take to the description of waves, we are operating within what Donna Haraway called situated knowledges (Rodgers 2011; Haraway 1991).

At the end of his discussion of the analog, Ted Friedman argues that the analog/digital binary is bivalent, and that scholars should instead think of reality in multivalent terms (2005, 45). That is sound advice, and we can now extend it. We should return some specificity to *the analog* as a particular technocultural sphere. That is to say that reality is just as analog as it is digital; and conversely, that it is just as not-digital as it is not-analog. Ultimately this goes back to an old argument, one made well by the last generation of technology scholars, ranging across methodological and political orientations, including Kittler and Massumi at other points in their writings: technology is part of the domain of human existence, not something outside it. The meanings we commonly attribute to the word *analog* did not even fully exist in the so-called analog era. Restoring some specificity to the term will help stimulate our technological imaginations (Balsamo 2011), and free us from the

burden of a history that was only recently invented. But it will also introduce a new set of problems, for even a restricted conception of *the analog* is slippery and proliferates. Analogy is everywhere, central to a host of disciplines and countless aesthetic traditions. But instead of seeing the *analog* as life itself, if we understand it as a dimension of life, we can also restore its descriptive and analytical power, all the while also forcing ourselves to develop richer and more varied histories and theories of digital media.

What then for media theory? I would hope that this history makes it at least more difficult to map the analog/digital binary onto older binaries like present/absent, material/immaterial, and real/symbolic, to name three well-loved couplets. These are cherished fallbacks, but they actually push us away from some of the most important questions media theory can ask today: how meaning and collectivity work together; how symbols and technologies both define what it means to be human and how humans fit into the larger world, ethically, ecologically, politically, historically; and how we might live well in the large-scale societies we now inhabit. In the shadow of impending ecological catastrophe and ongoing violence and injustice, these are pressing questions. By shedding nostalgia for a past that was more inherently connected to nature, we free ourselves to imagine new ways—and revivify dormant and alternative traditions—of connecting nature, culture, history, and technology.

See in this volume: algorithm, archive, cloud, culture, digital, internet, prototype

See in Williams: capitalism, communication, culture, experience, man, media, nature, organic, romantic

Notes

1 Fully documenting the word's spread is beyond the scope of this entry. However, it is clearly present both in published books and in message boards, online forums, and journalism.
2 This argument expands on Wendy Chun's (2011, 59) critique of computer interfaces as "functional analogs to ideology *and* its critique" because they concretize imagined relations to invisible processes and structures.

3   There is also a connection between analog-to-digital conversion and the history of transduction, but that would be a keyword entry in itself (MacKenzie 2002; Helmreich 2007).

4   Here, I echo Lucas Hilderbrand's point that the term digital "extends to so many devices that claims to a singular aesthetic are difficult to justify" (2009b). I would add that it is also difficult to justify a singular ontology for all of them.

5   Thanks to Fred Turner for this background information.

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