

Signal: An Expanded Semiotics of Periodicity (Part I)

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KEYWORDS Affect, movement image, percept, periodicity, postphenomenology, semiotics, signal, time image

ABSTRACT In this extended essay (the first of two parts), I reconsider the semiotic concept of *Signal*. I wish to update the meaning of the term *Signal* updating it in relation to postphenomenological perspectives on the technical extension of human perception by mediation. I define signal as *periodicity* and trace the structure of “regular recurrence” from wavelength, to percept, to memory. The discussion is situated as an “expansion” of semiotics towards cognition, applied science, and postphenomenology. Deleuzean and Peircean engagements are developed with some further comment on Ihde, Simondon, Massumi, Kant, and Heidegger in connection with the status of percept in relation to affect and concept.

1. EXPANSION

The concept of the expansion of semiotics to which I refer to in the title is inspired by two other titles, *Expanding Hermeneutics: Visualism in Science* by Don Ihde, and *Expanded Cinema* by Gene Youngblood. Both these texts are honored in the argument that follows, which develops and refines a semiotic concept of *Signal*, the signals circulating through our knowledge-making and image displaying machines, or the play of signals in an aesthetized field. In semiotics the concept of *signal* has varied considerably. Sometimes signals are considered to be a kind of indexical sign, “a knock on the door, a phone ringing,”¹ or as the materiality of the sign, e.g. the “sound pattern”² of a word, the signifier half of the pairing with the signified to make the dyadic sign-whole. Signals are often defined as a metaphysically inflected *reduction* of some kind, for example the reduction from mind to body (from mental meanings to gestures or “body language”), or even from human to animal (e.g. from “systems of signs” to “signal field theory”).³ The concept of signal that I develop here will attempt to avoid these movements of reduction and metaphysical connotations by defining signal as periodicity, and I will follow the trace of periodicity across an expanded semiotic field. This expansion will occur along three vectors: interdisciplinarity, percept, and affect, and quantification.



FIGURE 1⁵

2. INTERDISCIPLINARITY: SEMIOTICS, PHENOMENOLOGY, COGNITION, APPLIED SCIENCE

An expanded semiotics of signal requires disciplinary traversal and methodological clarification. First, semiotics provides atemporal models of specific formal structures that produce meaning and that can be used to analyze cultural formations from any epoch or zone of the globe. A meaning that is thoroughly historicized and pertains only to a specific context is properly understood as hermeneutic, not semiotic. For example, to take the well-known example of Barthes’ discussion in *Mythologies*⁴ of the cover of the magazine *Paris Match*, the structure *connotation/denotation* is atemporal, and can be applied to images from any culture and time.

However, the *interpretation* pertaining to France and its colonized peoples is thoroughly historical and hermeneutic. To give another example: on a personal visit to the Abu Simbel temple complex in Egypt, the local guide identified the multiple sculptures as of Ramesses II and offered as an explanation that in their multiplicity they represented his awesome power and tremendous ego. The question as to whether his interpretation is correct or not is a hermeneutic one. Implicit in his presentation, however was the semiotic distinction of “what this is” and

"what this means" that makes the denotative/connotative a semiotic concept that atemporally facilitates (grounds and produces the possibility for) historicized hermeneutic exegesis. Hermeneutics at a micro level is directed toward the interpretation of texts (with the concept of a text of course expanded to all forms of media), while at a macro level hermeneutics can interpret whole discourses or discursive fields (in which texts are situated). In a larger sense interdisciplinary traversal is a hermeneutic activity, since disciplines are discourse domains, and of course semiotics is a historical discipline like any other, so an expanded semiotics of signal will encounter the historicity of other disciplines in its elucidation of atemporal structures of meaning.

Second, phenomenology and cognitive science are here understood as disciplinary variations around the same phenomenon: intentional consciousness. Each discipline studies "the same thing" (the constitutive features of subjective awareness, perception, structures or schemas of meaning and memory, etc.) but cognition employs empirical methods (experimentation, quantitative methods) whereas phenomenology employs rigorous analytic qualitative description at a distal remove from the "natural attitude." Phenomenology studies from the inside (integral holistic relations from the contingent perspective of a subject embedded in a context) what cognitive science studies from the outside (isolated features in a context of measurement). Periodicity has its quantitative dimension (e.g. frequencies of wavelengths, spacings of pixels on a grid) and it's a qualitative articulation (as rhythm or forms of repetition).

Finally, signal is technologically mediated, an expanded semiotics of periodicity cannot ignore the materializations of signal: whether in its logical-mathematical dimension (for example in information theory) or in its movement through circuits and the productions by code; and the manner by which technologies of perception take the parameters of human perception and cognition as the rationale and ultimate "referent" of its designed properties. Technologies for perception expand the capacities of human-scale perception, and thus the phenomenological perspective employed here becomes post-phenomenological in the sense that the very notion of human consciousness and perception has to be expanded to include the contents that technological media produce and shape for our innate cognitive capabilities. A revised form of phenomenology, postphenomenology aims to overcome the limitations of subjectivism and its largely dystopian stance toward science and technology...asking how it can effectively transform classical phenomenology into a new and concrete

reflection upon technoscience.⁶ A modulated visual field, by anything from contact lenses to X-ray telescopes, is a technologically expanded field that takes us beyond traditional phenomenology towards this "post" condition.

3. PERCEPT AND AFFECT

In two broad strokes, mediation can be defined as involving a complex of *the experience* and *the meaning*. These two terms are not identical. It is clear that many films rely on "special effects" that are driven primarily by sensory stimulation or visceral impact. For example, an explosion on screen is interpretively the same whether or not the frequencies below 40 hertz are boosted by 20 decibels in the mix. The "meaning" is that "something explodes" but what is worked on in this case of audio manipulation is the *experience* of the explosion, not its meaning. We could call the sound of the explosion "the sound pattern" (signifier) in straightforward Saussurian terms. However, mediation mobilizes a rich network of technologies, techniques, knowledge, and signs to *tweak* (modulate, inflect) the signifier that is in fact an *excess*: it goes beyond what is simply needed to produce the signified. So, in the dyadic combination of the sound of an explosion (signifier, sound pattern) and the meaning produced, "something has exploded in the scene" (the signified), at the level of signal (the signifier). All manner of treatments and processing are applied that in no way change the signified (something explodes), and this excess can be defined as directed, not at the meaning, but at percepts and affects. To be sure, Barthes' idea of "the third meaning"⁷ is a way of grasping this excess that he called "significance" (rather than signification), and we could suggest that our frequency-enhanced explosion precisely makes the explosion more *significant*. However, Barthes' notion of "significance" (or Massumi's notion of "expression event"⁸) is abstract and can be brought into sharper focus through use of Deleuze and Guattari's concepts of *percept* and *affect*. However, we will use these terms more for their phenomenological valence and will not dive into the granular level of close reading of Deleuze and Guattari, where their concepts take on hallucinogenic difficulties (spiders, abscissas, infinite speed etc.).⁹ While Deleuze and Guattari are not phenomenologists (though they seem open to phenomenology in the section on logic in *What Is Philosophy?*,¹⁰ as the underdog of the American philosophical academy dominated by logicians, who are haters¹¹ of philosophy or at least of Deleuze and Guattari's concept of philosophy "proper"), if one defines phenomenology as I do along the lines of "rigorous description of the intuitive structures constitutive of subjective experience," one can

in fact find phenomenology in many places, in various epochs and genres (e.g. in literature) since the descriptive, intuitive, and subjective in general belongs to no discipline alone. Thus Deleuze and Guattari's large headings of Concept/Percept/Affect/Functive are rich in phenomenological valence as general and constituting intuitive structures. To "extract" the phenomenological features of their text does not necessarily ignore their anti-phenomenological stances taken elsewhere. Noting Deleuze's sense of "being suffocated"¹² by phenomenology as a student, I propose that the idea of philosophy as *creative concept building* through *encounters* (whether with film or other philosophers) is indeed non-phenomenological, since phenomenology aims to describe analytically something that is configured before it in some manner, rather than flow with a productive and constructive play or dwell on the enjoyment of making up ideas. However it does seem to me that Deleuze and Guattari "manage" their free conceptual play by first situating major conceptual headings (Actual, Virtual, Functives, Affect, Molar, etc.) that are adequately phenomenological in character, which function like major landmarks between or among which the creative productive excess of conceptualizations are at work. Reading Deleuze and Guattari allows one to dream of molar spiders without organs climbing at infinite speeds along abscissas in the plane of reference or what have you, while at the same time getting a sense that one is still *thinking* in some way; this sense of "still thinking", I argue, occurs because the hallucinogenic quality is tempered or stabilized by phenomenological insights that are perhaps made less "suffocating" through the literary stylizations. However, in "using" Deleuze phenomenologically, we will be going against his opposition to phenomenology as stated in *Cinema 1*, so an additional justification shall be offered. What phenomenology sets up as a norm is 'natural perception' and its conditions. Now, these conditions are existential co-ordinates which define an 'anchoring' of the perceiving subject in the world, a being in the world, an opening to the world which will be expressed in the famous 'all consciousness is consciousness of something...'

It will be noted that phenomenology, in certain respects, stops at pre-cinematographic conditions which explains its embarrassed attitude: it gives a privilege to natural perception.¹³

However, as we saw above, a *postphenomenological* development, led by Don Ihde, has incorporated technologically expanded forms of perception and consciousness into its methods and premises, so that it is no longer true today that phenomenology is rooted in non-technically-augmented perception and consciousness. Deleuze would

presumably be amenable to this development, given that it directly addresses his project of *thinking through cinema*. A second aspect of Deleuze's critique of "old school" phenomenology regards what is essentially a difference between being *in* the world and being *of* the world. For Deleuze, phenomenology is insufficiently immanent, and this lack of immanence restricts phenomenology to description and prohibits (creative literary schizo-analytic) freer and more inventive concept construction. Phenomenology was still squarely within this ancient tradition: but, instead of making light an internal light, it simply opened it on to the exterior, rather as if the intentionality of consciousness was the ray of an electric lamp ('all consciousness is consciousness of something...')

If, subsequently, a de facto consciousness is constituted in the universe, at a particular place on the plane of immanence, it is because very special images will have stopped or reflected the light, and will have provided the 'black screen' which the plate lacked. In short, it is not consciousness which is the light, it is the set of images, or the light, which is consciousness, immanent to matter.¹⁴

In other words, contra phenomenology, Deleuzean exegesis is not in the world but of it. It is not interested in shining its light on objects, but being the light diffused in the cosmos. Fair enough (who wouldn't want this?). Elsewhere this is phrased: "We are not in the world, we become with the world; we become by contemplating it."¹⁵ This prepositional dispute, however, seems resolvable as follows: cannot Deleuzean consciousness be understood phenomenologically as consciousness *doubly open, to both conscious (intentional descriptive) and unconscious (productive positing) acts of constitution*, in a prismatic feedback loop of immanence? If we shine the light of consciousness onto consciousness as it verges both internally toward force and desire, and externally toward world, things and action, might this not be an adequately phenomenological description of the diffusive and refractive Deleuzean cosmic-immanent light? This leads us toward that classic limit-question, "what is the constitution of constitution?" Answers to this question are not far from Deleuzean creative production of concepts:

In order to escape the dialectical duality of constituted and constitution, we must necessarily pose as a first element a pure act of constitution, a constitution of constitution, a pure *Leistung* or *pure act*.¹⁶

4. FUNCTIONS

For Saussure, semiotics was to form a part of “social psychology, and hence of general psychology.”¹⁷ In the main, semiotics has been developed as a qualitative discipline centered on socio-cultural productions, with its more science-oriented branches, such as biosemiotics and zoosemiotics, exploring sign systems in living systems more generally (such as biology and ecology), or engaged interdisciplinarily with cognitive science (a “general psychology” in Saussure’s sense). But the semiotic elucidation of quantitative sign systems does not have a large literature, which may be due to the early formulations situating semiotics within social science, or perhaps even due to the disciplinary split between linguistics and semiotics, with the former taking up mathematical and logical formalization with more methodological gusto. An expanded semiotics of periodicity takes up the relation of quanta to qualia, particularly with regards to the manipulation of functives toward the production of percepts and affects. Attention to functives helps us focus on what can be called the cognitive-industrial complex:

“The ITU has a recommended practice (775) for speaker placement that is endorsed by the MPGA as well. Center is straight ahead; left and right are at ± 30 from center; surrounds are at ± 110 from center, all viewed in plan.”¹⁸

Organizations such as the International Telecommunications Union and the Music Producer’s Guild of the Americas play a key role in reifying the aesthetic standards of the culture industry—for example, embodying assumptions of “presence” and “fidelity,” or the manner in which an “enveloping” world should sound in our homes—in the development of technologies and the standards issued to prescribe the way they address perception. Much cognitive research is done within a field which can be described as *hermeneutically constricted*, meaning certain practices of highly commercialized mediation are taken as an ideal standard, which necessarily poses limits and challenges to alternative constructions of mediated experience. Industry has the resources to conduct the experiments, and develop and market the technologies that condition mediation. For example in the case of surround sound, speakers are assigned specific semiotic roles (e.g. the front center speaker is to reinforce the presence of the actor’s voice, the rear surrounds are to produce ambient effects of spatial envelopment). Key experimental research in media cognition—in the case of the surround standard, the perception of spatial imaging and envelopment—occurs

within an interpretive horizon that has been pre-limited and already defined by an industrial commitment to certain forms of entertainment. For non-commercial makers, this may mean that experimental media may innovate and produce alternative contexts for experiencing audiovisual material in a scientific vacuum, relying perhaps more on descriptive-intuitive (phenomenological) reflections to ground alternative configurations.

What I am here calling the cognitive-industrial complex can be criticized at least along two vectors of concern:

- the enforcement of aesthetics found in popular entertainment taken to be normative in the development of new technologies
- naïve expressions of an ethos of presence and fidelity

For example, to cite the recommendation 775 noted above¹⁹:

“Recommendation ITU-R BS.775 recommends one universal multichannel stereophonic sound system with three front channels and two rear/side channels together with an optional low frequency effects (LFE) channel.”

“(a) that it is widely recognized that a two-channel sound system has serious limitations and improved presentation is necessary;”

We can note that two channel stereo is still the primary format for listening to music, which is undoubtedly related to the prevalence of headphones and computer speakers in everyday habitus, and the way these technologies easily link up with downloading audio files—multi-channel DVD-based music production is a small segment of the overall music market. Listening to music via iPods and smart devices through two ear pods seems to be the reinforcing practice behind the continued popularity of 2-channel stereo in music. Additionally, while the 5.1 surround configuration described has become a default (“universal” in the terms of the ITU recommendation) feature of the home entertainment setup, there are still supposed “serious limitations” to stereo (do the authors mean to imply that the limitations of 5.1 surround are not “serious”) due to a range of features such as the fact that speaker placement is often determined by the other furniture in a living space, which more often than not involves a fair bit of acoustic compromise (so that surround effects can indeed seem to appear out of nowhere, to the

complete distraction of the audiovisual experience, rather than reinforcing a sense of immersion). As we will see below in the discussion of signal processing, functives mediate between bio-physical levels of organization (inaccessible to consciousness, e.g. the level of electrons in circuits or the activation of rods and cones in the retina), and levels of phenomenality that allow physical periodicities to be productive of meaning.

5. THE EXCESS OF THE DYAD

The usual *telos* of signal is to sign or image. Signal plays a constituting role in the production of meaning (not the only role, but a key role). For reasons that will become more apparent as we proceed, we have initially defined signal as periodicities (recurring regularities) in semiosis. An expanded semiotics of signal allows for conceptual *elucidation of the texture, feel or experience* of a meaning, taking us beyond the usual triad of symbol, referent, and interpreting subject (as it appears in various theoretical formulations) by further explication of the relations between symbols (signs or images) and subjectivity. Periodicity is an atemporal structuring of images and signs (“atemporal” in the sense of non-historicized or non-hermeneutic, rather than in the sense of not being a temporal phenomenon). The semiotic scope of periodicity ranges from nanometers (light) and hertz (cycles per second) to what in cognition is called “rehearsal” (the repetition that moves perceived events from short-term to long-term memory).

It is worth a further comment on this affirmation of the atemporal project of semiotics, especially given the dominance of post-modernism in humanities (this is less the case in the social sciences, though it is still a strong current there). The atemporality of the semiotic project suggests the image of a traveler who gives oneself a passport to travel freely across border zones, whereas many in today's humanities disciplines are more like Jains staring at the earth for fear of stepping on ants. This “Jainism” asserts itself in the various hyper-anxieties around committing “textual violence” in the interpretation of any text, or example. The strictures to “historicize” and “localize” and the Foucaultian strategies of “resistance” at the level of the “micro-political” combined with the Lyotardian disparagement of “grand narratives” (to name the major threads that combine into this humanistic Jainism) produces an atmosphere which is strictly converse to the whole project of semiotics which aims to elucidate features that are productive of meaning irrespective of the local and micro context. My perspective is that semiotic structures are not “outside time” but only “outside the

local time zone.” There are scales of time with “the locally trendy” at one extreme end of the spectrum, and the evolution of our species at the other, and the contemporary semiotician that I envision happily self-creates the customized passport needed to allow for the required border crossings (and in this sense, joins up to a variant of the Deleuzean project of concept invention in the midst of an empirical field). Post-structuralism ironically utilizes semiotic insights to attempt to undo the atemporality of the semiotic project, primarily by over-emphasizing one particular semiotic concept, the “arbitrariness” of the sign (which is an atemporal structure!). In the next section I will perform a phenomenology of word acquisition outside the context of school-based (rote repetitive) learning in order: to phenomenologically situate the moment of the arbitrary generally in semiosis; to better define the excess of the dyad, which makes it so amenable to significant (in Barthes' sense) signal processing (modifications of percept and affect); and to connect to the largest scale of periodicity that we will concern ourselves with (rehearsal between short term and long term memory in cognitive terminology, or in a phenomenological terminology, the Bergsonian/Deleuzian distinction between movement image and time image).

Long-term memories that have reached this higher state of activation can then persist as current *short-term memory (STM)*. If not displaced by new information, short-term memories may be held for an average of 3–5 sec (sometimes longer). They will then decay (disappear from consciousness) if not repeated or rehearsed internally, which involves bringing the information back into the focus of awareness from *STM*.²⁰

For signals to sign or image, they must trigger memories (or they would in fact remain signals, base periodicities). Cognitive rehearsal, then, will be the “end” (telos, final output) of our signal chain. As we will clarify in section 7, those with theoretic sensibilities allergic to teleology will be able to take some comfort in noting that the end, in fact, is also a beginning.

6. REHEARSAL

And so I will begin with a rooster.

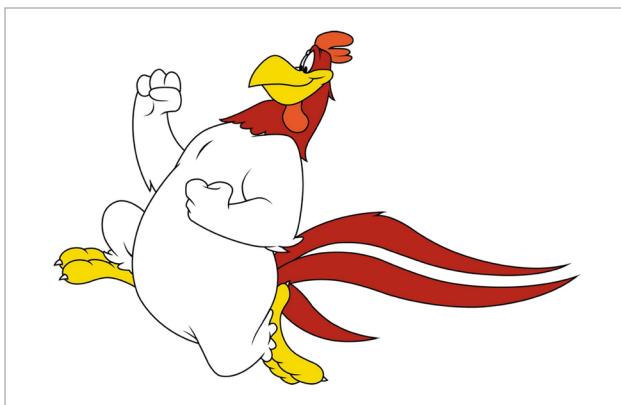


FIGURE 2²¹

The rooster in question is a real-life moment of casual or informal language acquisition (at home, involving interaction between parent and child, rather than the rote and regimented learning of language that occurs later in childhood through formal schooling), grounded in teaching a specific child the word “rooster” in tandem with pointing at a poster on her bedroom wall that indeed prominently features a rooster. The parent says “rooster” and points to the poster-image of the rooster, and the child henceforth understands that the image in the poster is a rooster and uses the phonemes “rooster” to call forth or understand that anything which looks like a rooster can be summarized or invoked with the phonemes “r/oo-s/t/er.” The rooster has had a prior existence in her memory in the form of cartoons featuring the rooster (featured in the bedroom poster) and trips to the grandparents’ farm have also yielded direct rooster-experiences. Before the parent’s instruction of fusing the rooster-image to specific phonemes, which can be characterized as a highly reduced or restricted set of percepts, approximately five of them (r-oo-s-t-er) for a much larger set of percepts (the variegated colors of the feathers, the crazy darting about the ground, talking on TV, clucking at the farm, the sharp beak, and beady eyes etc.), the rooster would have existed in the memory imagination of the child as a field of iconic resemblances, a mesh or mush or mash of analogic similarities (not yet individuated as “vs. chicken” or “vs. quail” and indeed the phonemes “rooster” will in time be misapplied and eventually, corrected). The phonemes are indeed arbitrary (there are other phonemes that could have been used to crystallize or consolidate the analogic-iconic-field-of-resemblances of all things rooster-like), but this arbitrariness is in relation to lineaments or connections of the non-arbitrary, for example:

- while the specific phonemes are arbitrary, the act of associating “phonemes-as-a-few-percepts” for a vaster field of percepts is not arbitrary. The act of ‘this will stand for (invoke, remind) that’ is a structure that arbitrary phonemes presuppose and indeed build upon, take up in order to achieve their effect. The phonemes become a kind of “perceptual shorthand” for wider array of perceptual differences otherwise too complex to utter in a relatively short duration. It is a shorthand because a limited economy takes over (stands in for) a more general economy, and this limited economy of phonemes is (by definition and function) less rich in percepts.
- the child is obviously in possession of pre-existing cognitive capacities to associate words (a reduced field of percepts, phonemes) for a greater field of integrated percepts. The parent cannot obtain the same results with a plant, and probably not a cat.
- henceforth, using the word “rooster” in specific instances of language (we can provisionally call these “speech acts” but I do not want necessarily to employ or evoke that entire theoretical corpus) will call up not the entirety of the rich field of rooster memories or imaginings (all the cartoon episodes or weekend trips to the farm or pages in illustrated books), but rather a highly reduced “sketchy” or schematic “fast summative rendering” if only because it will be part of a sentence structure (with time and attention constraints) involving other similar perceptual forms of shorthand. As Peirce wrote, “For example, when you remember it, your idea is said to be dim and when it is before your eyes, it is vivid.”²¹
- core perceptual conditions are also outside the arbitrary-semantic relation, for example figure-ground separation (identifying the rooster on the poster, the poster against the wall, the rooster against a background of dirt and barn walls), or recognizing the parent’s voice as the parent’s voice (same voice as yesterday and before)
- analogic likenesses (iconic resemblances) richly interpenetrate the cognitive and imaginative life of the child (e.g. recognizing her face in the mirror, or her mother’s face in a photograph), and phoneme-association-acquisition (learning language) takes these up (indeed often presumes these) in order to “cement” the meaning to the phonemes.



FIGURE 3²³

There are no doubt many more factual and empirical conditions and structurations that do not conform to the wider notion of “arbitrariness” associated with sign acquisition, and indeed it is a major theme of the overall argument presented here that the notion of the “arbitrariness” of the sign has often been over-played in the discourses that have incorporated semiotic insights in their theorizations.

What the rooster example illustrates is the following:

- Phonemes crystalize and lock down the repetitions (field of analogic-iconic-resemblances in memory, imagination and experience) to something more “measured” (a few percepts). Like the notes of a musical measure structured by time signature, a few phonemes fit easily within the span of short-term memory, and disciplines or structures the looser manifold of analogic “like” associations. The word gathers the multiplicity-of-repetitions (cartoon, farm, book, poster versions of roster) into a condensed (summarizing, reducing) singular form.
- It then lies within the power of mediation to either present the tamed concept rooster (a phonetic rooster, illustrated at the butcher shop with price per pound indicated) or bring us back to the analogic manifold, revivifying the field of perceptual differences which is summarized, schematized, and passed over by the shorthand of language (e.g. Joan Miro’s rooster):

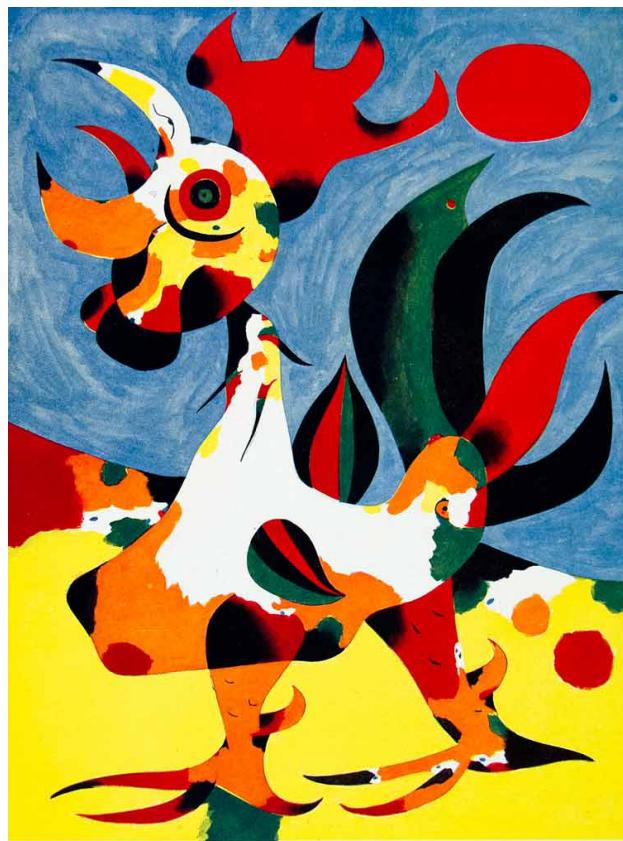


FIGURE 4²⁴

The above reflections suggest what we might call “a perceptual origination of the concept” in which the concept is the summarized repetition, and is indissociable from repetition in general. The “generality” of the concept is precisely the fact that it covers many instances. As we know, we can apply a concept to many cases, and if we cannot, then it is not a concept but perhaps “just” a word (though a word can usually also be applied to many cases). This dependency on periodicity, I argue, is characteristic of language and conceptual thought in general. What the concept ‘tree’ has going for it is all the things trees have in common (the idea of the “in common” is nothing other than repetition): leaves, branches, bark, shade and so forth.

Of course there are many concepts of the concept “concept” and I am using the one most closely associated with “words in general” rather than, say, the molecular-intensive concept of the concept that, according to Deleuze and Guattari, is “proper” only to philosophers (reserving percepts and affects to artists, and functives to scientists). For our purposes, concepts emerge from repetition, as summary sketches of a delimited field of repeating percepts (repetition of arbitrary phonemes, associated

with repetitions of analogs in experience). Using Bergson's terminology, we could say that a cluster of phonemes is a movement image while the summarized sketch (the meaning recalled) is a time image. We will keep the phenomenological insight of what Bergson originally (and aptly) named Recognition and Survival²⁵ and discard the weightier metaphysical argument that employs the standard metaphysical method of stacking pairs of oppositions, so that the Bergsonian binaries play out as matter-space-intellect-recognition-body-habit-objectivity (movement image) on the one side, opposed to spirit-time-intuition-survival-mind-memory-subjectivity on the other. Rather than move toward either these extremes of mind-body dualistic metaphysics (Bergson) or tints of cultural essentialism (Deleuze: American cinematic Movement Images vs. European filmic Time Images), I will move in a more straightforward direction toward cognitive science, namely the commonplace distinction between short term and long term memory, and the transition between the two that is accomplished through rehearsal. Rehearsal is at the "macro" end of this expanded semiotics of periodicity, with the micro dimension of nanometer wavelengths to be discussed shortly. We can unite these two "ends" of the periodic spectrum, however, through a simple interruption of signal: Time Frames and Frames of Mind

The American video artist Phyllis Baldino takes a different tact in considering the discrete properties of cinematic image. In her video *In the Present* she looks for the basic psychological unit of cinema. The video consists of a series of strange performative vignettes, each seven to twelve seconds – the length of time that an image stays in short-term memory before being committed to long-term memory. Each fragment is separated by a long pause as the screen goes white. This white screen functions to erase the short vignette from our mind, thus disabling our capacity to sequence it through memory. We take in each scene with only the part of the mind that examines sensation. By keeping us in the present, the video gives us a glimpse of a strange world free from the effects of long-term memory. This work seeks to disrupt the effect of continuity created by the cinematic image.²⁶

Because short term memory is a moving window only a few seconds "long," interventions of short durations (at meso-signal scale) that disrupt the video signal (flow of images) also disrupt the periodicity of rehearsal, on which basis the contents of short term memory (movement spatial images) are processed into long term memories (analogous to Bergson's time images). This level of temporality is usually summarized in the literature as the "conventional" status of meanings (social construction), but the pairing of signifier/signified is also necessarily

a movement from short term memory (symbol perceived by what Bergson called the action-oriented and perceiving "intellect") to long term memory (symbol recalled by what Bergson named "intuition" making connections across memories). This idea of the intuitive quality of memory helps explain what can be utterly anti-intuitive about semiotics (the differential relations of meanings) since memories (time images, "crystal images" as Deleuze calls them in reference to their appearance in film) have all the feel of time, practice, experience and self. Indeed key semiotic ideas (e.g. syntagma, paradigm) have a Bergsonian quality of "spatially intellectualized" abstractness, lacking the "depth" given by time and memory (which constitute for Bergson the ground of subjectivity). The dyad signifier/signified reads as a "spatial" configuration, "this thing here" refers to "that thing there." However the dyad is also "this symbol here," which refers to "all those moments you've lived and practiced repeatedly in the past." This "pastness" is also a perceptual "dimness," which is why signal as "base periodicities" (approachable through signal processing) can revive the concept and instigate anew the rich analogic field of differences made sketchy by the concept. This structure of overlapping periodicities at different scales (phonemes, images, memories, spatial configurations in short term memory) resembles a configuration of loops, and so requires a note on loops and sequences.

7. FIRSTNESS, LASTNESS, AND INCEPTION: A NOTE ON HEIDEGGER, PEIRCE, KANT AND CYBERNETICS

I have intentionally avoided a structuration of signal starting with a simple (e.g. wavelength) moving progressively toward a complex (recalled memory). In beginning with the rooster example I have actually started at the most developed or teleological "end" of the signal scale of semiotic periodicities, and in the next section will "backtrack" to the level of waveforms. Writing is linear and forces us to start somewhere, progress through something, and end up somewhere else. The hypertext format long ago solved the problem of linearity, or offered an alternative to it, but has not yet succeeded in displacing linear writing as the preferred format for argumentation or narrative. Hypertext has evolved in the main either to offer navigation between textual linearities, or to accommodate pleasant sidetracking diversions that do not branch off very far from a "home base" of linear exposition). We can sketch the historical background to this issue of sequence (what comes first or last) and scale (percept to memory recall) as follows:

- Kant developed the noumena/phenomena distinction (which is contemporaneous with the origin of the term "phenomenology"), and the idea

that all knowledge is a priori constructed by the mind's active faculties of Space, Time and Causality. However, in the *Critique of Pure Reason*, these three faculties were also given a sequence: causality necessarily involves perception across time and multiple perceptions (the registering of something about one thing in another), and so is “the product of a synthetic faculty of the imagination, which determines inner sense with regard to temporal relations.”²⁷ Space and time are thus perceptually “first” while causality (which is still an a priori of knowledge and experience) requires a subsequent synthesis of mind. Kant would be a kind of “cow-mother” to Peirce: “When I was a babe in philosophy, my bottle was filled from the udders of Kant.”²⁸ “In reference to his categories of Firstness, Secondness, and Thirdness, Peirce writes that the ‘list grew out of the study of the table of Kant.’²⁹

- Kant-nourished Peirce who, in a rather Deleuzian spirit, writes to Lady Victoria Welby:

*You know that I particularly approve of inventing new words for new ideas. I do not know that the study I call Ideoscopy can be called a new idea, but the word phenomenology is used I in a different sense. Ideoscopy consists in describing and classifying the ideas that belong to ordinary experience or that naturally arise in connection with ordinary life, without regard to their being valid or invalid or to their psychology.*³⁰

This idea of *ideoscopy* neatly connects this “particular approval” (fondness or joyful play of inventing ideas that we can connect to the Deleuzean in general) of inventing concepts to phenomenology, in that *ideoscopy* seems to be a form of category formation at less of a remove from the “natural attitude” than the phenomenology in Peirce’s time which “bracketed” (*epoché*) what Peirce here calls “ordinary experience.” And yet *ideoscopy* “brackets” in its own manner, and disregards the truth or validity of its concept inventions.

In pursuing this study I was long ago (1867) led, after only three or four years’ study, to throw all ideas into the three classes of Firstness, of Secondness, and of Thirdness. This sort of notion is as distasteful to me as to anybody; and for years, I endeavored to pooh-pooh and refute it; but it long ago conquered me completely. Disagreeable as it is to attribute such meaning to numbers, and to a triad above all, it is as true as it is disagreeable. The ideas of Firstness, Secondness, and Thirdness are simple enough.

Firstness is the mode of being of that which is such as it is, positively and without reference to anything else.

Here Peirce doesn’t reference his cow-mother Kant to Lady Welby as a source of his triadicity. Kant employed the periodicities of tables to organize his thinking: The

	Analytic	Synthetic
A Priori	Logical	Transcendental
A Posteriori	Hypothetical	Empirical

1. Quantity of Judgements

- Universal
- Particular
- Singular

2. Quality

- Affirmative
- Negative
- Infinite

3. Relation

- Categorical
- Hypothetical
- Disjunctive

4. Modality

- Problematic
- Assertoric
- Apodeictic

FIGURE 5³¹

tables of Kant were formative of Peirce’s style of thinking, since as we will see below, formal features in general can be understood as organizations of periodicity.

To finish this note on Peirce, for Kant, time space and causality are a prioris structuring all human knowing, and in Peirce’s concept of “firstness” we find a trace of the notion of the a priori. Likewise, the “further synthesis” that is required for the a priori of causality is for Peirce described as *secondness* (his concept of *index* is in the category of the second), because it involves knowledge of a relation between two things, most typically (in the examples he gives) between subject and object (something over and against the subject). To be sure, first-second-thirdnesses are not a prioris in Peirce, but their sequentiality recalls their a priori sequentiality in Kant.

- Heidegger, in his hermeneutic phenomenology, will consign this Firstness to a Lastness: “Initially we never hear noises and complexes of sound, but the creaking wagon, the motorcycle. We hear the column on the march, the north wind, the wood-pecker tapping, the crackling fire.”³² In other words, firstness actually comes *last*. FIRST we are hermeneutically embedded in a world that we understand, and we have to make a “special effort” to regard the things whose meanings we are familiar with as an assemblage of percepts. No doubt this is a form of turning Kant “on his head” (philosophers like to do this to other philosophers, e.g. Marx turning Hegel upside down, replacing the World Spirit with material economic forces as the driving force of history). This inscription of everything (the world) as an interpretive field is foundational for what is later summarized by Derrida as, “There is nothing outside the text.”³³
- In Christopher Nolan’s film *Inception*, the firstness or lastness of firstness *and* lastness is solved by an *a priori* (and cybernetically inspired) loop, in which our interpretation of the world is projected out into the world that we perceive (in order to interpret it) in a continuously looping process:

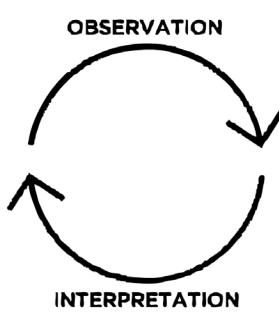


FIGURE 6³⁴

The very term “firstness” implies a temporality that can only be based on an arbitrary slice of time, positing that “first” there are, for example, wavelengths in the air, then these hit the eyes, which process them into perception, which builds up an image of the world (space, time, causality) which supports thought, and the final unifying synthetic thought is *last*, which is the other “end” of our slice of the time window. Heidegger counters this scientific mode of representation (context independent, arbitrary measures) by starting phenomenologically with lived experience, which is the ground for any subsequent formal elaborations,

and for Heidegger understanding everything around us is already embedded in a network of meanings (which becomes a premise of post-modernism). A *systems* conceptualization discards the very notion of a “starting point” and sees a process in continuous exchange. The concept of signal discussed here does not “begin” at either end of the scale (nanometers, rehearsal) and effectively we can “jump into” signal at any point to elaborate it. This should be clarified given the discussion below regarding Peirce’s concept of firstness in relation to signal processing (in this framework *signal processing* refers only to technical modifications of percept and affect, not intra-technical processes such as data compression and the like). In using Peirce’s concepts below, I am keeping this image of the loop in mind and not arguing for the Peircean model as the actual sequence of occurrences.

8. BASE PERIODICITIES

Signal allows a thinking of repetitions nested at different levels of organization and complexity that is constitutive of mediation. Mediated signals are nested at levels that I will define as physical (s_1), organic (s_2), phenomenal (s_3), phenomenological (s_4) and formal (s_5). Before I elucidate these five modalities of signal, I will review some contemporary discourse on signal:

Video is an electronic medium. This means its origin depends on the electronic transfer of signals. Video consists of signals that are kept in constant movement. Video signals are generated inside a camera and can circulate between recording and reproduction equipment (closed circuit). They can be variously modified by processors and keyers and transmitted both auditively and visually. Video is the first truly audiovisual medium that, in contrast to film, does not generate images as a unit and does not display the materiality of a film strip, which makes use of one track for image and one for sound. Thus differentiated, the electronic signal processing realizes—in recording, transmitting, and projecting—unstable states of pictoriality, which are variable in terms of their scale, form, directionality and dimensionality. In addition, the audiovisual idiosyncrasy of video consists in the fact that sound signals, which may have been generated by an audio synthesizer, are transformed into image signals so that audio signals govern the way video looks and, vice versa, the information contained in the video signals can be broadcast visually and audibly at the same time. The way the electronic signals are processed and transformed alternately into audio and video denotes that media-technical conditions for realizing a medium, whose forms of display derive directly from these electronic signal processes.

The optical recording of light, however, does not represent the only form of realizing video: the video signal, in contrast to the external input, can also be generated internally, in the devices themselves. There exist in video various possibilities for signal input before recording—for example, the signal output of one device can be used as the signal input for another device. More importantly, however, video can simply consist of signal processes, which are generated in the devices (for example, synthesizers) without any recording.

Video shares with television the basic characteristic that fluid forms of imagery arise through its signal-transmission technology.

[E]ven if compatible characteristics of recording can be discerned in both of the analog media—film and video—a relevant material difference in the status of the technical images remains. The electronically recorded “image,” which is then transferred to a display medium and mostly projected onto a screen, deserves this designation only on condition that the continuous flow of the signals, through which an electronic image can be evoked, is kept in mind. In tune with its unstable and incoherent character and in the interest of precision, I, therefore, suggest separating the transformative characteristics of video anchored in the signal processes conceptually from the entity of the image limited in space/time, perhaps as “tableau,” surround, or “frame.”

As a reality principle for video, audiovisuality indicates a technical level of the electronic image and sound processing in which the reversibility of audio and video denotes the mechanical operation of individual elements. Therefore, the fundamental transformational character of the electronic medium also comes close to computers....³⁵

Although Spielmann’s emphasis on video as an analog medium in *Video: The Reflexive Medium* (2005), overlooking digital video, is dated, her search for medium specificity, and her calling attention to the *polymorphousness* of audio and video (she terms it “reversibility”) fits our thematic, and reminds that analogic systems of control voltages also have polymorphous characteristics (though at a level in which the operator can exact much less control than in the digital realm). However, my purposes in citing this long passage are a) to recall the predominate use of the term “signal” in media discourse as the flow of electrons coursing through the circuits of the gear, and b) to note the metaphysical tropes that structure this quest for medium specificity. Particularly interesting is the notion that video, being signal based, is inherently unstable, incoherent, fluid, compared to the material solidity of film. At work in Spielmann’s categorization of media essences is a kind

of elemental logic, a pre-Socratic analogic associative thinking; we recall the elemental consciousness of the ancients “Is life and all that exists like water, fire or air” and so forth, in this conflation of the properties of electricity and fluid, energy as a kind of “immateriality” and film as composed of solid units and all the stability that entails (frame, surround, tableau). There is much possibility in this characterization of video for basic incorrectness. For example, there are multiple formats of video: Digital Beta or Beta SP, for example, allows for recording of up to 4 audio channels on separate tracks, it is only certain consumer grades of analog video that weave a mono audio channel into the video signal, leaving an additional audio track for extra dubbing possibilities. And there are analogs to analogs: while it is true that one can synthesize images on video tape without recording an image onto it through a lens, with film one could always, of course expose the film directly (in a dark room, or a black pouch) with light, dyes, transparencies and the rest in the manner of Man Ray’s well-known Rayograms or, a century earlier, in Henry Fox Talbot’s “photogenic drawings” (photographic contact printing c. 1834). Film also has a reversibility between image and sound—one can draw across film leader or scrape away at film emulsion so that the markings one makes cover both the areas of what is projected onto a screen and what is played back through the optical sound reader and heard in the speakers, producing visual rhythms that can be heard as audible rhythms, as demonstrated in Norman McLaren’s *Pen Point Percussion*.

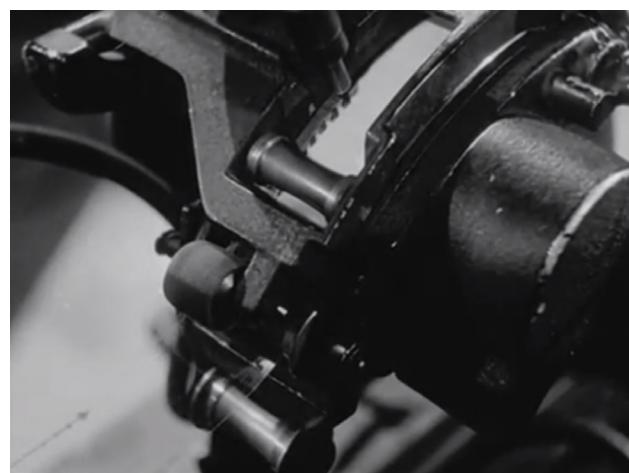


FIGURE 7³⁶

Spielmann’s description of video as fundamentally interlaced is incorrect, as Progressive Scan video goes back to the 1920s (video has a flavor that comes in whole frame sequences or “units” of images just like film). The sense

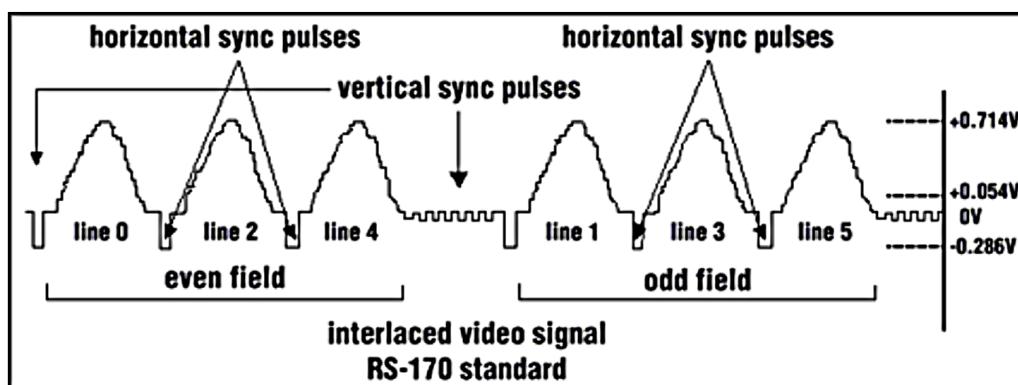


FIGURE 8³⁷

that magnetic tape is “less material” than film stock cannot be argued cogently, and appears based on an underlying metaphor of visible/invisible (tiny images can be seen when film strip is held up to the light, while video tape is visually opaque). Perhaps most alarming is the unstable and inchoate character of video: from an engineering perspective, something must have gone terribly wrong! In Spielmann’s elementalist gaze, all those clocks, synchronizers and stabilizers of the signal are for naught, the video signal may as well be Heraclitian flux or the physis water of Thales (who managed to also provide the geometric Thales’ theorem which is not so fluid). It is as though video exists in a kind of post-apocalyptic *Road Warrior* universe of power generators that keep frizzing, with the signal bleeping in and out, and we need to keep whacking the monitor to get the signal back.

One major material difference between film and video that Spielmann does not mention is that film can be flipped over and run through a projector backwards and with a reversal of the left-right axis, so that one can watch reversed and/or upside down versions of the film, whereas video creates magnetic patterns on only one side of video tape, meaning flipping the tape over does not give any indication of the video material on the other side—noting this material difference between film and video, it is hard to determine what creative or intellectual consequences should be drawn from this, which is a problem with media specificity arguments in general. The modalities of signal that follow are not based on the *specificities* of any medium (entailing the whole history of modernist search for essences of material production, and which comes bundled with various prescriptions or politics). Rather than the media *specific* (film vs. computer vs. video vs. painting etc.) these modes I will elaborate are media *neutral* and based on the periodic *actualities* of mediated experiences in general. The orientation here is not a politicized materialism, but a post-phenomenological account of semiotic periodicity.

9. FIVE SIGNALING MODALITIES

PHYSICAL (S1): the periodicity of waveforms. Wavelengths of light or sound that cohere in periodic (regularly recurring) cycles, making for identifiable qualia (colors, timbres, frequencies and amplitudes), inclusive of the circulation of electrons in circuits that have employed the “black box” fiction that all voltages in a loop are equal to zero in order to avoid Maxwell’s equations in favor of simple algebra for describing the electron goings-on inside of circuits.

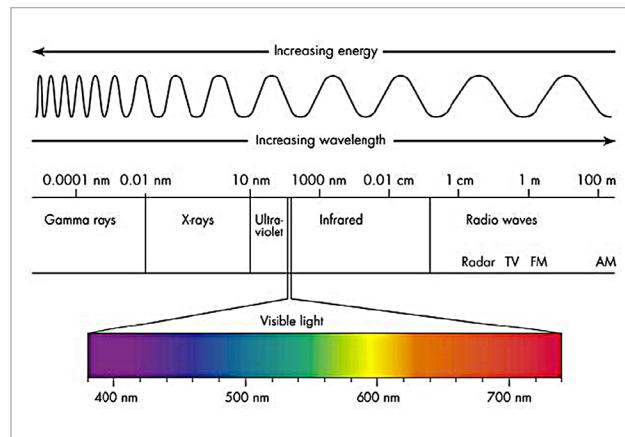


FIGURE 9³⁸

ORGANIC (S2): there is probably no life that does not need to organize itself as an open system without the negentropic structuration of rhythms and internal signals. The organic here also involves the differentiation of life against world, with the world being a field of random (entropic) noise against which life sounds some periodic signaling form of communication to announce itself to members of the same species. S2 also reminds us that the search for extraterrestrial life in the noise of the cosmos involves specifically the search for signals (S1) that are signs of life (S2), the sign of civilized alien being composed of non-entropic (highly organized) repetitions of electromagnetic waveforms.

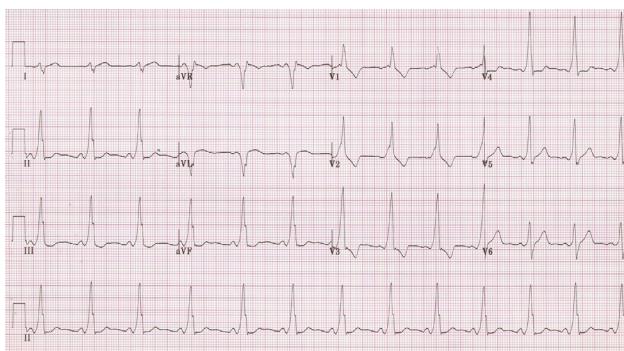


FIGURE 10³⁹

PHENOMENAL C (S3): perceptually constitutive at a level consciously inaccessible, which produces fields of percepts. For example, pixels, well ordered and repeating columns and rows of light emitting dots that we typically cannot see individually (unless they are of unusual size, as they are in fact in architectural-scale media facades). The phenomenal is the bridge from objective quanta to subjective qualia, and is at the level of biological “apparatus” which is within the realm of being addressed by *techne* (e.g. creating spatial effects through phasing differences in audio streams). Also in this area of perceptually (but not experientially) constitutive are such phenomena as vowels being acoustically describable as pitches (periodic waveforms) and consonants as noise (aperiodic). We can discern the difference between pitch and noise but we do not experience the difference between them as a difference in periodicity (e.g. both “shhhhhh” and “ahhhhhh” are experienced as continuous—periodic in experience—while being a/periodic at the level of perceptual constitution). Another example of s₃ signal would be the manner in which flash photography may trigger epileptic seizures in those so prone—this occurs “beneath” the level of conscious attention, as perceptual constitution.

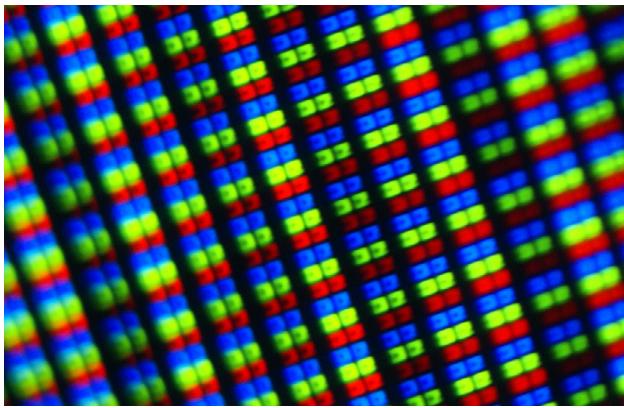


FIGURE 11⁴⁰

PHENOMENOLOGICAL (S4): Here I will borrow the idea of “low focus” awareness of Kozel.⁴¹ Signal in a phenomenological sense are the periodicities that support forms of consciousness, meaning and experience. Frames around images, the font or typeface of text, tempo in music, continuances of color and the like are constitutive of “higher level” semiotic functions productive of either an analogic (iconic) or digital (symbolic) character. Signal *gathers* (noting Heidegger’s replacement for the term “constitution” in his discourse). Nothing of what you are now reading would be, in fact, readable (producing semiosis) if letter size, kerning, spacing, stroke width and line direction were of a completely random and stochastic format.

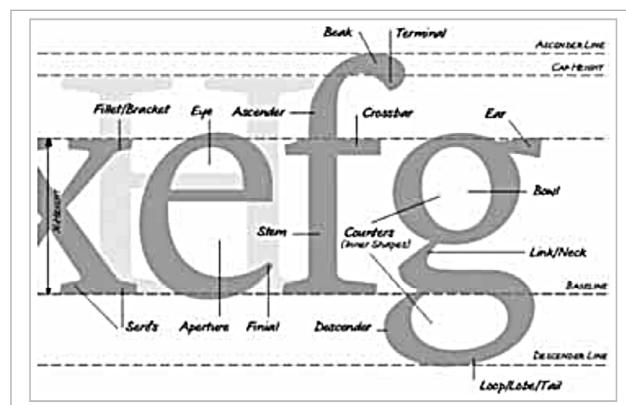


FIGURE 12⁴²

FORMAL (S5): At the level of “high focus” the formal level of signal represents periodicity as pattern or design, rhythm at the level of the built environment, grids of a city plan, stripes on a t-shirt or the black bars and color fields of Albers or Mondrian. The taking up of repetition as a formal or intentional element in composition brings us to an aesthetics of signal (which, as we will see later, can either be juxtaposed with or opposed to an aesthetics of noise). In contemporary digital art, for example, we can link data art to signal and glitch to noise (there is no glitch without data)—we will pick up on that discussion shortly. Almost all of what are typically described as the formal *qualities* in image composition can be understood as organizations of periodicity: line, pattern, balance, symmetry, framing, aspect ratio, the rule of thirds, perspective, shape, contrast etc. There are a few aspects of formal composition amenable to a “reading” of noise (aperiodicity)—e.g. asymmetry and texture—while other formal features are easily reversible across periodic or aperiodic registers (e.g. contrast, scale, and “form” in the sense of the articulation of volume through gradients of light).

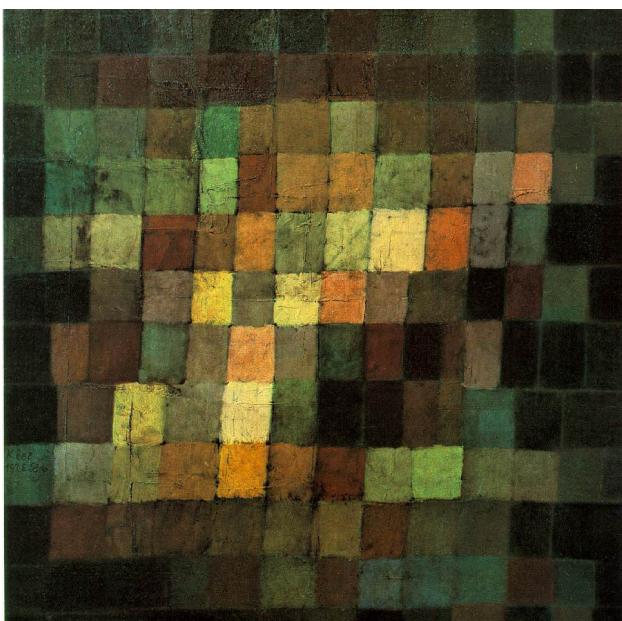


FIGURE 13⁴³

Having parsed signal out at these levels, we can review the notion of signal in Spielmann (which is shared by other theorists with an orientation around the material specificity of media, and who search for ideological connections to material features) and see if any additional light is shed on her description. Signal as it circulates though technology is physical (s_1) and ends up phenomenal (s_3) when it reaches the pairing of monitor and eyeball (if it reaches video tape instead of a screen, it becomes material—a pattern of magnetic particles for instance, and has to be re-converted into signal to be displayed). The phenomenal level of signal is organized to address the rods and cones of our eyes, and to low level neurological processing that, in the case of a video image, produces the initial possibilities of analogic-iconic visualization. One could draw upon a wealth of literature in cognitive psychology or the biology of perception to subdivide further the various neural processing stages of image formation at this level, but that is not necessary for our purposes. The phenomenal level of signal (s_3) embraces both the technologies of mediation and the pre-phenomenological basis of perception that is not accessible to conscious intervention but is addressable through technical development that makes use of experimental knowledge of perception.

Video signal is actually a composite of 5 signals⁴⁴: 3 for color information (red, green, blue), and two signals for horizontal and vertical synchronization. So the imagined “instability” of the video signal is countered, at the engineering level, by 2 out of 5 of the signals composing video

dedicated precisely to the stability of the image. Moreover, the scan rate of video is “backed up” by the 60 Hz cycle of the electric power grid of entire countries (to use NTSC as the example, which comprises all of North America, some parts of South America, along with Myanmar, South Korea, Taiwan, Japan, the Philippines, interestingly enough⁴⁵). The HDMI specification (for high definition transmission of video signal) encodes each of the 5 sub-signals separately and as digital information (for all the reputed benefits of digital).



FIGURE 14⁴⁶

Joan Jonas' video work *Vertical Roll* would be a manipulation of s_1 (physical, horizontal sync information) that culminates in a high focus formal-intentional experience (s_5 , formal), after a quick run through of s_3 (the fact that we can recognize imagery “between” the visual slices of the rolls, and even the fact of having our perceptual thresholds crossed to recognize electronic imagery in the first place, is a product of the phenomenal level). The level of s_4 is undoubtedly there but achieving “low focus” attention to a work with loud rhythmic claps is difficult to achieve, if only because the harsh rhythms tend to disrupt any attempt at bracketing the ordinary experience of the work (which itself says something about the conditions necessary for low focus). Of course this does not preclude the possibility of someone else doing a phenomenological report of *Vertical Roll*.

Spielmann's references to synthesis, to give another example, would take us from s_1 (stream of electrons) to s_3 (crossing of perceptual thresholds at the level of the monitor, the visibility of the hitherto invisible electrons in their circuits), and thence to possible articulations at s_4 or s_5 . However, we should note that techniques of synthesis



FIGURE 15⁴⁷

produce tools for the production of noise (aperiodic waveforms) as well as periodic waveforms. A signal can be phenomenally aperiodic—as in white noise—but phenomenologically periodic—static and continuous—which can be understood as signal or noise (a/periodicity) articulated at different levels.

Some media may oscillate between signal and noise at the formal (s_5) level, exhibiting periodic and stochastic features, while remaining periodic at the phenomenal level (s_3). Digital media is particularly interesting with regards to noise-signal reversibility because all the information is quantized, and yet quantization errors, such as through compression artifacts, produce a play of a/periodicities at different levels of the schema. Speculating from a Google Ngram view of these terms, for most of the history of modern media, signal and noise were a pairing of “natural” antitheses, appearing in texts between 1800–1945 with equivalent frequency. Around the time of the development of information theory (post WW2), signal started to pull away from noise in its occurrence (as one would expect from the successful suppression of noise in information systems).

It is tempting to give a political and musical-aesthetic reading of the convergence of signal and noise again in the early 70s (Vietnam, psychedelic music), while the dramatic ascendance of signal over and against noise from 1980 forward no doubt reflects the switchover to and dominance of digital technologies, which do not have the noise issues of analog equipment (quantization errors take the place of noise produced by the system as the nemesis of signal). Noise in media (tape hiss, hair stuck in the projector gate, lint stuck to oil paint) more and more seems like a distant memory.



FIGURE 17⁴⁸

Given the prominence of the concept of *signal* in information theory, I will more carefully distinguish the semiotic notion of periodicity being developed here from the technical definition of signal as information. There is in fact some instability in the general concept of signal itself in information theory.

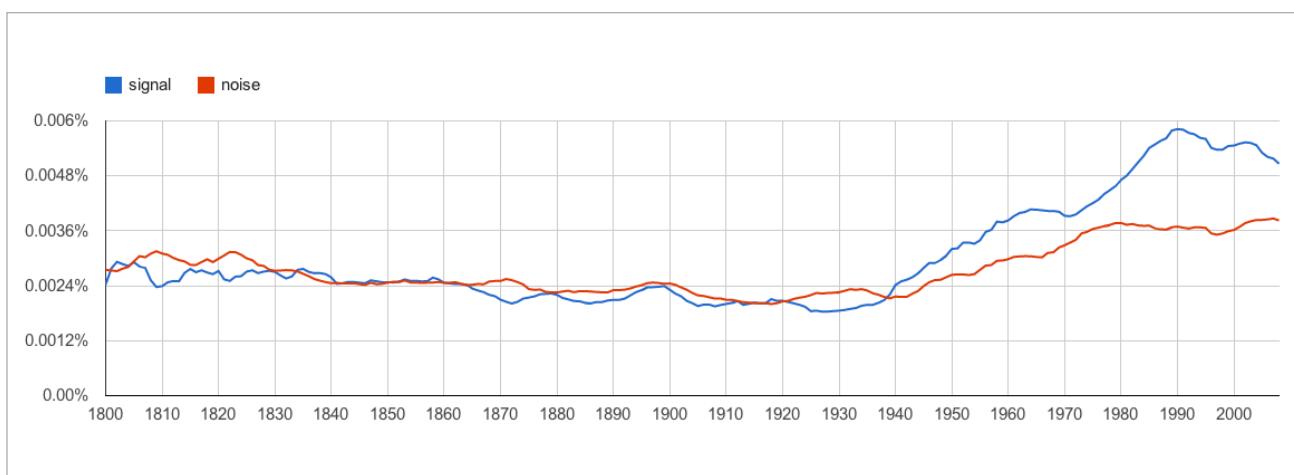


FIGURE 16

In the well-known cases of AM and FM radio (amplitude or frequency modulation), there is a “Carrier” that is the pure broadcast frequency (e.g. on the FM dial “95” refers to 95 megahertz or 95 million cycles per second), and the frequency of the Carrier is subtly altered (modulated) by the “Signal” which consists of material that would be within an audible frequency range (the theoretical human range of hearing is 20Hz to 20kHz, or 20 to 20,000 cycles per second). The transmission modulates the carrier with the signal, and at the receiver end (e.g. car radio), the modulation is stripped from the carrier, leaving one with the audible frequencies broadcast (music, morning show idiots, etc.). All three of these periodicities are in fact physically *signals* in the plainest use of the term (beams of emanating energy). The Carrier is a Signal (a waveform with a pure frequency in the millions of hertz), the Signal is also a Signal (the music or DJ voice or news report is an audio signal), and of course the modulated Carrier also is a Signal (the modulated frequency, signal summed with carrier). So there is a terminological difficulty because all three of these would count as “signal” in any common sense use of the term. The practice of reserving the term *signal* for the bad music or morning show idiots is a convention of information theory, in which *Signal* is equated with the *Information* that one wants to transmit, and the Carrier is the channel of transmission (which itself is just another signal but has to be named differently to distinguish the channel from the quantity—probabilistic, statistically modeled—of information).

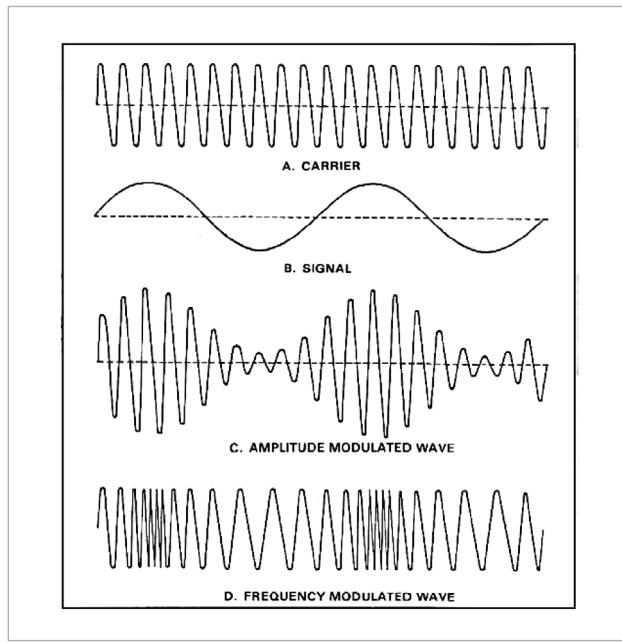


FIGURE 18⁴⁹

There are two conceptual ambiguities (but not mathematical ambiguities, as the theory works fine for delivering media content) in the notion of signal as information theory describes it. The first is that noise, which we can define here as “that which is not the signal which ends up in the signal” (interference) has a double character. There is internal noise, which is the noise of the electrical components that the signal is moving through (the unordered entropic condition of closed-system physical materials subject to thermodynamics) or other physical properties of the channel that cause interruptions of the signal. There is then also external noise, such as RF (radio frequencies), which are in fact simply other signals, albeit signals that interfere with the pure transmission of the *information* (for which information theory reserves the term *signal*) on our privileged channel. Information theory refers to these unwanted signals as noise, when in fact they are also-signals. A balanced audio cable, for example, contains two wires of signal, each out of phase with the other to be recombined at the input, so that any external noise will be phase reversed upon reconstitution of the signal (and thus canceled out).

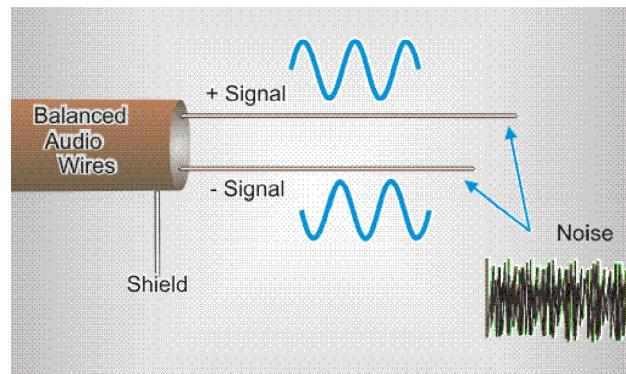


FIGURE 19⁵⁰

The second conceptual problematic is that, from the standpoint of information theory, the most information is contained in the least probable event, which is to say, “information rich” is broadly coterminous with “aperiodicity” because the periodic is formally redundant and thus informationally poor. As Weiner states, “The amount of meaning can be measured. It turns out that the less probable a message is, the more meaning it has.”⁵¹ Bateson famously defined “a bit of information” or “the elementary unit of information” as “a difference that makes a difference.”⁵² Thus there is some reversibility, instability, contamination, and undecidability in the very concept of signal: we need a steady carrier broadcast at a pure frequency (a signal, periodic waveform) to deliver

information (another signal) which is “richer” in its more aperiodic (less statistically redundant) form while designing a system that emits its own noise (aperiodicity, entropy, disorganization) but attempts to reject other signals (defined as “noise”) but which still sometimes interfere and are unwanted (qualitative assessment) because they create aperiodicities (disruptions) in the information which requires a continuous flow (periodic) of content (and in the case of our morning show idiots, not informationally rich, at least in the qualitative register). Information theory creates these conceptual ambiguities because, like all applied science, it needs to reduce each element to a monosemic unit to fulfill a calculative function. The difficulties noted here are definitional at the level of natural language (natural polysemy) not at the level of engineered discourse (where each element is assigned its unique variable and function). Information theory of course understands information as probabilistic physical quantities and is not descriptive at the level of meaning. This detour into mathematized signal is to provide additional context to the technicality of the term.

Modeling Signal across 5 levels (s_1-s_5) helps to disentangle some of these conceptual ambiguities while also providing a smooth gradient from quanta (s_1, s_2) to qualia (s_4, s_5), with s_3 as a “crossover point” from quanta (e.g. the electrical charge of a pixel) to qualia (crossing the perceptual threshold). s_3 , as the phenomenal level, designates the manner in which our perceptual capacities are the “referent” for the designed engineered capabilities of media technologies:

The human eye is sensitive to a very narrow band of frequencies, namely the frequencies between 429 terahertz (THz) and 750 THz. This is the same sensitivity range as a charge coupled device (CCD) or a complementary metal oxide semiconductor (CMOS) chip found in our digital cameras.⁵³

Digital cameras mirror or match the eye’s sensitivities: the chips of digital cameras are designed to address the eye and so can be considered ontologically as re-embodiments of aspects of our vision. s_3 provides a site for investigating technologies of mediation as non-alienating (or in Heidegger’s dramatic phrasing, non-“ruinous”⁵⁴), and this level of interface between designed capabilities and organic sensitivities is not so much “post-human” as re-human.

At the biological level this is experienced through electromagnetic waves making contact with the retina, lined with two kinds of photosensitive cells. These photoreceptors are known as rods and cones. The rods

only detect whether or not light is present. They are sensitive to the whole spectrum at once but only in terms of brightness or “luminance.” Cones are sensitive only to certain frequencies: red, green, and blue, values of “chrominance.” In this way, the pixel on a screen models the component light values held within the cells of the eye.

We should note, however, that technologically re-embodied perception does not guarantee perception at the human scale at all: in fact media possess capabilities to exceed the bandwidth of human thresholds. We can blind or deafen ourselves rather easily, as technically re-embodied perception is also a field of amplification and real power (boosted signal) and partakes of energetic magnitudes more than human.

10. SIGNAL PROCESSING: EFFECTS FOR AFFECTS

The five levels described above allow for “two and a half” levels of quanta signal (s_1-s_3) and another “two and a half” levels for qualia signal (s_3-s_5), recalling that s_3 is the phenomenal crossover. In this and the following sections we will primarily employ references to audiovisual, screen-based and computational media, though there is nothing stated herein that could not as well apply to “obsolete” analog media technologies (such as the visual effects of adjusting the tension on the springs of a printing press) and in fact I will briefly reference “old media” piano tuning in what follows. Signal processing at the crossover level of s_3 can be conceived of as having two faces, depending on which “side” of the screen or speaker we are ourselves addressing, which I will refer to as the Effecting and Affecting sides. Since the terms *effects* and *affects* are often used interchangeably (and indeed, like difference/difference sound the same via a strategic “a” and an “e”), and because the recent Affective Turn in criticism has produced a large literature that requires situating my use of “affect” in relation to signal, I will clarify my use of these terms.

- EFFECTS are in the chain of causality (and thus objectivity and physicality). An effect is passive and necessary with respect to its cause.
- AFFECTS are associative productions of subjectivity and embodiment. An affect is created actively and associatively with respect to percepts or stimuli.

The effect/affect distinction maintains the subjective as a realm of freedom (not determined by external causes) and as active construal of feeling. This relation to freedom in general will be discussed further below. However it is worth noting that what Brian Massumi has called “the

autonomy⁵⁵ of affect also undergirds human autonomy in general. If affects were effects, human sensation-feeling-emotion would have the same existential status as billiard balls (subject to Hooke's laws) or Newtonian falling apples. Affect is a produced response, not a passive reaction, and therein lies (in a nutshell) an ontogenesis of human freedom in general. In our model, this autonomy is in part illustrated by the fact that technologies of mediation address us at the level of s_3 , whereas affect clearly has its "ground" at the organic level of bodily constitution (s_2). This can be understood as a "level offset" between the signal as percept in relation to produced affect, an offset that, amongst other things, will mean that affect is not directly shaped or addressed by mediated percepts. This offset between s_2 and s_3 can help account for what Massumi has called the "gap between content and effect."⁵⁶

Since percept would fit this same definition of affects given above, *affect* need to be further distinguished from percepts:

- **AFFECTS** are internally dynamic, ranging from sensation to mood to feeling to emotion. Proprioception, arousal, rushes of adrenaline, pain and the range of internal "perceptions" that are not produced by five senses (which produce percepts) can all be considered affects in this framework.
- **PERCEPTS** are externalistic and ecstatic, constructive of world and environment. While science (and Kant) tells us that our image of the world is constructed in the brain, if percepts felt that they were "just in our heads" then we would lack the capacity to act in an environment. Percepts are "outside information" and address our senses attuned to the external environment even when produced purely internally (as in dreams or hypnagogia, which are clearly experienced as "inside images" but in these cases make for an internalized ecstasies).

There is nothing radical in the above distinctions (or perhaps they are radically *accommodative* of diverse discourses). In my view Massumi's definition of emotion as "subjective content, the socio-linguistic fixing of the quality of an experience which is from that point onward defined as personal"⁵⁷ is profoundly and phenomenologically inaccurate. This framing may work as a definition in his particular taxonomy (which is to solder a connection between postmodernism and scientific experiments), but the idea that emotion is a "socio-linguistic fixing" lacks any phenomenological valence (in fact, its valence

is purely hermeneutic, and is equivalent to stating that emotion is what Hallmark Cards purport them to be).

In signal processing, when working with effects of mediation (audio-visual-typo-graphic), one is working with "effects" (materials responding passively to causal forces of manipulation). These effects are perceived as part of externality (percepts) and motivate (not cause) various internal subjective states (affects). Given that the body is a physical object subject to causal forces, the closer an affect is to passive cause rather than associative response (e.g. needle pain), the more the phenomenal level of signal (s_3) can be said to be modulated toward effect rather than affect. Thus:

Effective Signal Processing: the side of quanta verging into qualia (s_1/s_3); in this trajectory one is working with the signal (in either an analogic or digital mode, i.e. either the flow of circulating voltages or the procedures of algorithms) as physical processes that terminate within ranges accessible to perception.

Affective Signal Processing: once phenomenally constituted at the plane of perception, the signal is imaging something (a picture, a sound) and the operator of signal processing is shaping the image in a field of qualia in which various aesthetic, intentional, or interpretive aims are being explored and realized.

These two orientations of signal processing are conventionally addressed by a division of labor, with engineers focusing on the Effective orientation, and artists engaged with the Affective side, working with the tools and ranges provided by the engineers. However these two orientations are not "pure" in that it will certainly be the case that those designing the calculative processes will at some point watch or listen to the results of their design (with varying attention to qualitative or quality control features), and the creative practitioner focused on imaging will often need to make some rudimentary (typically in the realm of basic arithmetic) calculation to get the effect they are seeking. Of course, today software applications such as Max/MSP/Jitter allow the artist-practitioner without formal training in technology to engage with both sides of Effect/Affect, through the use of a graphic programming environment.

At this point two areas need to be expanded upon and clarified. First we should delimit somewhat this field of rapidly expanding sensorial possibilities so that the reader

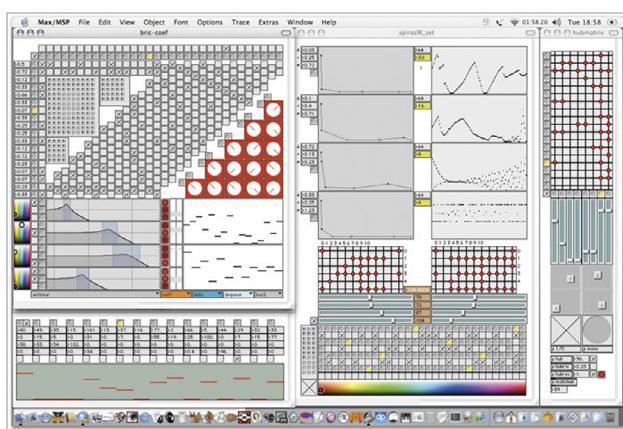


FIGURE 20⁵⁸

better understands the basic material limits of what one is working with in media technologies. Secondly, the use of the term *image* (as in the telos of signal is to image) is applied here polymorphously, and does not only apply only to visuals or pictures. In audio practices, for example, the term “stereo imaging” is used to articulate sonic spaciousness. A polymorphic *image* is a sensory gestalt and is not specifically visual (e.g. one can get a haptic image by closing one’s eyes and touching something), and marks a qualitative shift from signal as perceived periodicity into a new capacity as sign. *Image* is also chosen because we don’t have a separate word for “imagination” that addresses each sense or medium specifically.

In the case of audio media, there are only three categories of media “material” (and actually, there are really only two with the third being a mixture), which are:

Recordings: reproductions of external sources

Synthesized Sounds: audio files composed of waveforms that have been electronically generated straight out of mathematics

Processed Sounds: recordings that have undergone signal processing, or sounds produced through synthesis that further processing has been applied to.

This basic division holds for visual imagery as well. With digital photography we would re-name this division perhaps as 1) Representation, 2) Visual Effects, and 3) Processed Imagery. With vector imagery drawn with the help of something like a Wacom tablet we have a hybrid of Recording (of gesture, pen stroke) mapped to a synthetically generated line stroke of some kind, with of course the possibility of various effects to be added later

(processes). This suggests a model with two poles of origination (representation, synthesis) which might (at a higher level of generality, applicable to all media) look something like this:

Origin 1: Representation (Reproduction) / Processing, Alteration / Origin 2: Synthesis, Generativity

This is signal organized along a different spectrum. s_1-s_5 organizes signal along nested levels of complexity (from electron to organ to cultured organism), the dual-origin figuration of signal above designates the constraining properties of s_3 on s_1 . In other words, because media technologies are ultimately addressed to the limitations of our senses (while of course noting that loudspeakers intended for a stadium will exceed the threshold of pain if we stand next to them), we could define the spectrum above as system modalities of signal, with Origin 1 being the receptivity of technology to signals-at-large (wavelengths of sound or light), and Origin 2 addressing that other origin, namely the origination from the power supply, battery or outlet which is shaped by hardware or software. Between these two origins is a quantified field articulated as ranges and potentials of values and modulations. We can call these “system modalities” because they define the degree to which a particular signal is open or closed toward which origin (an “origin” in this case being simply what signal is open or closed to, external signal-at-large in the world, or signals from the power supply mediated through algorithms or circuits). It is worth noting a few additional features of how these modalities change from the field of quanta (s_1/s_3) to qualia (s_4/s_5 /Imaging).

Feature #1: At the level of conscious perception, one can of course so over-process a sourced media file (representation of some external object or place) that from a subjective point of view it “may as well be” synthesized.

Feature #2: Likewise, one can produce fairly “organic” textures with subtle modulations that invoke the filed of natural sources. Algorithms or processes can emulate “naturalness” in synthesized media.

Feature #3: As physical systems, signal-based media are also subject to influences beyond their “official” openings (towards power supply/synthesis, or towards environment/representation). As William Wegman’s video Mixer (1970) illustrates (in which Wegman applies a portable mixer—of the sort typically used to make whip cream or frosting—to the reel to reel mechanism of video playback), “unstable”

or “fluid” signal indeed may result from combining kitchen appliances with video technology.

Configuring signal as a system with two open ends can take us in another direction from the discourse founded on outdated notions of “original vs. fake” and the post-modern rhetoric of “fake = real.” This dual openness is not a migration between a truth and an appearance or between appearances multiplying in circulation, but between two co-generative possibilities of mediation. Being “grounded” in media actualities in the manner performed here (not in the sense of film vs. video, but more in the sense of what a general category of media does) can help one identify potential weaknesses in other discourses that may take on more overtly metaphysical, ideological or idiosyncratic tonalities.

EDITOR'S NOTE

This is the first installment of a two-part article, the second part of this article will appear in PJIM Volume v, No. 3, the next issue of PJIM.

BIOGRAPHY

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NOTES

1 <http://www.aber.ac.uk/media/Documents/S4B/sem02.html>

2 <http://www.martnet.com/~lexicon/origins.html>

3 <http://www.library.utoronto.ca/see/SEED/Vol3-1/Vladimirova.html>

4 Roland Barthes, *Mythologies* (Hill and Wang, 1972).

5 <http://moussemagazine.it/articolo.mm?id=529>

6 <http://www.sunypress.edu/p-4799-postphenomenology-and-technosci.aspx>

7 <http://thethirdmeaning.blogspot.ca/2007/10/roland-barthes-third-meaning.html>

8 Brian Massumi, “The Autonomy of Affect,” p. 5 online PDF, <http://www.brianmassumi.com/textes/Autonomy%20of%20Affect.PDF>

9 In essence, I am extracting what is phenomenologically “salvageable” from the literary schizo-analytic textual and textural style of Deleuze and Guattari, as for example: “For it is then that a relation can be directly determined as differential relation dy/dx , in which the only determination of the value of the variables is that of disappearing or being born, even though it is wrested from infinite speeds.” And in the very same paragraph, “The most closed system still has a thread that rises toward the virtual, and down which the spider descends.”

10 Gilles Deleuze and Félix Guattari, *What is Philosophy?* (New York: Columbia University Press (1994), 142.

11 Ibid., 140: “A real hatred inspires logic’s rivalry with, or its will to supplant, philosophy.”

12 <http://ndpr.nd.edu/news/24327-deleuze-and-the-genesis-of-representation/>

13 Gilles Deleuze, *Cinema 1*, trans. Hugh Tomlinson and Barbara Habberjam (Continuum Books 1986), online ebook (INGRAM), 59.

14 Ibid., 63.



- 15** Deleuze and Guattari, *What is Philosophy?*, 169.
- 16** Andre de Muralt, *The Idea of Phenomenology: Husserlian Exemplarism* (Northwestern University Press, 1988), 126.
- 17** Ferdinand de Saussure, *Course in General Linguistics*, trans. Roy Harris (London: Duckworth, [1916] 1983), 15–16.
- 18** Tomlinson Holman, 5.1 *Surround Sound Up and Running* (Focal Press, 2000), 26.
- 19** <http://www.itu.int/rec/R-REC-bs>
- 20** Bob Snyder, *Music and Memory* (Cambridge/London: MIT Press, 2000), 11.
- 21** <http://whatdavidbowiewoulddo.blogspot.ca/2011/12/dont-worry-rabbits-chickens-and-princes.html>
- 22** Charles Sanders Peirce, *Collected Papers of Charles Sanders Peirce*, Vol. 8 (Cambridge: Harvard University Press, 1958), 221.
- 23** Photo courtesy of Dr. Paul Matthew St. Pierre.
- 24** <http://joanmiro.com/>
- 25** Henri Bergson. *Matter and Memory* (New York: Zone Books, 1988).
- 26** http://www.chemicalpictures.net/?page_id=111
- 27** <http://belate.wordpress.com/2010/04/04/time-and-freedom-in-kant/>
- 28** Quoted in John Kaag, “Continuity and Inheritance: Kant’s Critique of Judgment and the Work of C.S. Peirce,” *Transactions of the Charles S. Peirce Society* (Summer, 2005, Vol. xli, No. 3), 515.
- 29** Ibid.
- 30** Peirce, *Collected Papers*, 220–221.
- 31** Table 1: http://en.wikipedia.org/wiki/Critique_of_Pure_Reason; Table 2: <http://equivalentexchange.wordpress.com/2012/04/27/kants-reflective-perspectives-on-experience/>

- 32** Martin Heidegger. *Being and Time*, trans. by J. Stambaugh (Albany: State University of New York Press, 1996), 193.
- 33** Jacques Derrida. *Of Grammatology*, Part II *Introduction* to the “Age of Rousseau,” section 2 “...That Dangerous Supplement...” The Exorbitant Question of Method (1967): 158–159, 163.
- 34** <http://www.nolanfans.com/forums/viewtopic.php?f=17&t=5141&start=40>
- 35** Yvonne Spielmann, *Video: the reflexive medium* (Cambridge/London: MIT Press (2008), 1–5.
- 36** http://www.youtube.com/watch?v=Q0vgZv_JWfM
- 37** <http://forum.videohelp.com/threads/344585-Need-advice-on-what-vcr-to-use-for-capturing-older-video-tapes?p=2153150&viewfull=1>
- 38** <http://9-4fordham.wikispaces.com/Electro+Magnetic+Spectrum+and+light>
- 39** <http://www.proprofs.com/quiz-school/story.php?title=em-clerkship-ekg-review>
- 40** <http://www.photoclubalpha.com/2008/01/20/a700-and-a100-rear-lcd-screen-resolution/>
- 41** Susan Kozel, *Closer: performance, technologies, phenomenology* (MIT Press, 2007), 55.
- 42** http://usabilitynews.usernomics.com/2007/08/www-usabilitynewsorg_13.html
- 43** <http://www.sai.msu.su/wm/paint/auth/klee/>
- 44** http://www.ehow.com/info_8658368_scable-vs-hdmi.html
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- 46** <http://www.youtube.com/watch?v=-oqJZOFzbFA>
- 47** <http://www.flickr.com/photos/minuek/6087180122/>
- 48** <http://yulia-textures.deviantart.com/art/film-dust-texture-261713199>

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