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Signal-to-Noise Ratio

If the place were not so distant,
If words were known, and spoken,
Then the God might be a gold ikon,
Or a page in a paper book.
But It comes as the Kirghiz light—
There is no other way to know it.
—Thomas Pynchon, "The Aqyn's Song"

Materialities of communication are a modern riddle, possibly modernity itself. It makes sense to inquire about them only after two things are clear. First, no sense exists—such as philosophy and hermeneutics have always sought between the lines—without physical carriers. Second, no materialities exist which themselves are information or, alternately, might create communication. When at the turn of the century, that hypothetical "Ether"—which Heinrich Rudolph Hertz and many of his contemporaries believed necessary to explain the distribution of wireless high-frequency signals (which would soon yield radio)—sank into the theoretical void, information channels without any materiality became part of the everyday itself. Electromagnetic waves as the modern outbidding [*Überbietung*] of all writing simply follow Maxwell's field equations and work even in a vacuum.

The information technologies of the last two centuries first made it possible to formulate (as Claude Shannon put it) a *mathematical theory of information*. As is well known, this theory not only disregards the fact that "frequently . . . messages have *meaning;* that is they refer to or are correlated according to some system with certain physical or conceptual entities."[1] Rather, because systems of communication that would transmit a single message (e.g., the number π, a determinate sine wave, or the Ten Commandments) are now superfluous and can be replaced by two separate signal generators,[2] the messages themselves are as meaningless to information theory as their statistics are meaningful. The messenger of Marathon, whose life and course coincided with a single message, has forfeited his heroic glory.

That happened not long ago. For until the parallel development of railways and telegraphy, Europe's state postal systems—which functioned more or less regularly after the Thirty Years' War[3]—transported people, letters or printed matter, and goods in the same carriage. In other words, because all three elements of the transport system were material beyond doubt, there was no need to distinguish further between addresses and persons,[4] commands and mes-

sages, or data and goods in terms of communication. Accordingly, philosophers could write of the "spirit of man" or the "sense of things" on the basis of actual material reality.

Modernity, in contrast, began with a process of differentiation that relieved the postal system of goods and persons and made them relatively mobile on tracks or national roads. As a matter of course, it placed officers in first class, noncommissioned officers in second, and troops in third; weapons were loaded onto freight cars.[5] All this occurred, however, to separate material entities from pure streams of command, which it brought up to the absolute speed of light or electricity. In North America, the new system was instituted during the Civil War—the "first 'technical' or 'total' war, which, unfortunately, has been studied far too little."[6] In Europe, the shift occurred through Field Marshal Helmuth von Moltke's two campaigns in 1866 and 1870. The flight path of the postcard—which, according to Derrida, is one with Destiny or History itself—no longer went straight from Socrates and Plato to Freud and beyond.[7] It abandoned the routes of literature and philosophy—that is, the path of the alphabet and its restricted possibilities of communication—in order to become a mathematical algorithm.

Shannon's famous formula reads:

$$H = -\sum_{i=1}^{n} p_i \log p_i$$

Here quantity *H* measures how much freedom of choice—that is, how much uncertainty—governs the output when an information network [*Nachrichtensystem*] selects a specific event out of a number of possible events with probabilities that are all known. If the system—for example, in the orthographically standardized sequence of *q* and *u*—worked with a single signal of material certainty, *H* would sink to its minimum level of 0.[8] According to Lacan, the sign of the sign is that, by definition, it can be replaced[9]; in contrast, all that is Real sticks in place.[10] Even measuring its travels through the space and time of an information channel would yield only physical data about energy or speed, but nothing concerning a code.

Therein lie the difficulties for materialism; for example, when Marx, contemplating the Second Industrial Revolution, affirmed the law of the conservation of energy. Messages are calculable, but not determinate. Also (and especially) if Shannon's formula for information, including the controversial sign that precedes it,[11] is identical with Boltzmann's formula for entropy, the possibility of information does not derive from physical necessity—that is, from a Laplace universe—but from chance. Only if system elements have the chance,

here or there, to be open or closed, does the system produce information. That is why combinatorics came about on the basis of dice,[12] and computer technology through endlessly repeated grids.[13] In the elementary—that is, the binary—case, *H* achieves its maximum of 1 when *p1* and *p2*, that is, the presence and absence of modern philosophemes, have the equal probability of 0.5. Both would reject a die whose six faces had unequal chances of occurring, even if a player, who bets on advantages for either side, might not.

The fact that the maximum of information means nothing other than highest improbability, however, makes it almost impossible to distinguish it from the maximum degree of interference. In contrast to the concept of logical depth, which IBM researchers have been working on recently, Shannon's index *H* serves "as a measure of the statistical characteristics of a source of information, not as a step towards finding the information value of any given waveform or function."[14] And so it happens that on the one hand, the highest information rate per time unit makes it advisable to use "all parts of the available frequency [in the channel]," while on the other, "one of the main characteristics of random noise is that its power spectrum is uniformly spread over the frequency band."[15] In other words, signals, whenever possible, mimic interferences. And because the thermal noise that all matter—and therefore also resistors or transistors—radiates when operating (according to another one of Boltzmann's formulas) is white noise of the same kind, information without matter and matter without information are coupled just like the two ways of reading a picture puzzle.

As strange as it sounds, applied engineering solves problems of this sort through what is called "idealization." One treats every signal, which after passing through a real channel is necessarily laden with noise, as if it had been generated by two different sources: a signal source and a noise source, which in the most straightforward case are simply added to each other. For all that, it is equally valid to assume that the signal already coded was coded once more by an enemy intelligence, and that this second coding is successful and enigmatic in proportion to the whiteness of the noise. According to Shannon's "Communication Theory of Secrecy Systems"—a paper that for good Pentagon reasons itself remained sealed for years—the only way out of this fundamental undecidability is offered by the experiential fact that encrypting systems are mostly selections from a number of chance events that, while large as possible, are ultimately finite, whereas noise can assume infinitely many values.[16] For this reason, numbers theory, which was formerly so purpose-free,[17] has today become a hunt for the highest possible prime numbers,

which—as encryptions of military-industrial secret messages—necessarily appear as noise to an enemy who has not yet cracked them. Turing, the well-known computer theorist and unknown cryptographer of the World War, formulated that laws of nature can be replaced by code systems, matters of evidence by intercepted messages, and physical constants by daily keying elements—that is, the natural sciences as a whole can be replaced by cryptanalysis.[18] The difference between chaos and strategy has become just that slight.

It is this "return of the Chaos of old within the inside of bodies and beyond their reality" with which Valéry's technical Faust terrifies a Devil whose "entirely elementary science" is, as everyone knows, simply speech. Experimental interconnection of information and noise makes "discourse a side issue."[19] After all, the orders of a culture of writing, whether literary or philosophical, could only construct meaning out of elements that had meaning themselves. Sentences emerged from words, but words did not come from letters. In contrast:

> Let us consider the signifier quite simply in the irreducible materiality that structure entails, insofar as this materiality is its own, and let us conjure the signifier up in the form of a lottery. It will be clear then that the signifier is the only thing in the world that can underpin the coexistence—constituted by disorder (synchronically)—of elements among which the most indestructible order ever to be deployed subsists (diachronically).[20]

Shannon demonstrated just such a logic of the diachronic chaining of chaos all the more strikingly for purposefully shaping his writing experiment—in contrast to the ancient play of letters that occurs in Cabbala—in a way that does without semantics. His point of departure is our conventional alphabet, that is, not some twenty-six letters, but rather these same letters and a *space* (as one finds on typewriters).

Here, in a purely statistical sense, a finite quantity of signs is to approach or simulate a language; in this case, English. As a matter of course, zero-order approximation, with twenty-seven symbols that are equally probable and independent of each other, provides only noise or gobbledygook: "xfcml rxkhrjffjuj zlpwcfwkcyl . . ." First-order approximation, that is, given probabilities or frequencies of letters as they occur in texts written in English, begins to admit articulation: "ocro hli rgwr nmielsswis eu ll . . ." Second-order approximation, which as a Markov chain also considers diachrony (that is, the probability of transition between all possible pairs of letters in a language), readily yields short words such as "are" or "be." Approximation of the third order, involving triads of English letters, can already compete with the mad, with Surrealists, or (as Shannon observed[21]) with *Finnegan's Wake*: "in no ist lat whey cractict froure birs grocid pondenome of demonstures of the raptagin is regoactiona of cre." Finally, when Markov chains no longer draw their elements from let-

ters, but from words, second-order approximation already produces the neatest self-references of orality, typography, and literature: "the head and in frontal attack on an English writer that the character of this point is therefore another method for the letters that the time of who ever told the problem for an unexpected."[22]

This frontal attack on English writers (or, alternately, devils) is led of course by noise, which Shannon's formula—as "another method for . . . letters"—introduced to written culture. Henceforth, letters received no better treatment than numbers (which exhibit unlimited manipulability); henceforth, signals and noises were defined only numerically. Communication (to use Shannon's language) is always "Communication in the Presence of Noise"[23]—and not just because real channels never do not emit noise, but because messages themselves can be generated as selections or filterings of noise.

Technical idealization, according to which the noise-laden output of networks counts as the function of two variables—of a signal input presumed to be noise-free and a separate source of noise—enables nothing more and nothing less than the specification of signal-to-noise ratios. In a first step, this interval indicates (on the basis of voltages, currents, or power) only the quotient of medium signal amplitude and the initial degree of interference. However, simply because electric networks, via their interfaces, are connected to human senses and these senses—according to Fechner's constitutional law of psychophysics—react to a geometric increase of stimulation as if it occurred only arithmetically, it is better to record the signal-to-noise ratio logarithmically. Accordingly, the unit *decibel* (named in technological—i.e., nearly unrecognizable—honor of the inventor of the telephone, Alexander Graham Bell) transforms a fraction into twenty times or (in the case of output) ten times its logarithm:

$$S_N^{\#} = 20\,\mathrm{dB}\,\lg\,\frac{U_{g\,\mathrm{eff}}}{U_{I\,\mathrm{eff}}}$$

Hereupon, spoken language—once, for the ears of philosophers, the auto-affection of consciousness itself—loses all interiority and becomes just as measurable as otherwise only the quality transmission of radio and television systems is.

A signal-to-noise ratio of 60 dB guarantees the seemingly noise-free communication that others would call "undistorted." One between 40 and 0 dB still affords understanding (albeit understanding that is not hermeneutical). Beginning at –6 dB, the hearer is left only with the general impression that language is "happening." And because our senses—as has

been clear since psychophysical experiments, at the latest—are themselves information technology [*Nachrichtentechnik*] by nature, "the realm between the threshold of hearing and the threshold of sensation" (that is, between the minimum and maximum of acoustic perception) "practically" bridges "the entire realm for which air possibly can provide the transmission medium for sound: at the lower end, the threshold of hearing lies between 20 and 30 dB above the noise level, which is determined by the thermal noise of air molecules; and at a sound pressure level of 160 dB"—approximately 30 dB above the pain threshold—undesired, "non-linear effects of sound distribution in the air occur,"[24] as is the case with bad stereo systems. More poetically, and to speak with Rudolf Borchardt, if our ears were ten times more sensitive, we would hear matter roar—and presumably nothing else.

Poetry, however, Borchardt and Adorno notwithstanding,[25] is not supposed to admit noise. Ever since the Greeks invented an alphabet with vowels that also served the purpose of musical notation—which, that is, was lyric and therefore constituted the first "total analysis of the sound-forms of a language"[26]—its system of communication has rested on the interconnection [*Verschaltung*] of voice and writing. At the same time, however, the quantity of operations that was possible with these graphic-phonetic elements also limited the degree of literary complexity. To this extent, poetry formed an autopoietic system that produced its own elements as self-referential components—and for this same reason (and like any system of the kind) could not make further distinctions between elements and operations.[27] Necessarily, then, there was no possibility for analyzing the input and output elements of this Greek analytic system again, until the voices or graphic traits had vanished again into the *quanta* of noise that, in physical terms, they are. On the contrary, according to Jakobson's definition, the "poetic function" assured focus "on the message as such," an immediate "palpability of signs,"[28] and therefore maximized the signal-to-noise ratio.

"What is it, everywhere, / That Man is well [*Worauf kommt es überall an, / Daß der Mensch gesundet*]?" asked Goethe—poet and psychiatrist in one—in *West-Eastern Divan*. He answered his own question with the self-referential emphasis of rhyme and spondaic meter: "All hear the sound gladly / That rounds itself into a note [*Jeder höret gern den Schall an, / Der zum Ton sich rundet*]." In strict fashion, poetry excommunicated, in the name of the articulated communication that it is, its environment—inhuman sound or "primordial echo [*Erzklang*]."[29] Only madmen, like the anonymous "N.N." of 1831, whose verses represent the oldest poetry left behind in German asylums, had the audacity to choose, of all things, Goethe's

poem "Audacity" [*Dreistigkeit*] as the motto for verses that hymned the very opposite: not articulated notes of speech but rather "Carnival's Good Friday-Easter-Cross-Wood-Hammer-Bell-Sound" [*Des Carnevals-Chartag-Ostern-Kreuz-Holz-Hammer-Glocken-Klang*].[30]

Of all the instruments, wood and hammers, metals and bells, have the highest quotient of noise. They function phatically—as a call to church or to a conflagration—and not poetically. For this reason, idiophones do not produce pure intervals, which Greek musical notation made storable and Pythagoras considered *Logos* itself. Mixtures of sound of innumerable frequencies—which moreover do not form integral relations[31]—cannot be recorded as sheet music. However, where the system of poetry and music stops, the mathematical "return of the Chaos of old" (as Valéry put it) begins. In the same Age of Goethe, which for solid poetic reasons had to excommunicate and lock up self-declared "sound-catchers" [*Klänge-Fänger*] like the anonymous N.N., a departmental prefect appointed by Napoleon, Baron Jean Baptiste Joseph Fourier, developed a method of calculation that paved the way not just for thermodynamics but also for all media of technological sound-catching, from Edison's cylinder phonograph up to the music computer.

Fourier analysis made it possible for the first time, through integration and series expansion, to evaluate periodic signals of finite energy—that is, all physical signals, whether their harmonics were integral multiples of a tonic note or not—as numbers. The equation,

$$S_c(f) = \int_{-\infty}^{\infty} s(t) \cdot^{-2j\pi ft} dt$$

transfers quadratically integrable functions of time, *t*, into functions of frequency, *f*, and in trigonometric conversion, provides the entire spectrum of partial sounds, *Sc*, according to magnitude and phase. A fundamental operation of poetry and music—repetition—is now thoroughly quantifiable, whether in the case of perceptible rhythms or in that of sounds which human ears hear as such only because they cannot break down their complexity into discrete elements. Above 60 hertz (or vibrations per second), our physiological capacity for distinction ends—if only because one's own vocal cords begin at this frequency.

With all its applications—from convoluting and correlating given signals up to the fundamental sampling theorem demonstrated by Nyquist and Shannon at Bell Labs—Fourier analysis changed the signal space just as much as, once upon

a time, the vowel alphabet of the Greeks had done, this anonymous act that founded our culture. To be sure, in everyday life, the fundamental law of systems theory continues to hold that "communications systems cannot undermine communication" by reverting to, say, the frequency range of nervous impulses.[32] Only Thomas Pynchon's novels present mathematical-neurological characters such as, in *The Crying of Lot 49*, the drug-addled disc jockey Mucho Maas or, in *Gravity's Rainbow*, Private First Class Eddie Pensiero (89th U.S. Infantry Division): their perception has already learned, whether by "measuring" or "thinking," to oscillate [*einschwingen*] into feedback loops by way of technical Fourier analysis; that is, to circumvent their own limitations and separate elements of communication from their operations.[33] However, for the voices of people to be subject to spectral analysis—which after 1894 proved the superiority of female employees to male ones in telecommunications [*Fernsprechdienst*] even to the Reichstag deputy August Bebel,[34] and after 1977 made it possible for the U.S. Air Force to establish an optimal and infallible means of regulating personnel access[35]—the system of everyday communication has also changed in an institutional framework.

Therefore, under modern—that is to say, media-technical—conditions that mock all phenomenology, media have taken the place of the arts. A "new illiteracy," as Salomo Friedlaender called it long before McLuhan or Ong declared the end (in a celebratory tone) of the "Gutenberg Era," erected "antibabylonian towers." These "radio towers"[36] in cities and in brains have positivized the anonymous madman of 1831. All "guitars" and "bells"—about which "N.N." could only dream or write verses—achieve the honor they are due in the Real. Chuck Berry (and with him our own communication system, the Libertas disco in Dubrovnik) hymned an illiterate electric-guitar player, who—as if that were not yet enough—is called "Johnny A. B. C. Goode."

> There was a lonely country boy
> Named Johnny B Goode
> Who never ever learned to read and write so well
> But he could play the guitar like ringing the bell.

Entertainment electronics simply means feeding back all operative rooms of free play [*Spielräume*] in analog—and more recently, digital—signal processing into the ears and eyes: as a trick, gadget, or special effect.[37] As is well known, the founding hero of such effects was Wagner. In the form of *The Ring of the Nibelungen*, music abandoned its native realm of *logoi* or intervals in order to measure out all the possible spaces and transitions between sound and noise. The prelude to *The Rhine Gold*, because its Rhine is a pure river of signals [*reiner Signalfluß*], begins with an E-flat major chord at the

lowest bass register, over which eight horns then lay an initial melodic motif. However, it is not melody but rather (and as if to test out the musical transmission bandwidth) a Fourier analysis of that E flat from the first to the eighth overtone. (Only the seventh, somewhere between C and D flat, cannot occur, because European instruments will not play it.)

And so, after the absolute beginning of Wagner's tetralogy has revoked, via music drama, Goethe's poetic filtering of "sound" into a "note," the absolute ending—Act III of *Twilight of the Gods*—can again leave overtones and again submerge into pure noise, that is, liquidate the signal-to-noise ratio.[38] Brünnhilde, who as the excommunicated Unconscious of a god can communicate with Wotan, the imperial author of her days, just as little as N.N. could communicate with Goethe, instead sings to him, as a finale, an "uninhibited lullaby"[39]:

Weiß ich nun, was dir frommt?
Alles, Alles,
Alles weiß ich,
Alles ward mir nun frei.
Auch deine Raben
hör ich rauschen:
mit bang ersehnter Botschaft
kehren die beiden nun heim.—
Ruhe, ruhe, du Gott!

Do I now know what avails you?
All, all,
All do I know,
All now is free to me.
Even your ravens
I hear rushing:
With anxiously desired embassy
Now they both homeward wing.—
Rest, rest, you God![40]

Wotan's unconscious desire goes into fulfillment, then, as soon as a heroic soprano and a full orchestra implement it. What ends with the *fading* of a god in Valhalla's sea of flames is European art itself. For the two ravens—dark messengers or angels of media technology—neither speak nor sing; in their flight, the transmission and emission of information—indeed, "message" and "noise"—collapse. *Twilight of the Gods* means the materiality of communication, as well as the communication of matter.

In the years between Fourier analysis and Wagner's tetralogy, the same thing motivated the Scottish botanist Robert Brown. To be sure, matter has been noisy since time immemorial, but Brown's chance discovery first transferred this stochastic message into a fitting concept. In 1872, the strange zigzag movements that pollens dissolved in water were performing under a microscope inspired him, like another Antonie van Leeuwenhoek, to believe he had discerned the hidden sex life of living matter for the first time. This sexualization of the realm of plants was in a sense appropriate for the Age of Goethe and its eponymous hero.[41] Unfortunately, however, Brown's further experiments revealed the same phenomenon occurring with dead pollens —indeed, with pulverized rocks. A spontaneous irregularity, the noise of matter, dissolved the fundamental concept of the

Age of Goethe, just as Fourier had dismantled the articulated music of language [*Sprachton*]. But instead of providing an explanation that does not exist, Brown simply lent the phenomenon his name: "Brownian motion."[42]

It was only half a century later, when Maxwell and Boltzmann opposed an atomic-statistical model to the received physical theory of constant energy, that Brown's item of curiosity arrived at the touchstone of scientific truth. To the technologically equipped eye, the zigzags demonstrated nothing less than the infinite ping-pong that molecules play with each other above absolute temperature *T*. A Brownian particle experiences approximately 10^{20} collisions with other molecules per second, so that "the periods during which [it] moves without abrupt change in direction are too rare and too brief to be caught even by modern high-speed photography."[43] For this reason, Boltzmann's formula expressed the noise of matter simply as the statistical mean:

$$\frac{\Delta PN}{\Delta f} = 4kT$$

Telecommunications specialists [*Nachrichtentechniker*] may content themselves with medium-level noise on wave bands, but not modern mathematicians. Whereas classical analysis limited its realm to regular forms and constant functions, the twentieth century—very much to its "fear and horror"[44]—went over to formalizing irregularity. In 1920, Norbert Wiener formulated Brownian movement as a function that cannot be differentiated at any point, that is, as a function whose zigzags form innumerable angles without tangents. On this basis, he was able to assign a measure to thermal noise that not only includes average values, but also its actual paths.

After this mathematical formalization of the Chaos of old, it was no longer difficult to approach the materiality of music and language as well. Wiener's Linear Prediction Code (LPC) has become one of the foundational procedures enabling computers to simulate the random generators in our larynxes. On the basis of past but discretely sampled (and therefore storable) sonic events (x_{n-1} to x_{n-k}), linear prediction prophesies a probable future event:

$$x_n^* = -\sum_{k=1}^{k} a_k x_{n-k}$$

Needless to say, it thereby miscalculates the Real in its contingency, yet this very error (as the difference between x_n and x^*_n) determines the next valuation, in order to minimize it progressively and adapt the coefficient a *k* to the signal as it actually occurs.

During the Age of Goethe—according to standing psychiatric definitions—the madness [*Wahnsinn*] or "idiocy" [*Blödsinn*] of patients like "N.N." consisted of "hearing a wild noise everywhere, but no intelligible tone, because they are not capable of extracting one of them from the multitude, of tracing it back to its cause, and thereby recognizing its meaning."[45] Wiener's Linear Prediction Code positivized this very Chaos. That is, his Fourier analysis can demonstrate mathematically that "the minimization of middle quadratic prediction error is equivalent to the determination of a digital filter that reduces the power density spectrum of the linguistic signal [at the input] as close as possible to zero"—or alternately, "transforms the spectrum of the prediction error into a white spectrum."[46] Whereas other filters (for example, in Shannon's writing experiment) also introduce, by way of transition probabilities, redundancy as the simulacrum of meaning, the Whitening Filter literally makes discourses "a side issue."

For this same reason, Shannon's mathematics of signals and Wiener's mathematics of noise return in structural psychoanalysis—which, after all, analyzes (or eliminates) discourses in the same way that Freud analyzed souls (or translated them into "psychic apparatuses"). In the first place, Lacan's concept of the Real refers to nothing but white noise. It celebrates "jam"—this keyword of information technicians—as modernity itself:

> The quantity of information then began to be codified [i.e., by Shannon]. This doesn't mean that fundamental things happen between human beings. It concerns what goes down the wires, and what can be measured. Except, one then begins to wonder whether it does go, or whether it doesn't, when it deteriorates, when it is no longer communication. It is the first time that confusion as such—this tendency there is in communication to cease being a communication, that is to say, of no longer communicating anything at all—appears as a fundamental concept. That makes for one more symbol.[47]

Second, and as a matter of due consequence, Lacan's symbolic order—far from what philosophical interpretations hold—is a law of probability that builds on the noise of the Real; in other words, a Markov chain.[48] Psychoanalysts must intercept the improbabilities in (and out of) repetition compulsions just as cryptographers extract a secret message from what seems to be noise. Third, this media-technical [*nachrichtentechnische*] access to the Unconscious liquidates the Imaginary—which as a function of initial optical pattern recognition has already equated the philosophical concept of insight [*den Erkenntnisbegriff der Philosophie*] with misrecognition.[49] That is why it is only by means of psychoanalysis that a subject's chances can be tallied in terms of game theory—that is, calculated.[50]

What can be calculated by means of computerized mathematics is another subject, and a strategic one: self-guided weaponry. Wiener developed his new cybernetics not to ana-

lyze human or even biological communication. As he put it himself, "the deciding factor in this new step was the war."[51] On the eve of the Second World War—given the extremely accelerated air forces of the enemy—it was strictly a matter of optimizing Anglo-American artillery systems to compete. Because the actual flight path of bombers involves the complex interplay of commands, errors of navigation, air turbulence, turning circles, maneuvers evading artillery fire, and so on, it cannot—inasmuch as it is the chance movement of human beings—be predicted. And yet, prediction proves vital simply because artillery projectiles, whose speed exceeds their target's only in relative terms (unlike that of human targets), must intercept the bomber in its future position, and not at its present location. Therefore, to minimize the problem of incomplete information—this noise from a future[52]—Wiener implemented the Linear Prediction Code in an automated artillery system, which soon operated on a computer basis. The United States of America entered the Second World War armed in this capacity.

In less than two hundred years, mathematical information technology transformed signal-to-noise ratios into thoroughly manipulable variables. Along with the operational borders of the system known as everyday language, those of poetry and hermeneutics were exceeded, and media established whose address (all advertising to consumers notwithstanding) can no longer be called "human" with any certainty. Ever since its foundation [*Stiftung*] in Greece, poetry had the function of reducing the chaos of sound to recordable and therefore articulated tones, whereas hermeneutics—ever since it was instituted by Romanticism—secured this complexity reduction intellectually [*geisteswissenschaftlich*]: by assigning it to the address of a poetic subject called the "author." Interpretation purified an interior space of all noise, which in the beyond of events, in fits of delirium and wars, never ceased not to stop.

Ever since noise, through the interception of enemy signals, has not been evaluated by interpreting articulated discourses or sounds, the yoke of subjectivity has been lifted from our shoulders. For automated weapons systems are subjects themselves. An unoccupied space has emerged, where one might substitute the practice of interception for the theory of reception, and polemics for hermeneutics. Indeed, one might inaugurate *hermenautics*—a pilot's understanding of signals, whether they stem from gods, machines, or sources of noise.