What's New About the New Media?

_Friedrich Kittler

As the oldest written cultures attest, the new seems to be as old as advanced civilization itself. Complaints about the fury who makes the good old times disappear reach back to the depths of the old times. What today is new about the new has nothing to do with such a transformation. Our current century differs from all pasts because—and only because—it produces the new on an assembly line. The so-called new media are but one last sad example of this.

As we all know, the assembly line on which the new has emerged for the past two hundred years is called technology. However, looked at historically, it is everything but true that technology as such produces constant innovations. Just as the essence of technology [1] (in Heidegger's words) is nothing technological, it is also not essential to its essence only to produce those things which had definitely never before existed. In Greek thought, the cobbler produced his shoes no differently than "people," according to Aristotle's great saying, "engender people." [2] Thus, the timeless form or essence of a shoe preceded technological products just as the form or species of a living thing anticipates its individual examples.

However, this constancy of essences not only reigned in the clear heights of the history of being, but also in the empirical stuff of cultural history. Thus, according to the analysis of a leading military historian, the traffic technologies of the Imperium Romanum, especially its *cursus publicus*, a relay postal system for imperial messages and legions, exhibited speeds which medieval and early modern Europe did not even come close to reaching.[3] This only changed under Napoleon, the consummate organizer of military-technological innovation. The first-ever technical medium of transmission, Claude Chappe's optical telegraphy, accelerated the news flow between the general staff and the troops in battle to speeds, whose superhuman nature cost Archduke Carl of Austria a victory that was thought to be assured. [4]

Since then, victories in battle—to use a phrase from Paul Valéry's essay on Count Helmut Moltke—have always been "methodical conquerings," [5] because the age of Napoleon closed a feedback loop between theory and praxis, mathematics and technology, unprecedented in world history. In 1792, members of the general staff and mathematicians founded in cozy agreement an elite school, which initially was called the "Ecole des poudres et des salpêtres," the school for powder and

_ 1 See Martin Heidegger, "Die Frage nach der Technik," *Vorträge und Aufsätze*, second edition (Pfullingen 1959), p. 13.

_ 2 See, for example, Aristoteles, *Met.* l 3, 1070 a 8.

_ 3 See Martin Van Creveld, *Command in War* (Cambridge, Mass./London, 1985).

_ 4 See, for example, Rolf Oberliesen, *Information, Daten und Signale: Geschichte technischer Informationsverarbeitung* (Reinbek, 1982), pp. 60-62.

_ 5 See Paul Valéry, "Une conquête méthodique," *Oeuvres*, Jean Hytier, ed., (Paris, 1957-1960), vol. I, pp. 970-987.

saltpeter, and two years later was promoted to become the Parisian École Polytechnique.
With that, a mathematics was institutionalized which, in spite of all Pythagorean-Platonic traditions, surrendered its purity to applicability; simultaneously, a military technology was institutionalized which made short shrift of the traditional warrior castes. It was not for nothing that Bonaparte could count the applied mathematician of the Ecole, Gaspard Monge, among his closest friends. [6]
It has remained so until today.
Since Napoleon founded modern strategy, every great war has caused a push ahead in innovation, especially in the media of transmission. In the First World War, the mobile field telephone was introduced, ultimately to triumph over stationary cable telegraphy; in the Second World War, the encoded radio remote control of the Wehrmacht emerged to triumph over the telegraphy and telephony of their enemies—but only until Alan Turing, to whom we owe the circuit principle of all computers, cracked this secret code with the first computer prototypes and could ultimately reverse the fortunes of the war. Media are thus—contrary to Sigmund Freud and Marshall McLuhan—not extensions of human senses or thought apparatuses, they have a historicity of their own, which is crucially based on strategic feedback. Every innovation in media technology emerges as a move which reveals or exploits the weaknesses of an established medium. To that extent, but only to that extent, does the new in the new media coincide with the rate of innovation of modern military technologies.
After Euler, Monge, and all their glorious descendants, applied mathematics was not satisfied with optimizing canons and fortresses, secret messages and marching plans. A less spectacular, but much more momentous application of applied mathematics, was applying it to mathematics. It was a British friend of the Ecole Polytechnique in general, and of Lucien Bonaparte in particular, who adapted the Napoleonic standardization of gun barrels, looms, etc. to computing itself. Charles Babbage developed two machines for the automation at first of algebra and finally also of differential calculus. While the machines never ran without disruption, they did revolutionize the industrial production process in general. Since Babbage, screws and nuts, sprockets and rods have been produced to such a high, previously unheard of degree of precision, that the construction of the new as such could be tackled.

_ 6 See Paul V. Aubry, Gaspard Monge: *Le savant ami de Napoléon Bonaparte* (Paris, 1954).

_ 7 Hermann Lemp quoted Ronald W. Clark, *Edison, der Erfinder, der die Welt veränderte* (Francfort/Main 1981), p. 62.

_ 8 See Morris Kline, *Mathematics: The Loss of Certainty* (New York, 1980), p. 295

Edison's media-technological laboratory in Menlo Park put inventing on the long-term agenda, and to that extent invented inventing. "The idea of applying science to industry brought the wrath of many researchers upon him, and the idea of attacking the problems of industry scientifically brought about mistrust from big business." [7] But precisely here was where the future lay, which in the meantime has become our own prehistory. The invention of inventing meant, in the case of the light bulb, nothing less than that the whole globe, first made a world by telegraphy, should be scoured for electrically usable woods. Countless experiments with filaments which preferred to burn rather than to give their heat as light, brought nothing; only a rare species of bamboo from Japan met with Edison's full satisfaction. With this, however, science ceased to be a description and analysis of that which is; it took on all characteristics of a presenting [*hinstellen*] which, in the strong Heideggerean sense of the word, presents the materials and elements of this world as inventable.
Precisely this inventability had repercussions for pure mathematics. That the great English number theorist Godfrey H. Hardy still announced in 1940 that true mathematics is for all eternity safe from all application, [8] was now an ironic twist of history. David Hilbert reformulated the axioms of geometry with a radicalness which made them just as easily applicable to points, lines, and planes as to beer coasters, tables, and chairs. In other words: all materials were allowed, even those which still had to be invented. Babbage had only attempted to build apparatuses which let previously known mathematics run automatically; Hilbert called for automatic processes, which secured the decidability, soundness, and completeness of all possible mathematics, that is, including future mathematics. The Hilbert program therefore wanted to make pure mathematics purely technical.
As we know, Hilbert's program failed as a theory. However, only one of the two refutations to which it was subjected was theoretical. With his famous incompleteness theorem, Gödel thought, among other things, that he had proven the freedom of the human mind. The other refutation of the Hilbert program, in contrast, was Turing's machine, the prototype of all modern computers. Thus, from one program, which was supposed to solve theoretical foundational crises, and for that reason served as a praiseworthy model for Heidegger's *Being and Time*, [9] derive all

_ 9 See Martin Heidegger, *Sein und Zeit: Erste Hälfte* (Halle/S., 1931), p. 9 ff.

the programs which run on computers since 1944. A descent into hell so dramatic as otherwise only in the Gnostic visions had thrown away the purest of all theories on this earth in order to give theory and praxis an entirely new foundation: theory becomes the invention of algorithms, practice the invention of materials, until the difference between the two will decrease to around nil.

The Turing machine, which disproved the Hilbert program, was made up of a piece of paper which could never exist: it was infinitely long. Accordingly, the machine, if it had existed, would have been infinitely slow. In contrast, the Turing machines which today run in control centers and administrative offices, private houses and everyday appliances, are perhaps not infinitely fast, but they are faster than all the other media that have been invented since Edison and Marconi to trick the human senses. Everything that message technology at least in its military optimization has developed in transmission and compression capacity has been integrated into computer architectures, in order to more than compensate for the original handicap of the Turing machine. On their long journey from the electron tube to the integrated circuit of today, computers have not only profited from the level of development of all prior media, but have above all made it possible to develop increasingly fast computers at an increasingly fast rate.

This amazing acceleration has at least two good explanations. First, the machines, which can imitate all other machines, can basically also simulate their own hardware as software. The design of new computer generations has already long surpassed the tedious tinkering, soldering, and wiring in some kind of mythical garage, which once gave the glorious name Silicon Valley to sleepy suburbs. Instead, design has access to software libraries of all relevant circuit elements, which combine on the computer screen to form running simulations, and can be optimized in the shortest time possible. Precisely because computers, entirely in contrast to people, are combinatorial machines, they can play through amazingly large possible spaces of possibility in the briefest span of time. Thus, the length of the design process becomes increasingly shorter.

The second reason—why the lifetimes are becoming increasingly short—lies in the hardware. While particle physics, a spectacular billion-dollar show discipline, pushes ever deeper into an outer space which is and will remain Hecuba, inconspicuous solid-state physics discovers in unlikely pebbles, glass, or carbon molecules, ever-more effective materials and smaller structures which have digital circuit behavior, and thus can construct computers millions of times. Even more radical than Edison once had been, a self-evident computer-supported material research lays its own foundations ever deeper. This has the dramatic consequence that computers in the fifty years of their existence have simply doubled their productivity every eighteen months. This at least has been claimed by a law which Gordon Moore, the cofounder of the Intel Corporation, has extrapolated from the available empirical data. What is taking place seems to be a true evolution which easily surpasses all other known rates of evolution—be it of animal species or cultures or individual beings.

Of course the world has always been a simultaneity of the most different spaces and times. Astronomy or geology calculate in millions of years or kilometers, the human sciences in years or centuries, meters or kilometers, while high-frequency technology or solid-state physics calculates in nanoseconds or micrometers. The only thing new and unheard of about the current situation is that computers occupy two times and spaces at the same time, and thus coordinate them: the large dimension of perception and language on the one side, the micro dimension of circuits on the other. Like a tunnel to the invisible realm of the small, they link the laws of matter with the laws of our cultures. Like a fury of disappearance, which first emerges from her nothingness, they offer the possibility that presence and absence, one and zero can play with one another. This, I would suggest, is the new part of the new media.

However, one might also put it the other way around, that the current talk about the new media in the plural is a sinister euphemism. Obviously this plural has been invented by the advertising agencies of the media, which tremble in verbose and ineffectual fear before the fury of their disappearance. According to them, it should neither be thinkable nor possible that the discrete universal Turing machine devours all other media. But after photography and phonography have already been digitized in the shortest possible period of time, it remains a mystery how film and television, especially radio and telecommunications in general, could or should somehow resist their digitization. Niklas Luhmann once remarked that there is no post-modern, just a modern post (office, that is).

Accordingly, we should say that there are no new media, but one new medium, named the computer, the newness of which (according to Turing's proof) is that it can be all machines, and thus all media.
The strange plural, one might postulate, has one single legal reason. The so-called PC revolution of the early eighties for a time hid the fact that there had always been computers in the plural. As it was for the general staffs and army corps in the Napoleonic-telegraphic period, in the early period of computer technology the general staffs, radar early-warning systems, and large computers were thoroughly networked with one another. Only those desktop computers which Silicon Valley first constructed in its heroic founding years from integrated circuits entirely earned their epithet "stand alone," in a literal sense. Every individual, in Greek every idiot, played from idiotic floppy discs, which were his only intersection to the rest of the world, with an idiotic operating system that could just about support the individual processing of a single user.
We all know how quickly and dramatically this solitude again disappeared. The global net spreads across the globe increasingly, at growth rates which do not at all slow the exponential rates of increase in computer productivity, that is, Gordon Moore's law of eighteen months. Because the net, in direct opposition to hardware and software, material invention and algorithm invention, is the side of our global computer systems turned to man, it alone catches the attention of culture critics, prophets, or philosophers. Already philosophers, who had just recently been working on Kant or Hegel, announce that the net—quoting Derrida loosely [10]—will allow ugly white old men to appear as pretty colored young women. Just as carelessly and forgetfully, they celebrate the new in the new media. As if the European nation-states, as they invented private postal services—and with them the individual—in the eighteenth century, had not already promoted such *Liaisons dangereuses* for a long time. As if language and writing had not always existed, in order to prove that truth lies.
The new in the global computer-based network should thus not be searched for in the realm of opinion and belief, of voluntary or unconscious deceptions. Less then ever can it be said that media are extensions of the human senses or modes of interaction. Because through their very networking, computers are first put in the position not only to integrate already existing media of storage, but also past media of transmission.
It is not letter content, but the postal systems themselves which are integrated into the net. Thus, McLuhan's earlier and perceptive comment, that the content of a medium is always another medium, takes on a new, then unpredictable meaning. It remains true with the dramatic reservation that the media of the past—from everyday language to television—did not also include their own meta-levels. Grammars in one case, television guides in the other, were necessary in order to switch from the simple use of a medium to its rules. In contrast, networked computer systems do save, process, and transmit everything in media content that the so-called content providers can place in the net, but they do this according to their own hardware architectures, operating systems and software programs. Therefore, their networking begins and ends with pure self-referentiality.
According to the available empirical data, of all the transactions which the internet transmits over fiber optic cables, satellite, etc., software holds the lion's share. Computer users might prefer email or chat groups, pornography or surfing adventures; computers themselves, in contrast, if only in order to keep from deteriorating into Turing's so-called state of halt, need programs. The fifty-year history of computers has shown that programs in fact can save and transmit in all possible media—from the punched card to the printed source code. But the one medium in which programs can also actively run beyond that is the working memory itself.
To this extent, the software transfer from computer to computer is only a last logical step, to help them (according to Turing's dark prophecy) achieve world domination. [11]
During the Cold War, when computers where still huge tube systems—and in addition, strategic secrets, which according to a secret agreement between Truman and Churchill were never to come to Stalin's knowledge—this world domination was thought of as a single gigantic electronic brain, according to the anthropomorphism current at the time. Today, when the monsters are only called mainframes, they are dying out like dinosaurs. Although world-wide computer networking will not lead to world-wide democracy, as the software companies repeatedly promise, it will indeed bring about a decentralization of computing. Already there are programs, like the hunt for prime numbers or cryptographic keys, which because of their combinatorial

_ 10 See Jacques Derrida, "La loi du genre," in *Glyph* 7 (Baltimore-London, 1980), p. 200.

_ 11 See Alan Turing, "Intelligente Maschinen, eine häretische Theorie," in Alan M. Turing, *Intelligence Service: Ausgewählte Schriften*, Bernhard Dotzler und Friedrich Kittler. eds, (Berlin, 1986), p. 15.

complexity would take years to run on one single computer and are thus from the start programmed and run in networks. The fitting specialist term for such compartmentalizations of computation in space and time is "computer farm." World domination, in other words, has said good-bye to anthropomorphism, and instead taken on the shape of domesticated animals. If, according to Moore's law, already every individual computer generation stands in an evolutionary chain, then the network makes real populations from masses of such individual beings. This, like every self-referentiality or feedback, once again increases the evolution rate of that unheard-of culture which is not based on carbon, but silicon.

The most beautiful, by now also best-known example for such growth rates is a free operating system, that is, not written and marketed by a private firm, which goes by the name of Linux. At the beginning, in the early spring of 1991, Linux was only the monomaniacal dream of a Finnish computer-science student, who wanted to stretch his brand new stand-alone PC to the limit in terms of hardware technology (which most commercial operating systems neither did nor do). For this lofty goal, Linus Torvalds accepted what is probably the most difficult loneliness there is in highly technological conditions: in test runs of the supposedly optimal operating system, the machine crashed every few minutes. The twenty-one year-old, however, did not give up. After a few weeks of lonely programming on the lowest level of machine language, he got the crashes to at least leave a few meaningless symbols on the screen. This sufficed to eliminate mistake after mistake, until the high technological asceticism of a lonely monomaniac suddenly became a world-wide networking programming adventure for thousands. Whoever wanted to could download Torvalds' free operating system from the net, install it and try it out. It has remained so until today, but in the meantime the desire has infected millions. The operating system Linux thus knows no address and no central bureau, no offices and no employees; it only exists as a strictly virtual networking of all those who can read and write the source code The drive to herd formation thus does not remain limited to the computer, but rather has also taken hold of their programmers. Since this is so, the optimization of Linux is advancing just as rapidly as it crept along in those early spring nights: improvements appear every few weeks, which one can not only read about, but directly load them into the working memory. No other operating system can even dream of such rates of evolution.

Thus it came to be that the Intel Corporation, which indeed had failed to hear the declaration of love for Intel hardware, which Linux is, for a whole of seven years, has recently suddenly awakened. Months before a new generation of computer hardware, which is supposed to put all its predecessors in the shade, comes to still questionable production-ready state, Intel is donating millions of dollars in order to make the corresponding software capable of running on Linux. In other words, the world-wide network of software distribution and the microscopic network of transistor gates are entering an alliance or symbiosis which probably (to put it in very old-fashioned terms) is the only possible critique of late capitalism. In principle, that is, when one obtains their source code without a mediating distributor directly from the internet, free operating systems cost not a penny. On the other hand, a chip factory made of many almost perfect purified rooms and almost perfect electron lithography, without which Intel's new flagship would never reach mass production, costs around three to four million dollars. If, however, the hardware, barely on the market, is already greeted by a market-ready software, the price of the individual chip, which indeed according to Turing's principle are only trivial copies of copies, sinks irreversibly towards zero. Gordon Moore's exponential law is also and especially valid, if you make the exponents negative, for the economic. After all, silicon, the raw material of all so-called new media, is slumbering in every pebble on the planet. The only possible critique of that economy, which the discourse-ethics pundits of today do not tire of denouncing as late capitalism, is then self-critique. Hardware and software as united technologies have themselves caused prices to play no further role. All innovations, which firms in the last two or three years have been experimentally marketing, are only variations on this scarcely hidden principle.

A top manager, responsible for integrated solutions and Linux marketing at IBM, set a new tone four weeks ago: "We want to work together with the others, and not throw our weight in the balance to dominate others. We will throw in our weight where we can help others... I believe that people recognize that IBM is not doing this out of self-interest. Of course, it is of indirect use to us, but sim-

_ 12 Jonathan J. Prial, cited in Volker Weber, "Wir teilen das Wasser und die Müsliriegel," 17, 1999, p. 47.

ply because we help the community, this helps us in the end in our main business. Open Source for us does indeed mean that we are making investments for which we will achieve no payback. We will not look at this timidly: we are not just getting our feet a little wet, but jumping in head first." [12]

The altruism of economic innovation does indeed raise the question, what main business will still follow the old-fashioned price laws? A fraction faithful to McLuhan, which includes, among others, candidates for the German Economic Ministry, has long written off the market for hardware and software, and replaced it with the hope that the new media will also and especially need the old media as content. According to such oracles, only the business of "content providers" is still worthwhile. Thereby, "content" by definition includes all conceivable media—with the one dramatic reservation, that they are already no longer originally digital.

Following this insight, old and new money, an oil concern and a software concern, have founded two strongly competing subsidiary companies, which do nothing else except digitize the images from all countries or museums. Just as at one time Monge was given the commission by Bonaparte to capture the pictorial treasures of Italy for the future Louvre, the digital, but only the digital rights of the European museums are now falling into the hands of Getty or Microsoft. Clearly the said museums have still not understood that the digital virginity of their images will soon be the only guarantee of their value. Precisely because the old world, different from the new, has by and large slept through the innovations called hardware and software, and all those treasures—which Redmond or Santa Monica, like the American provinces in general, do not have at their disposal—remain its reserve. It would be good for Europe to recognize these riches, her riches. It would be even better for Europe to question the concept of digital copyright as such, because it violates Europe's traditions in general just as the Turing Machine does in particular. As we know, Turing's famous 1950 test served to prove that in fifty years, that is, today, no one will be able to tell the difference between statements made by people and statements made by computers. [13] It also served to prove that the nineteenth century, with its invention of intellectual property, set a phantasm into the world. Accordingly, Europe's traditions do not intend that copies of a picture should transfer their ownership

_ 13 See Alan Turing, "Rechenmaschinen und Intelligenz," *Intelligence Service : Ausgewählte Schriften*, p. 160.

to the copyist, more still, that mathematical algorithms should enjoy any kind of patent protection. If a computer industry which drives its own prices towards zero, instead attempts to market the rest of the world, opposition is required. The European Commission would be well advised to listen not only to lawyers from Redmond, Washington.

With their struggle about contents and the apple of the eye, as the chairman of the board from Intel called it, the so-called new media often only disclose that their content is knowledge. For the first time in its history, knowledge is truly implanted. It no longer floats as mind, let alone as intellectual property over programs and machines, but has rather entered their software and hardware. If we keep this machine knowledge from proprietary closure or from getting a lid put on it which only programmers or technicians can open, this historical innovation offers a unique chance. The opposition between thought and being, mind and nature, or whatever the epochs of our past history may have called it, loses its severity. The self-coronation of thought, which is also always its abdication before nature, vanishes like the watery mirror through which Narcissus would finally jump. Knowledge about the world has become a part of this world. For just that reason, its trees cannot grow into the heavens. Computers—as a computer scientist put it recently—are machines of limited resources in a world of limited resources.[14] This means that their complexity, despite its unheard-of rates of evolution, cannot catch up with the complexity of that which made it possible and necessary. They can, however, like the angels and other forms of intelligence from the Eurasian past, attest to the truth that knowledge is nobody's property, but a pattern which only emerges at intersections. Between people and machines, machines and natures, natures and people, a true trinity of intersections has formed, which perhaps makes it possible to step out of Zoroaster's long shadow. Dark matter, when it glows in the silver light of silicon, has begun to compute. The knowledge of a long history, as it dares to lower itself to the depths of the codes, has achieved its own materiality. And that dark nature which, as Schelling said, seeks eternally for itself without ever finding itself, is finally freed from the shadow of God. It no longer emerges only when the Other calculates it, with Leibniz, but remains in its "being other," as connection.

_ 14 See Yuri Gurevich, "Algorithms in the World of Bounded Resources," Rolf Herken, ed., *The Universal Turing Machine: A Half-Century Survey* (Hamburg-Berlin, 1988), pp. 407-416.