

Universities: Wet, Hard, Soft, and Harder

Friedrich Kittler

“Uni,” das ist wie “Kino.”

—Martin Heidegger, *Was heißt Denken?*

In this paper (whose central European bias is unfortunate, but unavoidable) I try to draw some diagnostic and even prognostic consequences from the eight hundred years of the university educational system. I rely on a simplified version of Heidegger’s *Seingeschichte* for my analysis. I can think of no other means than historical inquiry to prepare us for the future.

1. Anamnesis

European universities were, as Ernst Robert Curtius put it, “original creations of the Middle Ages.”¹ They differed from previous organized studies of classical antiquity by virtue of both their wetware, the so-called *universitas magistrorum et studentium*, and their hardware: lecterns, libraries, and mail systems. To be sure, the arrangement whereby a single master teaches more than one listener was invented by Pythagoras of Samos (around 530 BCE, in southern Italy). And, of course, Plato’s Academy closely followed this pattern,² except for the fact that it almost totally excluded women,³ and established a long-lasting model up to the nineteenth century, when Oberlin College and Zurich University both rediscovered coeducation. Precisely because, however, Platonism would have been unthinkable without the presence of beautiful, naked, young, free men in Athens,⁴ students—the wetware of knowledge—could in no way be compelled to write down what the masters had just said. The Greek concept of *scholé* meant leisure, which

1. Ernst Robert Curtius, *Europäische Literatur und lateinisches Mittelalter* (Bern, 1948), p. 62.

2. See Plato, *Republic*, 10.600a.

3. See for example Plato, *Phaedrus*, 60a, 116 a–b.

4. Compare Friedrich Nietzsche, “Götzen-Dämmerung oder Wie man mit dem Hammer philosophirt,” *Götzen-Dämmerung*, in *Werke: Kritische Gesamtausgabe*, ed. Giorgio Colli andazzino Montinari, 9 vols. in 30 (Berlin, 1967), 6.3.120, §23:

is not the same as the medieval concept of *schola*, let alone the modern concept of compulsory school attendance, gymnastics, and school uniforms.

Thus, it was only after the fall of the Roman Empire that writing fell as an obligation to monks, nuns, and finally male students. Of all forms of manual labor, mechanical copying, as with present-day computers, closely corresponded to Saint Benedict's dictum *Ora et labora*. Even if the writer, simply because his tongue knew only some vernacular dialect, did not understand at all the Latin or even Greek words he was supposed to preserve, his work augmented the monastery library and, as Cassiodorus observed, inflicted a further wound to Satan's parchment or skin.⁵ Except for some slips, the only data losses that thereby occurred were the goddesses and gods.

Most European universities came into being as extensions of former monasteries or cathedral schools. Therefore, they always possessed from the outset a library full of Latin manuscripts. This very wealth not only guaranteed the famous *translatio studiorum*, transporting classical antiquity to the High Middle Ages, but also constituted a kind of hardware, a storage device just as precious as our hard drives. This stored data had to be further transmitted, processed, and recorded; that is, the three necessary and sufficient elements of a complete media system were all implemented by medieval universities, such as the Sorbonne, Oxford, or Prague. Masters and later doctors or professors proceeded to explain ancient manuscripts; students, by writing these oral commentaries between the lines of their textbook, did the *interpretatio*; and after a student had been promoted to doctor he enjoyed the *libertas utriusque docendi*, that is, he was free to offer his teaching to universities throughout Europe. In many cases, universities even entertained, as did medieval guilds (most prominently that of butchers), a postal system of their own. Because students came from different countries and different language regions, they collectively formed distinct nations connected only by such mail systems and an all too basic Latin.

This threefold hardware—the data-processing lecture, the data-storing university library, and the data-transmitting mail—enabled a cumulative and recursive production of knowledge for almost three centuries before

Plato geht weiter. Er sagt mit einer Unschuld, zu der man Grieche sein muss und nicht "Christ", dass es gar keine platonische Philosophie geben würde, wenn es nicht so schöne Jünglinge in Athen gäbe: deren Anblick sei es erst, was die Seele des Philosophen in einen erotischen Taumel versetze und ihr keine Ruhe lasse, bis sie den Samen aller hohen Dinge in ein so schönes Erdreich hinabgesenkt habe.

5. Compare Cassiodorus, *De institutione christiana*, ed. R. A. B. Mynors (Oxford, 1937).

FRIEDRICH KITTLER is professor of aesthetics and media studies at the Institute for Aesthetics and Cultural Studies at Humboldt University, Berlin.

two highly correlated events changed the whole infrastructure of academia: first, Gutenberg's invention of the printing press; second, the emergence of national, that is to say territorial, states.

Contrary to McLuhan's assertions in *Understanding Media*, Henry Ford, not Johann Gensfleisch zum Gutenberg, created the first assembly line. The movable and (at least for Europe) new letters were meant to enhance both the calligraphic beauty and the literal correctness obtainable by medieval and mostly academic scriptoria, where up to fifty copyists simultaneously had to write text books from oral dictation and, in doing so, unintentionally but unavoidably multiplied the number of errata.⁶ Mortals are error prone, as every programmer knows. That is why Rabelais praised the infallible printing press as a divine gift, whereas the equally infallible artillery figured as Satan's invention.⁷ Thus, humanism, in its double dependency on universities and printers "thought" somewhat naively it could "tell heaven from hell."⁸

In fact things were more complex. Gutenberg's invention posed a rather unheard-of problem. Printing could only come into being and continue to proceed if and when the notoriously underfinanced inventor got back the money he had invested. The circular economy of academic manuscript production and, more important, the universities' monopoly on scientific data storage were dependant on early capitalism. Only inside academic circles did books continue to be mutually exchanged and dedicated;⁹ outside, powerful new players—the emerging national states—took over the rights to them.

Nationes no longer designated only French, English, German, and Romanic students living in their own vernacular fraternities near the Rive Gauche; whole European peoples followed the pattern of their universities and spoke one out of many printed languages. In Rabelais's France, Charles IX had already been eager to import a printer and his tools from German

6. Compare Michael Giesecke, *Der Buchdruck der frühen Neuzeit: Eine historische Fallstudie über die Durchsetzung neuer Informations- und Kommunikations-technologien* (Frankfurt am Main, 1991).

7. See François Rabelais, *Pantagruel* (1532), *Œuvres complètes de Rabelais*, ed. Jacques Boulenger (Paris, 1955), p. 204:

Maintenant toutes disciplines sont restituées, les langues instaurées: grecque, sans laquelle c'est honte que une personne se die sçavant [!], hébraïcque, caldaïcque, latine; les impressions tant élégantes et correctes en usance, qui ont esté inventées de mon [Gargantua's] eage par inspiration divine, comme à contrefil l'artillerie par suggestion diabolicque.

For wider contexts, see Paolo Rossi, *La nascita della scienza moderna in Europa* (Rome, 1997).

8. Pink Floyd, *Wish You Were Here* (1974), Capitol 29750.

9. See Heinrich Bosse, *Autorschaft ist Werkherrschaft: Über die Entstehung des Urheberrechts aus dem Geist der Goethezeit* (Paderborn, 1981), pp. 25–36.

Mayence; François I took two more steps by prescribing French as the language of the legal code and by ordering two copies of each book to be stored in his royal *dépôt légal*. Thus the nation-state's legal deposit, the forerunner of the French Bibliothèque Nationale, obviously, shamelessly devalued the wealth and subverted the monopoly of medieval university libraries. The same devaluation happened to the postal systems maintained by butchers, scholars, or cities. The production of modern subjects (in the Cartesian sense) required their extrication from the older guilds. All their mail systems were either bluntly forbidden or smoothly integrated into a national communication system, a so-called privilege, which in Western Europe went on to devour the telegraph, the telephone, radio, and finally television.¹⁰

For universities now bereft of their privilege to stand, next to *imperium* and *sacerdotium*, as the third column of medieval power,¹¹ there remained just one possible path to adaptation, even to innovation. They had to become a *res publica litteraria*. This, however, in no way implied, despite its republican Roman disguise, a republic of free, let alone bourgeois, citizens. Because every nation-state needed to be represented in each single town and province, the three higher faculties—theology, jurisprudence, and medicine—had to supply each town not simply with doctors but with civil servants.¹² Only the most vulgar materialism of the past could and did confuse such academic public servants with the so-called bourgeois. Indeed, a doctor's hat still privileged its bearer to a noble's sword—certainly not, however, the old medieval *noblesse d'épée*, but rather—it goes without saying—the *noblesse de robe*.

When, during the first third of the eighteenth century, the swords belatedly realized how far the robes had outdone them as ministers of the state, high nobility modernized the curricula of its knights' schools. From circa 1750, then, the *noblesse d'épée* alone surrounded the thrones. Alberto Martino even goes so far as to suspect that the whole of the Enlightenment was a cover name for much more earthly goals. French academics and intellectuals, newly unemployed, wanted back their power and therefore proclaimed a revolution.¹³

This revolution, sadly, was mistaken. Those who came to power were not priests or physicians, but engineers, teachers, and, admittedly, lawyers.

10. For the U.S. part of the story, see Thomas Pynchon, *The Crying of Lot 49* (New York, 1966).

11. See Herbert Grundmann, *Vom Ursprung der Universität im Mittelalter* (Darmstadt, 1964).

12. See Thomas Ellwein, *Die deutsche Universität: Vom Mittelalter bis zur Gegenwart* (Wiesbaden, 1997), pp. 47–52.

13. See the first volume of Alberto Martino, *Daniel Casper von Lohenstein: Geschichte seiner Rezeption*, 5 vols. (Tübingen, 1978). This fits well with the self-fulfilling prophecies of a better enlightened future analyzed by Reinhart Koselleck, *Kritik und Krise: Ein Beitrag zur Pathogenese der bürgerlichen Welt* (Freiburg, 1969).

On the one hand, the early modern university had relied so heavily on printed books in all their multilingual interrelations that the rather simultaneous emergence of technical, equally infallible construction drawings escaped its notice. Letters, ciphers, and diagrams in their threefold combination proved too alien for humanists. The combination, however, of type and woodcut or copperplate enabled scientific visualization at a level of precision unheard of by Greeks and monks. Technology as a science was just the ever-expanding output of this alliance,¹⁴ and Carnot's and Monge's *École Polytechnique*, founded in 1794, was its earliest institutional instantiation. And a brilliant young student of all these technically applied mathematics, a certain Bonaparte, overran, equipped with Satan's heavy artillery, old Europe. Since that time universities on both sides of the Atlantic have had to cope with engineers. To make a long story short: European emigrants to America's shores settled all these issues and two world wars.¹⁵

On the other hand, an ancient initiation rite came to an abrupt end. The former first faculty, despite its name, was in no way philosophical. The curriculum ranged from trivia—the grammatical, rhetorical, and dialectical aspects of language—to the higher quadrvia of Pythagorean mathematics—music and arithmetic, astronomy and geometry in their Greek interconnection.¹⁶ As such, this faculty had to remain a mere propaedeutic to the other politically relevant faculties and couldn't award doctoral degrees in its own right. The bloody Revolution and its dreamy German counterpart changed all this. In France, the medieval universities remained as unreformable as ever, but new *Écoles Normales*, by teaching future teachers, enabled Napoleon to procure a new elite of bureaucrats. In Prussia, the king made academic professors and high school teachers civil servants so that a dramatically modernized philosophical faculty could invent—by dialogic seminars and hermeneutic lectures—the so-called unity of *Forschung und Lehre* (teaching and research) that then fed back from universities to the gymnasia, from philosophy to literary studies.¹⁷ Interpretation was no longer interlinear, but its contrary, as Gadamer, despite the evidence of programming languages, persuaded Habermas.

Modern mathematics (from Fourier to Hilbert) as well as modern phi-

14. See Johann Beckmann, *Entwurf einer allgemeinen Technologie* (Leipzig, 1767).

15. See John Gimbel, *Science, Technology, and Reparations: Exploitation and Plunder in Postwar Germany* (Stanford, Calif., 1990).

16. See Archytas of Taranto, B1, Diels-Kranz. Here is one of those Greek light(ning)s that Curtius's imperial Latinism choose to ignore.

17. See the references given in Friedrich Kittler, *Discourse Networks 1800/1900*, trans. Michael Metteer and Chris Cullens (Stanford, Calif., 1990), pp. 148–64. Also see Michel Foucault, "Qu'est-ce qu'un philosophe?" *Dits et écrits*, ed. Daniel Defert and François Ewald, 4 vols. (Paris, 1994), 1:552.

losophy (from Hegel to Heidegger) originated from the French and German programs, the two most successful and often copied models of higher studies.¹⁸ Once technological hardware completed a triumvirate with ontology and mathematics, our present-day system was in place. It began with Felix Klein, Hilbert's colleague in Göttingen, and the "wizard" Steinmetz at MIT. They built experimental labs inside their universities¹⁹ and, in the first case, with a little help from the kaiser, imposed a doctor title for engineers on reluctant German universities. Otherwise Alan Turing could never have devised his famous mathematical machine, which, on the one hand, disproved Hilbert's *Entscheidungsproblem* but, on the other hand, proved that a small, although practically speaking powerful subset of the real numbers is nevertheless computable.²⁰ The Turing machine, then, was, is, and will be the condition of possibility of all computers. Just as in ancient Greece where one and the same alphabet stood at once for speech elements, natural numbers, and musical pitches,²¹ our binary system encompasses everything known about culture and nature, which was formerly encoded in letters, images, and sounds.

2. Diagnosis

Universities, however, and to say the least, have utterly forgotten that glorious history. Especially in those parts of Europe where states still feed, control, and starve them, universities do not think of themselves as more venerable than the nation-states, their short-term partners. Instead of seeking a sudden divorce, both universities and nation-states still keep praying for the former's survival. On the other hand—and this is the good news—universities have finally succeeded in forming once again a complete media system. Turing's universal machine—*vulgo* the computer—processes, stores, and transmits whatever data it receives, whether textbooks, measurements, or algebras. Computers, therefore, have come full circle; from the mathematics departments where they once began, making their way through physics, chemistry, and medicine, they have finally arrived in the humanities. For the second time in its eight centuries, the university is tech-

18. For Heidegger's relation to Hilbert and the mathematical Grundlagenkrise, see Martin Heidegger, *Sein und Zeit* (Halle, 1931), §3, p. 9.

19. For MIT, see Steve Heims, *The Cybernetics Group* (Cambridge, Mass., 1991); for Klein and Wilhelm II, see Karl-Heinz Manegold, *Universität, Technische Hochschule, und Industrie: Ein Beitrag zur Emanzipation der Technik im 19. Jahrhundert unter besonderer Berücksichtigung der Bestrebungen Felix Kleins* (Berlin, 1970).

20. See Alan M. Turing, "On Computable Numbers with an Application to the Entscheidungsproblem," *Proceedings of the London Mathematical Society* 2 (1937): 42.

21. See Johannes Lohmann, *Musiké und Logos*, ed. Anastasios Giannarás (Stuttgart, 1971), p. 10.

nically uniform simply because all departments share one and the same hardware.

This logistical fact has yet to be taken into systemic account. It will not do to equip every office or desktop with Microsoft Office and Wintel machines, but we can foresee happy consequences from the new uniformity of knowledges, disciplines, departments. As Heidegger said, early and humbly: precisely because the core of the Greek episteme, ontology or the logos of Being, has materialized in computing machines, European philosophy comes to its very end, and thinking may begin again.²²

Clearly, there remains a twofold task. First, we have to organize this end within each single university; second, we must pose a new question.

“La fin de la philosophie se dessine comme le triomphe de l'équipement d'un monde en tant que soumis aux commandes d'une science technicisée. Fin de la philosophie signifie: début de la civilisation mondiale en tant qu'elle prend base dans la pensée de l'occident européen.”²³ In this direction, our universities are well under way. For the first time since Galileo's experiments, mathematicians and physicists work on the same workstations. For the first time since Steinmetz's electrotechnical lab, engineers and scientists pose the same questions about a better hardware design that by itself will create still better questions. And for the first time since the invention of alphabetic library catalogues²⁴ and structured manuscript pages,²⁵ every file in Dewey's sense turns into a file in our computerized sense.²⁶ Thus, even the humanities' knowledge volatilizes into software libraries. Furthermore, whereas the book-based humanities encountered difficult problems when trying to store or address images, animations, and sounds, computers do not simply record such data but address and process them. The methodical integration of studies in language and music, film and poetry may begin.

3. Prognosis

And more is to be done. Humboldt's unity of teaching and research remains at stake as long as university systems do not overcome the unfortu-

22. “La philosophie prend fin à l'époque présente. Elle a trouvé son lieu dans la prise en vue scientifique de l'humanité agissant en milieu social. Le trait fondamental de cette détermination scientifique est par ailleurs son caractère cybernétique” (Heidegger, “La Fin de la philosophie et la tâche de la pensée,” trans. Jean Beaufret and François Fédier, in *Kierkegaard vivant* [Paris, 1965], p. 178). In those bygone days, *cybernetics* or elsewhere *logistics* meant computer science and computer hardware indiscriminately. Many further references could be given.

23. *Ibid.*, p. 180.

24. See Lloyd W. Daly, *Contributions to a History of Alphabetization in Antiquity and the Middle Ages* (Brussels, 1967).

25. See Ivan Illich, *Im Weinberg des Textes: Als das Schriftbild der Moderne entstand* (Frankfurt am Main, 1991).

26. See Markus Krajewski, *Zettelwirtschaft: Die Geburt der Kartei aus dem Geiste der Bibliothek* (Berlin, 2002), pp. 99–121, 150–55.

nate distinction between *Geisteswissenschaften* and *Naturwissenschaften* (humanities and sciences).²⁷ When the human face dissolves “comme à la limite de la mer un visage de sable,”²⁸ the humanities would best be known as cultural studies. When, on the other hand, physics is no longer a transcendental apperception, informing Kantian scientists on data given in the twofold frame of space and time, but rather some computer-preprocessed data flow, a scientific visualization, or even sonification,²⁹ the distinction maintained between science and engineering would be annulled. Cultural studies vis-à-vis technical ones would form a smoother constellation of departments, offices, and faculties:

1. When the old humanities do not deal with man, their topics are cultural technologies such as writing, reading, counting, singing, dancing, drawing—³⁰ surprisingly almost the same skills that every free young boy and girl in Lakedaimon or in Athens once displayed.³¹ For the humanities, there is nothing nontechnical to teach and research; thus, we can throw Habermas’s infamous opposition between communicative and instrumental reason overboard.

2. The so-called sciences and technologies, far from dealing with ahistorical truth, are involved in history simply by making it. Computer science, for example, as opposed to Greek or modern mathematics, has quite another impact. It follows that the cultural contexts of proofs, experiments, and hypotheses are in no way trivial and do require elucidation.

3. To accomplish these two operations, universities—like their base, philosophy—have to exorcise each last remnant of their monotheistic, that is, monkish, legacy,³² dating from the Middle Ages. The gods do play at dice, “and the gods made love.”³³

27. It could be factually shown that Wilhelm Dilthey in drawing this distinction did little else than to prevent Helmholtz’s growing influence on contemporary departments of philosophy and psychology.

28. Although it is deemed unfashionable now, I quote from the first edition: Foucault, *Les Mots et les choses: Une Archéologie des sciences humaines* (Paris, 1966), p. 398.

29. See Peter Mittelstädt, *The Interpretation of Quantum Mechanics and the Measurement Process* (Cambridge, 1998).

30. Berlin’s three universities, for practical purposes, have recently allowed at Humboldt University such an interdisciplinary framework. The Helmholtz-Zentrum für Kulturtechniken includes, among others, mathematicians, computer scientists, literary critics, art historians, and *Kulturwissenschaftler* (untranslatable as “cultural studies,” in the British sense are all-too-biased for popular culture).

31. I can live with the fact that drawing was facultative, but the other skills obligatory. See, for example, Aristotle, *Politics*, 8.3.1338a40–42.

32. See Heidegger, *Sein und Zeit*, §44, p. 229: “Die Behauptung ‘ewiger Wahrheiten’ ebenso wie die Vermengung der phänomenal gegründeten ‘Idea-lität’ des Daseins mit einem idealisierten absoluten Subjekt gehören zuden längst noch nicht radikal ausgetriebenen Resten von christlicher Theologie innerhalb der philosophischen Problematik.” Whoever cares, then, about deconstruction straddles Athens and Jerusalem.

33. The Jimi Hendrix Experience, *Electric Ladyland* (1968), MCA 11600.

In order not to remain merely nominal, these reformulations must have institutional consequences. From now on the cultural sciences need computer specialists as well as mathematicians on their teaching staffs, and, inversely, the technical ones need historians of science. Just as Hegel's *Geist* was only as deep as its explications,³⁴ today's knowledge is only as powerful as its implementations. The future of the university depends on its faculty to unite separated notation systems of alphabets and mathematical symbols into a superset.

All the risks of this future, however, depend upon a correct diagnosis of our present. What has happened to high technology since the end of World War II must be conceptualized as a recursion of much older stories so that universities will be able to reform themselves. Computer technologies are as academically inflected as Europe's scholarly knowledge, but they are also just as commercialized. The universal discrete machine, still the most influential hardware architecture, was the product of a Ph.D. thesis, the draft of a Princeton mathematician, whose elegance led to a brilliant career inside the Pentagon. UNIX, prototype of all modern operating systems and, therefore, programming language styles, was developed, it is true, by Bell Labs. Its worldwide success, however, came about only after the University of California at Berkeley had heavily modified it,³⁵ after Linus Torvalds, while a young student at Helsinki Technical University, wrote the free LINUX kernel from scratch in 1991, and, finally, after a whole bunch of hackers, internet-based students, and faculty members had helped Torvalds in helping thirty million people.³⁶ "When we speak of free software, we are referring to freedom, not price."³⁷

This is no wonder. A Turing machine, just like the medieval student, is a nearly cost-free copying machine, and a perfect one. The internet is a point-to-point transmission system copying almost infallibly not from men to men but, quite to the contrary, from machine to machine. The liberty to connect whole computer farms throughout the world has strong affinities to the old *libertas utrique docendi*. Thus, the internet, originally a digital

34. See G. W. F. Hegel, *Phänomenologie des Geistes*, ed. Johannes Hoffmeister (Hamburg, 1952), p. 15: "Die Kraft des Geistes ist nur so groß als ihre Äußerung, seine Tiefe nur so tief, als er in seiner Auslegung sich auszubreiten und sich zu verlieren getraut." The key word, to my colleagues' knowledge, seems to be *getrauen*, "to dare."

35. See Peter H. Salus, *A Quarter Century of UNIX* (Reading, Mass., 1994).

36. See Linus Torvalds and David Diamond, *Just for FUN: The Story of an Accidental Revolutionary* (New York, 2001).

37. Richard M. Stallman, "The GNU General Public License," *Free Software, Free Society: The Selected Essays of Richard M. Stallman* (Boston, 2002), p. 195. Without GNU/LINUX, nonetheless, I could not teach any programming undergraduate course; all my students would have to spend about a thousand dollars just for editors, compilers, software libraries, and debuggers. Under the GNU license, all these are free.

connection between military commands and the most brilliant U.S. universities, closely resembles the early modern connection between territorial states and academic mail systems (to pass over the structural identity between middle Latin and my own pidgin English.) In this regard, universities seem better prepared for their alphanumerical future than any other competing institution.

Just as Gutenberg's printing press, although it was only meant to mechanize the calligraphy of medieval scriptoria, brought about the separation of universities and book markets, Californian universities—as well as some others—have seen before their gates or even on their grounds hardware labs or software companies that actually dominate the information market. Once again, knowledge wanders into private sectors—the free entrepreneurship so dear to George W. Bush that he wages wars in its name. This change, alas, means secrecy, not openness. The secret manifest in commercial chip designs, operating systems, and application program interfaces (APIs) lies in the fact that technical documentation—in screaming contrast to all technical history—is not published anymore. By virtue of their inaccessibility alone, blueprints and source codes earn money. The unique possibility of criticizing so-called late capitalism will be its tremendously practical self-critique; the mass price of computer chips, once they have been designed, sinks rapidly to zero.

This is precisely what the software industry doesn't admit. Instead of source codes and application programming interfaces, it publishes a future's music celebrating systematic closure. One famous firm has two goals: computers shall hide more and more behind the inconspicuous facade of cars or washing machines; users shall be treated more and more like computers, that is, as programmable. Thus, some new medieval darkness threatens to separate the monkish elite of a few programmers from the billions of laypeople also known as computer illiterates. Countless proprietary solutions, patents, trademarks, and copyrights exist for this very purpose, protected as they are by America's Digital Millennium Copyright Act. The Pentagon, as if to mock four thousand years of mathematics since Babylon or Baghdad, seeks to classify prime number algorithms and others for the sake of the NSA. Patenting or making knowledge secret, however, not only hinders insight and discovery. It threatens sheer survival, and not merely inside computer-directed airbuses or stealth bombers. Aerodynamically unstable airplanes would instantly fall from heaven if their computer systems crashed.

In actual technical systems, errors and failures cannot be ascribed anymore to persons. Therefore, independent control has become just as necessary as it is rare. Because the sheer complexity of actual hardware and

software excludes infallibility, proprietary solutions prevent even debugging. Actual knowledge needs places to produce, store, and transmit itself independently of any company. What better places are there than universities? This applies just as much to digitally processed data as to the digitalized data of history. In the first case, the plans of enormous scientific publishing houses to monopolize academic journals are probably doomed to failure because Ph.D. advisers, getting at the data much earlier, can publish them digitally. The same holds true for free source code. In the more trivial case of formerly analog data, sounds, and images, their future seems to be up to the gods. Whether or not arts and treasures of bygone cultures can be saved from private digital rights does not seem of primary concern. Whereas in Gutenberg's time the university had to renounce its storage monopoly, its leading role in processing and transmitting now remains as crucial as ever. In this climate of academic freedom, ever-new codes and chips have to be developed in order to climb from the all too low level of zeroes and ones to higher levels of filtering and processing digital data streams. Just as in the past neither books nor libraries proved usable without meta-levels of knowledge, now neither algorithms nor databases can do without *Wissenswissenschaften* ("knowledge of knowledges," *histoire des systèmes de pensée*).

If envious states succeed in persuading the university in general and cultural studies in particular to think of themselves as a mere compensation and a mere assessment of the consequences of technology, then eight centuries from Bologna to Stanford will have passed in vain. The sciences are too good merely to avert attention from what science does.

4. Envoi

However (and forever), "science does not think."³⁸ To make it possible that tomorrow's universities will still work, may a deeply recursive gratefulness, throughout our daily labors, stay in our minds and hearts: To all the Minoans and Achaeans, who, fucking, founded Europe long ago; to all the scholars who freed her from the one God—Hebrew, Christian, or Muslim.³⁹ This is what Heidegger's *Seinsgeschichte* tells us to do. Computers may

38. "Die Wissenschaft denkt nicht" (Heidegger, *Was heißt Denken?* [Tübingen, 1961], p. 4).

39. See Pope Gregor IX, *Epistulae saeculi XIII e regestis pontificum Romanorum selectae per G. H. Pertz*, ed. Carolus Rodenberg, 2 vols. (Berlin, 1883), 1:653:

Sed quia minus bene ab aliquibus credi posset, quod se verbis non illaqueaverit oris sui, probationis in fidei victoriam sunt parate, quod isto rex pestilenti[a]e [Frederick II.] a tribus barratoribus, ut eius verbis utamur, scilicet Christo Iesu, Moyse et Machometo, totum mundum fuisse deceptum, et duobus eorum in gloria mortuis, ipsum Iesum in ligno suspensum manifeste proponens, insuper dilucida voce affirmare vel potius mentiri presumpsit, quod omnes illi sunt fatui, qui credunt nasci de virgine Deum, qui creavit naturam et omnia, potuisse; hanc heresim illo errore confirmans, quod nullus nasci potuit,

be copying machines, but, thanks to Aphrodite, we are not.⁴⁰ The way from her to now and back must always be gone over again.

Zukunft der Wissenschaft. . . . Deshalb muss eine höhere Kultur dem Menschen ein Doppelgehirn, gleichsam zwei Hirnkammern geben, einmal um Wissenschaft, sodann um Nicht-Wissenschaft zu empfinden: nebeneinanderliegend, ohne Verwirrung, trennbar, abschliessbar; es ist dies eine Forderung der Gesundheit. Im einen Bereiche liegt die Kraftquelle, im anderen der Regulator: mit Illusionen, Einseitigkeiten, Leidenschaften muss geheizt werden, mit Hilfe der erkennenden Wissenschaft muss den bösartigen und gefährlichen Folgen einer Überheizung vorgebeugt werden.⁴¹

—Friedrich Nietzsche, “The Future of Science”

cuius conceptum viri et mulieris coniunctio non precessit, quod omnes illa sunt fatui, qui credunt nasci de virgine Deum, qui creavit naturam et omnia, potuisse; hanc heresim illo errore confirmans, quod nullus nasci potuit, cuius conceptum viri et mulieres coniunctio non precessit, et homo nichildebet aliud credere, nisi quod potest vi et ratione natur[a]e probare.

Up to us to teach.

40. One of our earliest Greek vase inscriptions, written circa 730 BCE on far West Ischia (Pithakousai) and alluding both to the *Iliad* and the *Odyssey* has to say and sing:

Nestor's cup I am good to drink from
 He who drinks from this cup on the spot
 Desire takes him of sweet-garlanded Aphrodite.

Compare Ernst Risch, “Zum Nestorbecher aus Ischia,” *ZPE* 70 (1987): 1–9.

41. Nietzsche, *Menschliches Allzumenschliches: Ein Buch für freie Geister* (Stuttgart, 1978), pp. 205–6, §251. We scholars are a feedback loop in recursive action. Nietzsche's “Regulator” clearly evokes James Clerk Maxwell's mathematical theory of “governors” or negative feedback loops, “Kraftquelle,” James Watt's first untamed vapor energy.