

THE PHILOSOPHICAL FOUNDATIONS OF NANOETHICS

Arguments for a method*

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I. PUTTING THE DEBATE ON A NEW FOOTING

You probably know the joke about the Joke Club. The members of the club meet once a week, but they are so familiar by now with the entire repertoire of jokes they tell each other that they have assigned each one a number. On a typical evening, someone will stand up and say “thirty-five,” and that will be enough to set off gales of laughter. The joke I have just told you is none other than number 35.

In the world of science and philosophy, there are certain debates which bring to mind this joke. Instead of spelling out an argument, it would be enough for someone to say “seventeen,” at which point someone else could answer, “I object! Twenty-nine!”

Despite its extreme youth, the discipline known as "nanoethics" sometimes gives this impression. The same arguments are always served up, and they are always answered with the same counter-arguments. Of course, there is no point in seeking originality for its own sake, but it might be wise to extricate the debate from the rut into which it has fallen. I believe that certain fundamental errors concerning the nature and object of ethical evaluation are holding the discipline back. I see at least three such errors that tend to be made again and again.

Ethics is not prudence

The first error consists in confusing ethics with prudence, and in understanding “prudence” along the lines of rational risk management. Ninety percent of the reports, articles or books that I have consulted on the subject make this mistake, even though it is just as serious a mistake as it would be for a physicist to

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confuse weight and mass. To illustrate the difference between ethics and mere prudence, Kant likes to use the example of two shopkeepers, both of whom behave honestly. The first deems it to be his duty to do so, out of respect for himself, for his customers and for moral law. The second does so out of fear that if he started cheating his customers, he might be caught some day and lose both his reputation and his clientele. The first shopkeeper acts morally while the second is merely prudent. Yet the ways they behave, to the extent an external observer could describe them, are strictly indistinguishable.

The development of nanotechnologies in the short and medium term brings with it risks that have already been rather thoroughly inventoried, even if they are laden with numerous uncertainties. These risks concern health, the environment, safety, privacy, and many other things. The foremost risk for any country today, however, is that of being left behind in the scientific, technological, industrial, economic and military race that has already begun at a lightning pace.¹ Here is a striking illustration of what I mean.

"Addressing the fourth annual Foresight Conference on Molecular Nanotechnology in 1995, Adm. David Jeremiah, a former vice chairman of the Joint Chiefs of Staff, made a bold prediction. The 'military applications of molecular manufacturing have even greater potential than nuclear weapons to radically change the [world] balance of power", he said. The risk in trying to stop others from using the technology to gain a strategic advantage, Jeremiah continued, was that 'the uninformed policy maker is likely to impose restrictions on [the] development of technology in such a way as to inhibit commercial development, ultimately beneficial to mankind, while permitting those operating outside the restrictive bounds to gain an irrevocable advantage."

The science writer who quoted these words added: "It was an ominous, *if not unfamiliar*, statement to the assembled crowd, some of whom were undoubtedly excited by the potential of exploring the area of science Jeremiah was referring to."²

This question is undoubtedly of major importance. Imagine that a country, an industry or a firm finds it in its interest to develop nanotechnologies. Given the cost and the duration of the necessary investments, it needs to be able to

¹ See for instance the NSF Report *Converging Technologies for Human Performance*, Mihail C. Roco and William S. Bainbridge (eds.), June 2002, p. 30: "While American science and technology benefit the entire world, it is vital to recognize that technological superiority is the fundamental basis of the economic prosperity and national security of the US... we must move forward if we are not to fall behind."

² Margaret E. Kosal, "Nano-tech: Is small scary?", *Bulletin of the Atomic Scientists*, September 1, 2004.

anticipate the risks its products will pose and the way that society will evaluate them, even if its own interest is the only thing important to it. Any other attitude would be irrational or even suicidal. But these considerations are dictated by prudence, not ethics.

Ethics is not cost-benefit analysis

The second error which urgently needs to be corrected is that of always handling ethical questions by tallying up costs and benefits, that is, by reducing ethics to a sort of all-encompassing economic calculus. On one scale, we place the benefits expected from technological and economic progress and on the other, the costs. The uncertainty is usually greater where the second scale is concerned, and it is obviously apprehended in terms of risks. Now, the concept of risk involves three elements: a) a potential for damage exists, normatively qualified as negative; b) it is possible to assign a degree of likelihood to the occurrence of this damage, in the form of a probability, for example; c) we are free to adopt, as a yardstick for assessing the damage, a system of individual or collective evaluations, for example the “preferences,” the satisfaction or utility functions of the population of individuals potentially affected by the damage.

It should be clear that the ethical questions posed by advanced technologies do not satisfy any of the three conditions I have just enunciated. When the June 2002 report of the National Science Foundation entitled *Converging Technologies for Improving Human Performance* announces that the convergence of nanotechnology, biotechnology, information technology and cognitive science will bring about a “transformation of civilization,”³ one would have to be awfully clever to venture to qualify this eventuality as positive or negative, to judge its degree of likelihood or to evaluate the consequences by adding up the “utility” differentials across the whole population.

It is important to understand that the methodological obstacle I am emphasizing here cannot be reduced to a form of *uncertainty* regarding the data. It is not epistemic, it is ontological. Let me take as an example the very interesting “Report on the Social and Ethical Issues of Genetic Engineering with Human Beings,” of November 1982, better known under the name “Splicing Life.”⁴ In a section of the chapter “Social and Ethical Issues” entitled “Concerns with Consequences”, we come across the following reflections:

³ NSF Report, op. cit., p. 21.

⁴ President’s Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research.

The current tendency is to think of a person as an individual of a certain character and personality that, following the normal stages of physical, social, and psychological development, is relatively fixed within certain parameters. But this concept—and the sense of predictability and stability in interpersonal relations that it confers—could quickly become *outmoded* if people use gene splicing to make basic changes in themselves over the course of a lifetime. People can already be changed profoundly through psychosurgery, behavior modification, or the therapeutic use of psychoactive drugs. But genetic engineering might possibly provide quicker, more selective, and easier means. Here again, *uncertainty about possible shifts in some of people's most basic concepts brings with it evaluative and ethical uncertainty* because the concepts in question are intimately tied to values and ethical assumptions. It is not likely that anything so profound as a change in the notion of personal identity or of normal stages of development over a lifetime is *something to which people would have clear value responses in advance*.

This text is remarkable for its blindness, inasmuch as, at one and the same time, it designates a difficulty, which in reality is an impossibility, as Popper demonstrated— that of anticipating what our values and ethical principles will be in the future—while continuing nevertheless to reason in consequentialist terms. The sleight of hand lies in talking about uncertainty when in fact it is a matter of radical indeterminacy. One would like to see an exponent of Bayesianism try to figure out how to place subjective probabilities in the value system space! This is hardly the first time that such confusion manifests itself, since Werner Heisenberg's famous *Unbestimmtheitsrelation* is translated as the "Uncertainty Principle" when in fact it is an indeterminacy principle.

The reduction of the ontological to the epistemological is all the more serious an error insofar as the transformations that our ethical principles and values will undergo in the future will in part be caused by the very technological choices that we make. The NSF report *Converging Technologies* is well aware of this when it remarks, with respect to the "transformation of civilization" brought about by the convergence of technologies: "Perhaps wholly new ethical principles will govern *in areas of radical technological advance*, such as the acceptance of brain implants, the role of robots in human society, and the ambiguity of death in an era of increasing experimentation with cloning."⁵

If ethics could be reduced to a moral cost-benefit analysis, it would be faced with a hopeless task when it came to the problems that interest us, since we

⁵ NSF Report, op. cit., p. 22; my emphasis. The report adds, however: "Human identity and dignity must be preserved."

would not even know on which side of the scales to place such or such an aspect of an anticipated development. If ethics were a calculus, even if this calculus turned out to be impossible to undertake in practice, every ethical problem could be presumed to have a solution, whether or not we were capable of determining it. But humanity's "moral predicament" is of a different nature. It sometimes happens that human creative activity and the conquest of knowledge proves to be a double-edged sword, "putting in danger the very pursuit of the processes to which it is nonetheless indispensable."⁶ We are going to look at some examples of this. In short, it is not that we *do not know* whether the use of such a sword is a good or a bad thing—it is that it *is* good and bad at once.

The ethics of technologies, not of techniques

The third error consists in bringing the ethical evaluation to bear on the technique itself. On what, then, should it be brought to bear? On *technology*! Modern English no longer seems to make a distinction between these two terms (any more than French does), and that is a loss. Technology is the technique embedded in the discourse [logos] that comes with it, both carrying it and being carried by it. I will borrow an illustration from Hannah Arendt's major work, *The Human Condition*. This book, published for the first time in 1958,⁷ begins with a reflection on an event which she regards as "second in importance to no other," namely the launching into orbit of a Sputnik, on October 4 of the previous year. Arendt writes:

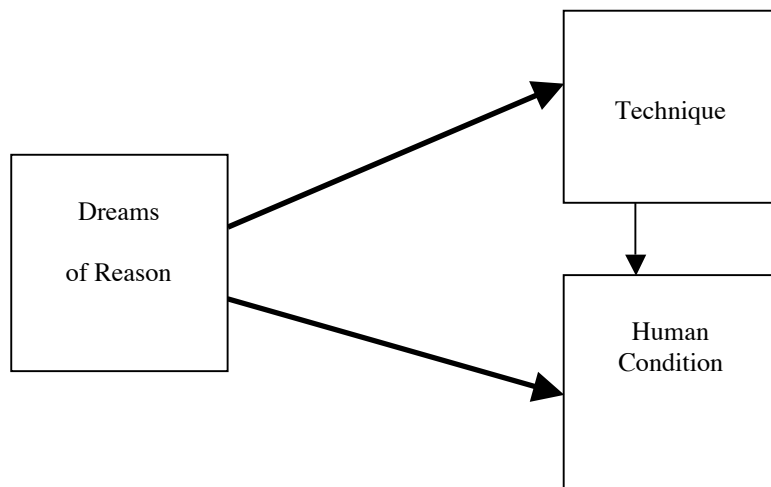
“The immediate reaction, expressed on the spur of the moment, was relief about the first 'step toward escape from men's imprisonment to the earth.' [...] Such feelings have been commonplace for some time. They show that men everywhere are by no means slow to catch up and adjust to scientific discoveries and technical developments, but that, on the contrary, *they have outsped them by decades. Here, as in other respects, science has realized and affirmed what men anticipated in dreams that were neither wild nor idle.* What is new is only that one of this country's most respectable newspaper finally brought to its front page what up to then had been *buried in the highly non-respectable literature of science fiction* (to which, unfortunately, nobody yet has paid the attention it deserves as a vehicle of mass sentiments and mass desires). The banality of the statement should not make us overlook how extraordinary in fact it was; for although Christians have spoken of the earth as a vale of tears and philosophers have looked upon their body as a prison of mind or soul,

⁶ Henri Atlan, *Les Etincelles de hasard*. Tome 1: *Connaissance spermatique*, Paris, Seuil, 1999, p. 45.

⁷ By the University of Chicago Press.

nobody in the history of mankind has ever conceived of the earth as a prison for men's bodies or shown such eagerness to go literally from here to the moon. [...] The earth is the very quintessence of the human condition [...]"⁸

I hold this text to be an essential contribution to the problems we are considering. It tells us that men dream science before doing it and that these dreams, which can take the form of science fiction, have a causal effect on the world and transform the human condition, whether they embody themselves in techniques or not. The object of ethical evaluation must therefore be, not the technique alone, but this structure displaying a common cause:



Whoever thinks that it is the technique alone which has an effect on the human condition will be obliged to sort out what is technically realizable from what is not. Existing efforts in nanoethics do indeed take extreme care to distinguish what they deem to be serious science from what everyone refers to as "science fiction." But what constitutes the latter varies considerably from one report to another. If everyone concurs in exiling the overheated products of Michael Crichton's imagination to the outlands of junk literature, there is still controversy as to whether the self-replicating nanobots dreamed up by Eric Drexler are likewise condemned to live out their days within the disreputable realm of science fiction. The interested party himself seems to have completely changed his mind and now relegates what made him famous to the category of the "unserious." The recent report of the British Royal Society, for its part, does not hesitate to express its disdain for the American NSF report, noting uncharitably: "One would be forgiven... for dismissing many of the papers as being less about sound science and technology than they are about science fiction."⁹

⁸ Ibid., pp. 1-2. My emphasis.

⁹ The Royal Society, *Nanosciences and nanotechnologies: opportunities and uncertainties*, RS Policy document 19/04, July 2004, p. 55.

The first implication of the change in perspective I am proposing is that anything goes as far as what should be placed in the "Dreams of Reason" box: the unserious is no less important than the serious when it comes to shaping the scientific imagination. One will therefore find in this box metaphysics, ideology, the practice of language, the arts, popular literature and many other things. Popper has taught us that no science exists which does not rest on a "metaphysical research program," a set of presuppositions about the structure of the world which are neither testable nor "falsifiable" empirically, but which nonetheless play an essential role in the progress of science. The metaphysics underlying the NBIC convergence is therefore to be found in the box alongside the "hype" ideology fed by the books of a Ray Kurzweil,¹⁰ an Eric Drexler¹¹ or a Damien Broderick.¹²

Like Hannah Arendt reacting to the journalist's expression comparing the earth to a prison, the nanoethics researcher must be attentive to the twists and turns of language which can be symptoms bringing to light the most hidden layers of the scientific or technological imagination. I cannot resist giving a recent example from the pages of the New York Times. In November 2003, scientists in Israel built transistors out of carbon nanotubes using DNA as a template. A Technion-Israel scientist said, "What we've done is to bring biology to *self-assemble an electronic device* in a test tube [...] The DNA serves as a scaffold, a template that will determine where the carbon nanotubes will sit. That's the beauty of using biology."¹³ The transitive use of the reflexive verb "self-assemble" speaks volumes about the ambition of nanobiotechnology to capture (i.e. to "enframe," the Heideggerian *Gestell*) the self-organizing properties of living organisms in order to harness them to human ends.

Why is the approach I am proposing especially appropriate to nanotechnology and, more generally, to the NBIC convergence? Because, for the most part, the technologies in question do not yet exist in material reality. But in the form of "dreams"—with all their metaphysical, ideological, popular and other dimensions—they are already here. And, indeed, they have been present for a long time, as I am going to show by quoting philosophical texts going back several decades, or even several centuries, which, in retrospect, can be said to have foreseen many things and, perhaps, to have helped bring them into being.

¹⁰ Ray Kurzweil, *The Age of Spiritual Machines*,

¹¹ Eric Drexler, *Engines of Creation*,

¹² Damien Broderick, *The Spike*, Forge, New York, 2001.

¹³ Kenneth Chang, "Smaller Computer Chips Built Using DNA as Template," *New York Times*, November 21, 2003:

<http://www.nytimes.com/2003/11/21/science/21DNA.html?ex=1075525200&en=67948bd27029a142&ei=5070>.

I have used the expression “dreams of reason” deliberately, as an allusion to the nightmarish engraving by Goya whose title is "El sueño de la razón produce monstruos."¹⁴ A highly ambiguous title, since the word "sueño," in Spanish, can mean either “sleep” or “dream.” In English and French, the usual translation is “The sleep of reason begets monsters,” which is taken to mean: “When reason is sleeping, or dormant, the imagination, left unchecked, begets monsters.” But another meaning is equally possible: "The dream of reason begets monsters." In other words, it is reason itself, and not its absence, which has the capacity to bring monstrous things into being through its dreams. I like this ambivalence embedded in the very heart of the relationship between science and the imagination.

What I would like to do now is, not to set forth an entire nanoethics research program that would avoid the three errors I have just discussed, but simply to make some suggestions as to the direction that such a program could take.

II. HAS THE HUMAN CONDITION BECOME OUTMODED?

Human nature and the human condition

There is another major philosophical error which mars the contributions to bioethics or nanoethics that I have read: they almost always confuse human nature and the human condition. They raise questions about the impact of technologies on human nature to which, as they probably know full well, no answer can be given, and this allows them to avoid raising the same questions with respect to the human condition. Thus, the report I already mentioned, “Splicing Life,” asks:

“To consider whether gene splicing would allow the changing of human nature... breaks down into two questions. Which characteristics found in all human beings are inborn or have a large inborn basis? And will gene splicing techniques be able to alter or replace some of the genetic bases of those characteristics? As to the first, the history of religious, philosophical, and scientific thought abounds with fundamental disputes over human nature. Without a consensus on that issue the second question could only be answered affirmatively if it were clear that gene splicing will eventually allow the alteration of all natural characteristics of human beings. As it is by no means certain that it will ever be possible to change

¹⁴ <http://www.bne.es/Goya/c75.html>

the genetic basis of all natural characteristics, it seems premature to assume that gene splicing will enable changes in human nature.

[...] The possibility of changing human nature must, however, be kept in perspective. First, within the limits imposed by human beings' genetic endowment, there is already considerable scope by means other than gene splicing for changing some acquired characteristics that are distinctively human. For example, people's desires, values, and the way they live can be changed significantly through alterations in social and economic institutions and through mass education, indoctrination, and various forms of behavior control. Thus, even if gene splicing had the power that some people are concerned about, it would not be unique in its ability to produce major changes in what it means to be human—although it would be unusual in acting on the inheritable foundation of thoughts and actions.”¹⁵

One must take a much more radical position than the report does: in a society even partially secularized, a consensus on the question of human nature is unthinkable, for the very good reason that such a question holds meaning only within a theological framework. As Hannah Arendt explains so well in her book *The Human Condition*,

“The problem of human nature, the Augustinian *quaestio mihi factus sum* ('a question have I become for myself') seems unanswerable in both its individual psychological sense and its general philosophical sense. It is highly unlikely that we, who can know, determine, and define the natural essences of all things surrounding us, which we are not, should ever be able to do the same for ourselves – *this would be like jumping over our own shadows*. Moreover, nothing entitles us to assume that man has a nature or essence in the same sense as other things. In other words, if we have a nature or essence, then surely only a god could know and define it...”¹⁶

I would add that the reference to “human nature” is surprising on the part of scientists, for, when it comes to ethics, most of them are “spontaneous” Kantians. They gladly pay homage to man's “dignity” and freedom of choice, a benign form of humanism that is unlikely to scare anyone. Now, for Kant, as for Rousseau, what defines humanity is a ceaseless striving for perfection, a capacity to break free from the constraints of nature—in short, “man's nature is to

¹⁵ *Splicing Life*, op. cit., pp. 69-70.

¹⁶ *The Human Condition*, op. cit., p. 10.

have no nature." For this reason, I am afraid that Kantianism will be of little help to anyone who hopes to find a theoretical basis for deciding what ethical limits should be placed on the engineering of "human nature."

The human condition is something else. Precisely because no essence has been assigned to man, he must construct a world that will condition him. "In addition to the conditions under which life is given to man on earth, and partly out of them," writes Hannah Arendt, "men constantly create their own, self-made conditions, which, their human origin and their variability notwithstanding, possess the same conditioning power as natural things."¹⁷ The totality of these conditions, both natural and man-made, constitute neither a nature nor an essence, for if they were different, man would be no less man.

The rebellion against the given

The human condition is thus an inextricable mixture of things given and things made. This means that man, to a great extent, can shape that which shapes him, condition that which conditions him, while still respecting the fragile equilibrium between the given and the made. Now, already in the 1950s, philosophers of German origin, driven from their homeland by the rise of Nazism, prophesied a human rebellion against the given: I am thinking in particular of Hannah Arendt, of her first husband, Günther Anders, and of their mutual friend, Hans Jonas—all three were students of Heidegger before breaking with him to varying degrees. In the opening pages of *The Human Condition*, Arendt wrote in 1958 with extraordinary foresight: "The human artifice of the world separates human existence from all mere animal environment, but life itself is outside this artificial world, and through life man remains related to all other living organisms. For some time now, a great many scientific endeavors have been directed toward making life also 'artificial', toward cutting the last tie through which even man belongs among the children of nature."¹⁸ She went on to add: "This future man, whom the scientists tell us they will produce in no more than a hundred years, seems to be possessed by *a rebellion against human existence as it has been given*, a free gift from nowhere (secularly speaking), which he wishes to exchange, as it were, for something he has made himself."¹⁹

Yet this was well before the first great achievements in genetic engineering, and the famous lecture by Feynman that is said to be at the origin of the nanotechnology project would not be delivered until the following year. It turns

¹⁷ Ibid., p. 9.

¹⁸ Ibid., p. 2.

¹⁹ Ibid., pp. 2-3. My emphasis.

out here again that ideas and dreams preceded technical achievements and that philosophy came before science. The nanotechnological “dream of reason” is to overcome once and for all every given that is a part of the human condition. I will limit myself here to demonstrating this is the case of the two givens that make human life finite, its mortality and its beginning in birth.

Defeating death

The dream of abolishing death or, at a minimum, extending human life indefinitely, is explicit in the many texts, whether “serious” or “science fiction,” that enumerate the benefits to be expected from the NBIC convergence. In one of the scenarios contemplated in the NSF report *Converging Technologies for Improving Human Performance*, one finds the following words: “No death.”²⁰ Science fiction obviously has a field day with this theme. Ray Kurzweil’s latest bestseller boasts a science fiction title—*Fantastic Voyage*—and a subtitle that sums up its aim magnificently: *Live long enough to live forever*.²¹ True to the method I recommend for founding a nanoethics, I do not intend to discuss the scientific validity of a project that consists in staying alive long enough to be able to take advantage of an era when “nanotechnology will enable us to vastly expand our physical and mental capabilities by directly interfacing our biological systems with human-created technologies”²² and to thereby fulfill “the promise of living forever.” This project may or must be based on phony science, but the dream is real enough. It evidently goes back much earlier than the nanotechnology program, as the quotation from Arendt reminds us, but the metaphysics underlying this program is bound to give the dream new impetus.

If there is an ethical problem here, the method is to bring it to light by studying the anatomy of the dream. As in psychoanalysis, the words used to express it should be treated as symptoms. Kurzweil points to those he calls the “enemies” of the dream. One of these, he writes, is “an increasingly vocal body of opinion that opposes extending human longevity on the basis that it supposedly *violates the essence of human nature*. Author Francis Fukuyama, for example, considers research that might extend human longevity beyond its current fourscore years to be *immoral*.” Kurzweil feels obliged to stipulate: “We should note that we don't consider these thinkers themselves to be our adversaries but, rather, their regressive ideas. The *essence of the human species* is to extend and expand our boundaries.”²³

²⁰ Op. cit., p. 169.

²¹ Ray Kurzweil and Terry Grossman, *Fantastic Voyage: Live Long Enough To Live Forever*, Rodale, 2004.

²² Ibid., dustjacket presentation. I should note that a serious study, the NSF report *Converging Technologies*, cites Kurzweil in a way that shows it takes him seriously.

²³ Ibid., p. 8. My emphasis.

Thus, Kurzweil claims to know, better than Augustine or Kant, what constitutes the “essence of the human species,” while leaping headlong into the trap of confusing condition and essence. But it is the following sentence which best reveals the vision of the human condition being conveyed here, right in line with the spirit of the times: “I view disease and death at any age as a calamity, as *problems to be overcome*.”²⁴

Death as a “*problem to be overcome*”: if immortality has always had a place in man’s thoughts or dreams, it is only very recently that death has come to be considered a “problem.” It is impossible to understate the radical break this position represents with respect to the way humanity has heretofore always conceived the human condition and, more specifically, the mortality of human beings. I once worked on the anthropology, philosophy and metaphysics of death with another thinker of Germanic origin, Ivan Illich, the well-known author of *Medical Nemesis*.²⁵ The following quotation will suffice to make clear the abyss that separates Illich’s philosophy from the dream of a Kurzweil:

“I do not believe that countries need a national 'health' policy, something given to their citizens. Rather, the latter need the courageous virtue to face certain truths:

- we will never eliminate pain;
- we will not cure all disorders;
- we will certainly die.

"Therefore, as sensible creatures, we must face the fact that the pursuit of health may be a sickening disorder. There are *no* scientific, technological solutions. There is the daily task of accepting the fragility and contingency of the human situation. There are reasonable limits which must be placed on conventional 'health' care. We urgently need to define anew what duties belong to us as persons, what pertains to our communities, what we relinquish to the state.

"Yes, we suffer pain, we become ill, we die. But we also hope, laugh, celebrate; we know the joy of caring for one another; often we are healed and we recover by many means. We do not have to pursue the flattening-out of human experience.

²⁴ Ibid., dustjacket presentation.

²⁵ Ivan Illich, *Limits to Medicine: Medical Nemesis: the Expropriation of Health*, Harmondsworth, New York, Penguin, 1977.

"I invite all to shift their gaze, their thoughts, from worrying about health care to cultivating the art of living. And, today, with equal importance, the art of suffering, the art of dying."²⁶

I do not think that the primary role of ethics is to tell us what is good and bad; rather, it is to force us to raise uncomfortable questions about aspects of the human condition that we ordinarily take for granted. One may very well consider Illich's posture to be "reactionary," but there remains a question which cannot be eluded. Man's "symbolic health" lies in his ability to cope consciously and autonomously, not only with the dangers of his milieu, but with a series of profoundly intimate threats that all men face and always will face, namely pain, disease and death. This ability is something that in traditional societies came to man from his culture, which allowed him to make sense of his mortal condition. The sacred played a fundamental role in this. The modern world was born on the ruins of traditional symbolic systems, in which it could see nothing but arbitrariness and irrationality. In its enterprise of demystification, it did not understand the way these systems fixed limits to the human condition while conferring meaning upon them. When it replaced the sacred with reason and science, it not only lost all sense of limits, it sacrificed the very capacity to make sense. Medical expansion goes hand in hand with the myth according to which the elimination of pain and disability and the indefinite deferral of death are objectives both desirable and achievable thanks to the indefinite development of the medical system and the progress of technology. One cannot make sense of what one seeks only to extirpate. If the naturally unavoidable finiteness of the human condition is perceived as an alienation and not as a source of meaning, do we not lose something infinitely precious in exchange for the pursuit of a puerile dream?

The shame of being born

The rebellion against man's finiteness is not concerned with mortality only; in a way that is subtler and less visible, but still more fundamental, it takes on the fact that we are born into the world without our having had anything to do with it.

"Human beings are ashamed to have been born instead of made": under the name of "Promethean shame" (*Prometheische Scham*), this revolt against the given was identified by Günther Anders back in 1956 in his great book *Die*

²⁶ A talk given on 14 September 1990 in Hanover, Germany, "Health as one's own responsibility? No, thank you!" Text available at <http://www.pudel.unibremen.de/subjects/Expertenherrschaft/HEALTHPU.PDF>

*Antiquiertheit des Menschen*²⁷ (*The Antiquatedness [or Obsolescence] of the Human Being*).

The French reader cannot help recalling here another philosophical emotion: Sartrean nausea, that sense of forlornness which takes hold of man when he realizes that he is not the foundation of his own being. Man is essentially freedom (the "for-itself"), but this absolute freedom runs up against the obstacle of its own contingency or "facticity": our freedom allows us to choose anything except not to be free. We discover that we have been *thrown* (the Heideggerian *Geworfenheit*) into the world and we feel abandoned. Sartre expressed this idea with a phrase that has become famous: man is "to freedom condemned." He acknowledged his debt to Günther Anders.²⁸

Freedom never ceases trying to "nihilate" that which resists it. Man will therefore do everything he can to become his own maker and to owe his freedom to no one but himself. But this metaphysical *self-made man*, were such a being possible, would paradoxically have lost his freedom, and would therefore no longer be a man, since freedom necessarily entails the impossibility of coinciding with itself (the "necessity of contingency"). Promethean shame leads inexorably to the obsolescence of man.

If they had lived to see the dawn of the twenty-first century, Sartre and Anders would have found a resounding confirmation of their analyses in the shape of the "NBIC convergence," a Promethean project if ever there was one. The aim of this distinctively metaphysical program is to turn man into a demiurge or, scarcely more modestly, the "engineer of evolutionary processes." Evolution, with its clumsy tinkering, has often botched the job, and it cannot be especially proud of its latest handiwork, man. It is up to man himself, then, to try to do better. This puts him in the position of being the divine maker of the world, the demiurge, while at the same time condemning him to see himself as out of date. We are going to encounter more than once this extraordinary paradox of the coincidence of opposites: the overweening ambition and pride of a certain scientific humanism leads straight to the obsolescence of man. It is in this broad perspective that we must always set the specific questions which are termed "ethical" and which touch on the engineering of man by man.

The finiteness of the human condition is not the only aspect to be targeted by a revolt against the given. The plurality of men and their oneness are also under attack. Here one thinks of reproductive cloning, but the problem is at once more subtle and more universal. I will come back to this in the conclusion.

²⁷ Munich, C. H. Beck, 1956.

²⁸ See K. P. Liessmann (ed.), *Günther Anders Kontroversen*, Munich, Beck, 1992, p. 26.

III. THE OBSOLESCENCE OF NATURE, ETHICS AND KNOWLEDGE

I find it surprising that more people do not find it surprising that the "NBIC convergence" brings together three terms which clearly designate technologies, and a fourth which appears out of place, since it belongs to another register: cognitive science. Cognitive science is itself located at the crossroads of many disciplines, and it can itself lead to the development of new technologies, but if the idea were to refer to the latter, it would have been simpler to take "technologies" as the common denominator. A passing remark that one finds in the pages of the NSF report *Converging Technologies* probably supplies the underlying answer to my surprise. This remark, which is meant to be humorous, takes the form of a little poem:

If the *Cognitive Scientists* can think it
the *Nano* people can build it
the *Bio* people can implement it, and
the *IT* people can monitor and control it.²⁹

In this division of labor, cognitive science plays the leading role, that of thinker, which is nothing to sneeze at. In my philosophical history of cognitive science, *The Mechanization of the Mind*,³⁰ I myself defended the thesis that the project of cognitive science, going back to its origins in cybernetics, was much more a philosophical than a scientific one. This philosophical project of cognitive science appears to me today as the "metaphysical research program" of the NBIC convergence, to use Popper's terminology.

Artificial nature

At the heart of this program there is an enormous paradox. The metaphysics in question clearly wants to be *monist*: one would no longer say today that everything in the universe proceeds from the same *substance*, but one will say that everything is subject to the same *principles of organization*: nature, life, and the mind. The watchword of cognitive science is: "*naturalizing* the mind." It is a matter of fully restoring the mind (and life) to their proper place within the natural world. Now, it happens that the principles of organization supposed to be common to everything that exists in the universe are mechanistic principles. A device that processes information according to fixed rules, that is, the algorithm, constitutes the sole model of everything that exists. Chronologically, and despite

²⁹ NSF Report *Converging Technologies*, op. cit., p. 13.

³⁰ Jean-Pierre Dupuy, *The Mechanization of the Mind: On the Origins of Cognitive Science*, Princeton, Princeton University Press, 2000.

what certain preconceptions might suggest, the mind was first to be assimilated to an algorithm (or Turing machine: McCulloch and Pitts' model, 1943); next was the turn of life, with the birth of molecular biology (Max Delbrück and the "phage group," 1949); and only later came the thesis that the laws of physics are recursive (or *Turing computable*). The naturalization of the mind thus merges with the mechanization of the mind. It is once again the "hype" literature that says it best, inasmuch as its great philosophical naiveté causes it to toss rhetorical caution to the winds. The American futurologist Damien Broderick offers a striking thumbnail sketch of the history of biological evolution in the following terms. Once again, the choice of words is constantly revealing, beginning with Broderick's term for living beings: they are "living replicators":

Genetic algorithms in planetary numbers lurched about on the surface of the earth and under the sea, and indeed as we now know deep within it, for billions of years, replicating and mutating and being winnowed via the success of their expressions – that is, the bodies they *manufactured*, competing for survival in the macro world. At last, the entire living ecology of the planet has *accumulated, and represents a colossal quantity of compressed, schematic information*.³¹

The eucaryotic and procaryotic cells with which life began are assimilated to products of the human mind, genetic algorithms, that will only make their appearance in the closing decades of the twentieth century. These beings are a condensed form of *information*, the *blueprint* for the *manufacture* of living beings themselves. The materialist monism of modern science has suddenly become a spiritual monism. If the mind is but one with nature, that is because nature has been interpreted as if it were a product of the mind. This feat is reminiscent of the stage routine performed by the famous Swiss clown Grock. A superb concert performer, he would stride up to his Steinway and discover that the stool was too far removed from the piano. He then would strain to move the piano in order to draw it closer to the stool. The piano is nature, and the stool, the mind. The reconceiving of nature in terms that could lead one to believe it were a creation of the mind is what makes it possible to say that the mind has been brought closer to nature. An expression in the form of an oxymoron sums all this up very well: nature has become *artificial nature*.

The next stage obviously consists in asking whether the mind could not take over from nature in order to carry out its creative tasks more intelligently and efficiently. Broderick asks: "Is it likely that nanosystems, designed by human minds, will bypass all this Darwinian wandering, and leap straight to *design*

³¹ Damien Broderick, *The Spike*, New York, Forge, 2001, p. 116. My emphasis.

success?"³² In a comparative cultural studies perspective, it is fascinating to see American science, which had to carry on an epic struggle to root out of public education every trace of creationism, including its most recent avatars, such as *intelligent design*, return to the design paradigm through the intermediary of the nanotechnology program, the only difference being that man now assumes the role of the demiurge.

Ethics under threat

The reconceiving of nature as an artifact has important ethical and epistemological implications. It is interesting, here again, to analyze what the promoters of the NBIC convergence imagine to be the stance of those they take to be their "enemies," or at the very least their critics. The same words are always used to sum up this presumed stance: human beings do not have the right to usurp powers reserved to God alone; *Playing God* is a forbidden game.³³ Often it is added that this taboo is specifically "Judeo-Christian."

I will let slide the fact that this allegation completely misconstrues the lesson of the Talmud as well as that of Christian theology. It gets them mixed up with the ancient Greek conception of the sacred: the Gods, jealous of men guilty of *hubris*, send after them the goddess of vengeance, *Nemesis*. But the Bible depicts man on the contrary as being the co-creator of the world. As the biophysicist and Talmudic scholar Henri Atlan notes when analyzing the literature about the Golem: "One does not find [in it], at least to begin with, the kind of negative judgment one finds in the Faust legend concerning the knowledge and creative activity of men 'in God's image.' Quite to the contrary, it is in creative activity that man attains his full humanity, in a perspective of *imitatio Dei* that allows him to be associated with God, in a process of ongoing and perfectible creation."³⁴ I will come back to this in the conclusion. As to Christianity, a whole series of major authors, from Max Weber to Louis Dumont, from Marcel Gauchet to René Girard, have analyzed it as "the religion of the end of religion": they hold it responsible for the desacralization of the world (the famous "disenchantment"), and, consequently, for the progressive elimination of every taboo, prohibition or limit. This, moreover, is why the same authors view Christianity as the primary cause of the scientific and technical development of the West, for science and techniques depend precisely on the overcoming of every limit.

³² Ibid., p. 118.

³³ See the section "Concerns about 'Playing God'" in the report *Splicing Life*, op. cit., p. 53 sq.

³⁴ Henri Atlan, *Les Etincelles de hasard*, op. cit., p. 45.

It fell to science itself to pursue this desacralization of the world set in motion by the religions of the Bible, by stripping nature of any prescriptive or normative value. It is therefore utterly futile to try to paint science as being at odds with the Judeo-Christian tradition on this point. Kantianism conferred philosophical legitimacy on this devaluation of nature by making the latter a world devoid of intentions and reasons, inhabited only by causes, and by separating it radically from the world of freedom, where the reasons for action fall under the jurisdiction of moral law.

Where then is the ethical problem located, if there is one here? It is clearly not in the transgression of who knows what taboo or limit guaranteed by the sacred, since the joint evolution of religion and science has thoroughly undermined the very concept of a moral limit, and hence of a transgression. But that is precisely the problem. For no free and autonomous human society exists which does not rest on a principle of self-limitation, even when it believes it has received this principle from some kind of transcendent authority. Rousseau and then Kant defined freedom or autonomy as obedience to the law one gives oneself. Rousseau wanted the laws of the political community to have the same exteriority with respect to men as the laws of nature, even though it is men who make the former and even though they know this. But in a society that dreams of shaping and molding nature to its desires and needs, it is the very idea of an exteriority or alterity which loses all meaning. The substitution of the made for the given is obviously a part of this same process. Traditionally, nature was defined as what remained exterior to the human world, with its desires, its conflicts, its various depravities. But if, in our dreams, nature becomes entirely what we make of it, it is clear that there is no longer anything exterior, so that everything in the world will sooner or later reflect what men have done or not done, sought or neglected.

This ethical problem is much weightier than any specific questions dealing, for instance, with the enhancement of such or such a cognitive ability by various techniques. But what makes this ethical problem all the more insoluble is that, while the responsibilities men exercise over the world are increasing without limit, the ethical resources at our disposal are diminishing at the same pace.

Let us return to the paradox we have already highlighted: the triumph of scientific humanism brings with it the obsolescence of man. We talk about the mechanization of the mind. It is the mind, obviously, which mechanizes itself. But this is only an outward appearance: the mind that carries out the mechanization and the one that is the object of it are two distinct (albeit closely related) entities, like the two ends of a seesaw, the one rising ever higher into the heavens of metaphysical humanism as the other descends further into the depths of its deconstruction. In mechanizing the mind, in treating it as an artifact, the

mind presumes to exercise power over this artifact to a degree that no psychology claiming to be scientific has ever dreamed of attaining. The mind can now hope not only to manipulate this mechanized version of itself at will, but even to reproduce and manufacture it in accordance with its own wishes and intentions. Accordingly, the technologies of the mind, present and future, open up a vast continent upon which man now has to impose norms if he wishes to give them meaning and purpose. The human subject will therefore need to have recourse to a supplementary endowment of will and conscience in order to determine, not what he can do, but what he ought to do—or, rather, what he ought not to do. These new technologies will require a whole ethics to be elaborated, an ethics no less demanding than the one that is slowly being devised today in order to control the rapid development and unforeseen consequences of new biotechnologies. But to speak of ethics, conscience, the will—is this not to speak of the triumph of the subject?

One may nevertheless regard this triumph of the subject as simultaneously coinciding with his demise. For man to be able, as subject, to exercise a power of this sort over himself, it is first necessary that he be reduced to the rank of an object, able to be reshaped to suit any purpose. No raising up can occur without a concomitant lowering, and vice versa.

Let us come back to cognitive science. We need to consider more closely the paradox that an enterprise that sets itself the task of naturalizing the mind should have as its spearhead a discipline that calls itself artificial intelligence. To be sure, the desired naturalization proceeds via mechanization. Nothing about this is inconsistent with a conception of the world that treats nature as an immense computational machine. Within this world man is just another machine—no surprise there. But in the name of what, or of whom, will man, thus artificialized, exercise his increased power over himself? In the name of this very blind mechanism with which he is identified? In the name of a meaning that he claims is mere appearance or phenomenon? His will and capacity for choice are now left dangling over the abyss. The attempt to restore mind to the natural world that gave birth to it ends up exiling the mind from the world and from nature. This paradox is typical of what the sociologist Louis Dumont, in his magisterial study of the genesis of modern individualism, called

the model of modern artificialism in general, the systematic application of an extrinsic, imposed value to the things of the world. Not a value drawn from our belonging to the world, from its harmony and our harmony with it, but a value rooted in our heterogeneity in relation to it: the identification of our will with the will of God (Descartes: man makes himself master and possessor of nature). The will thus applied to the world, the end sought, the motive and the profound impulse of the will are

[all] foreign. In other words, they are extra-worldly. Extra-worldliness is now concentrated in the individual will.³⁵

The paradox of the naturalization of the mind attempted by cognitive science, then, is that the mind has been raised up as a demigod in relation to itself.

Many of the criticisms brought against the materialism of cognitive science from the point of view either of a philosophy of consciousness or a defense of humanism miss this paradox. Concentrating their (often justified) attacks on the weaknesses and naiveté of such a mechanist materialism, they fail to see that it invalidates itself by placing the human subject outside of the very world to which he is said to belong.

When knowing is making

At the beginning of the eighteenth century, Jean-Baptiste Vico gave the postulate of the “new science” (1725) a celebrated formulation: *Verum et factum convertuntur* ("The true and the made are convertible"). This means that we can have rational knowledge only about that of which we are the cause, about that which we ourselves have produced. The principle of *verum factum* was originally understood as implying a want or lack on the part of human beings: we can never know nature in the way that God does, for God created what we can only observe. Quickly, however, the principle acquired a positive sense more in keeping with the growing affirmation of modern subjectivism: what human beings make can be rationally---that is, demonstratively and deductively---known despite the finiteness of human understanding. Among the branches of knowledge, ranked in descending order according to their degree of perfection, mathematics by this criterion of course comes first, followed, however, not by the natural sciences but by the moral and political sciences. It is thus that Hannah Arendt interpreted both the artificial conception of politics developed by Hobbes and Vico's turn “from natural science to history, which he thought to be the only sphere where one could obtain certain knowledge, precisely because he dealt here only with the products of human activity.”³⁶

But the first principle of the science of nature itself, according to Arendt, had to be that one can know only in making, or rather in remaking. Despite his human limitations, the scientist “nevertheless from the outset approached it [nature] from the standpoint of the One who made it.”³⁷ This explains not only the scientist's emphasis on the "how" of physical processes rather than on the being

³⁵ Louis Dumont, *Essais sur l'individualisme*, Paris, Seuil, 1983.

³⁶ *Human Condition*, op. cit., p. 298.

³⁷ *Ibid.*, p. 295.

of things, but also---and above all---the considerable role assigned by science to experiment: “The use of the experiment for the purpose of knowledge was already the consequence of the conviction that one can know only what he has made himself, for this conviction meant that one might learn about those things man did not make by figuring out and imitating the processes through which they had come into being.”³⁸

It is clear that the NBIC convergence presents itself as the ultimate culmination of the *verum factum*. It is no longer merely by doing experiments on it, it is no longer merely by modeling it, that men will now come to know nature. It is by remaking it. But, by the same token, it is no longer nature that they will come to know, but what they have made. Or rather, once again, it is the very idea of nature, and thus of a given that is exterior to the self, which will appear outmoded. The very distinction between knowing and making will lose all meaning with the NBIC convergence, as will the distinction that still exists today between the scientist and the engineer.³⁹

Is there an ethical problem here? Back in 1958, Hannah Arendt had discerned what it was with great perspicacity. If knowledge becomes mere "know-how" and coincides with making, something called thought will be forgotten. Arendt wrote:

“The trouble concerns the fact that the 'truths' of the modern scientific world view, though they can be demonstrated in mathematical formulas and proved technologically, will no longer lend themselves to normal expression in speech and thought. [...] it could be that we, who are earth-bound creatures and have begun to act as though we were the dwellers of the universe, will forever be unable to understand, that is, to think and speak about the things which nevertheless we are able to do. In this case, it would be as though our brain, which constitutes the physical, material condition of our thoughts, were unable to follow what we do, so that from now on we would indeed need artificial machines to do our thinking and speaking. *If it should turn out to be true that knowledge (in the modern sense of know-how) and thought have parted company for good*, then we would indeed become the helpless slaves, not so much of our machines as of our know-how, *thoughtless creatures* at the mercy of every gadget which is technically possible, no matter how murderous it is.”⁴⁰

³⁸ Ibid.

³⁹ Already today, in the case of biotechnologies, the distinction between discovery and invention, on which patent law rests, is proving increasingly tricky to maintain, as the debates about the patentability of life forms demonstrate.

⁴⁰ *Human Condition*, op. cit., p. 3. My emphasis. The expression "thoughtless creatures" coupled with the notion of technologies turned "murderous" sends a chill down the spine. We

IV. AMPHITRYON AND THE GOLEM

I would like to conclude by telling you two very lovely stories which illustrate much better than an arid philosophical analysis some of the points that I have made.

The first is a true story. It was told to me by the late Heinz von Foerster, a Viennese Jewish immigrant to the United States who would found second-order cybernetics after having served as secretary to the Macy Conferences, which were the cradle of the first cybernetics. The story takes place in Vienna toward the end of 1945, and it concerns another Viennese Jew, the psychiatrist Viktor Frankl, the celebrated author of *Man's Search for Meaning*. Frankl had just returned from the Auschwitz-Birkenau camp, having miraculously survived, he had discovered that his wife, his parents, his brother and other members of his family had all been exterminated, and he had decided to resume his practice.

Here is the story as my friend Heinz told it to me:⁴¹

Concentration camps were the setting for many horrific stories. Imagine then the incredulous delight of a couple who returned to Vienna from two different camps to find each other alive. They were together for about six months, and then the wife died of an illness she had contracted in the camp. At this her husband lost heart completely, and fell into the deepest despair from which none of his friends could rouse him, not even with the appeal of "Think if she had died earlier and you had not been reunited!". Finally he was convinced to seek the help of Viktor Frankl, known for his ability to help the victims of catastrophe. They met several times, conversed for many hours, and eventually one day Frankl said: "Let us assume God granted me the power to create a woman just like your wife: she would remember all your conversations, she would remember the jokes, she would remember every detail: you could not distinguish this woman from the wife you lost. Would you like me to do it?" The man kept silent for a while, then stood up and said "No thank you, doctor!" They shook hands; the man left and started a new life.

know that three years later, Arendt would witness the trial of Eichmann in Jerusalem and could find but one personality trait able to help explain his responsibility for the horror: "thoughtlessness."

⁴¹ Von Foerster Archives in Vienna.

When asked by von Foerster about this astonishing and simple change, Frankl explained, “You see, Heinz, we see ourselves through the eyes of the other. When she died, he became blind. But when he *saw* that he was blind, he could see!”⁴²

Such at least is the lesson that von Foerster drew from this story, in typical cybernetic fashion. But I think that another lesson can be drawn from it which extends the first. The thought experiment to which Frankl subjected his patient echoes one of the most famous Greek myths, that of Amphitryon. In order to seduce Amphitryon’s wife, Alcmena, and to pass a night of love with her, Zeus assumes the form of Amphitryon. “All through the night, Alcmena loves a man whose qualities are in every particular identical to those of her husband. The self-same description would apply equally to both. All the reasons that Alcmena has for loving Amphitryon are equally reasons for loving Zeus, who has the appearance of Amphitryon, for Zeus and Amphitryon can only be distinguished numerically: they are two rather than one. Yet it is Amphitryon that Alcmena loves and not the god who has taken on his form. If one wishes to account for the emotion of love by the propositions that justify it or by the qualities attributed to the objects of love, what rational explanation can be given for that “something” which Amphitryon possesses but not Zeus and which explains that Alcmena’s love is directed only at the former and not the latter?”⁴³

When one loves somebody, one does not love a list of characteristics, even were it to be sufficiently exhaustive to distinguish the person in question from everyone else. The most perfect *simulation* still fails to capture something, and it is this “something” which is the essence of love, that poor word that says everything and explains nothing. I greatly fear that the spontaneous ontology of those who wish to be the makers or re-creators of the world knows nothing of the beings who inhabit it but lists of characteristics. If ethics is the least bit related to love, its "supervenience base," to use the jargon of analytic philosophy, is condemned, by this ontology, to remain fundamentally incomplete.

The second story is a Talmudic tale of the 13th century that the French biophysicist Henri Atlan told me. This tale relates what happens when the prophet Jeremiah succeeds in creating a golem. The story does not at all portray this creation as an act of revolt against God, but, quite to the contrary, as the

⁴² Translated from the German: " Wir sehen uns mit den Augen des anderen. [...] Als er aber erkannte, daß er blind war, da konnte er sehen!"

⁴³ Monique Canto-Sperber, entry "Amour" in the *Dictionnaire d'Ethique et de philosophie morale*, M. Canto-Sperber (ed.), 4th edition, Paris, Presses Universitaires de France, 2004.

culmination of a long ascending path to holiness and knowledge, the two going hand in hand from the standpoint of an *imitatio Dei*: “Indeed, how can we know if the initiate has succeeded in deciphering and properly understanding the laws of the creation of the world, if not by verifying that his knowledge is efficacious in that it makes it possible for him to create a world too? How can we know that his knowledge of human nature is correct, if not by verifying that it makes it possible for him to create a man?”⁴⁴

The criterion for the truth of the sage’s knowledge is, like the criterion for scientific truth today, the *verum factum*: we only really know that which we are capable of making or re-making. The case of Warren McCulloch, architect of the Macy Conferences and, in this sense, the true founder of cybernetics, much more so than Norbert Wiener, is enlightening from this viewpoint. A neuropsychiatrist by trade, McCulloch became more and more disappointed over the years by the methods of the neurosciences. He turned instead to logic and to what was not yet called artificial intelligence. The students or disciples by his side at MIT went by the names of Seymour Papert or Marvin Minsky—the same Minsky, incidentally, who would, much later, train a certain Eric Drexler. The neurophysiologist Jerome Lettvin has described in the following terms the intellectual evolution of McCulloch, whom he greatly admired: “he was dedicated to knowing how the brain works *in the way that the creator of any machine knows its workings*. The key to such knowledge is not to analyze observation but *to create a model* and then to compare it with observation by mapping. But the *poiesis* must come first, and McCulloch *would rather have failed in trying to create a brain than to have succeeded in describing an existing one* more fully.”⁴⁵

But let us go back to Jeremiah and his artificial man. Unlike other golems, this one can talk. Quite naturally, it addresses its first words to its creator. Here is what it says to him, appealing to his conscience: “Do you realize the confusion you have just introduced into the world? From this day forward, when one meets a man or a woman in the street, one will never know if it is one of God’s creatures or one of yours!” It turns out that Jeremiah had not thought of that. Very troubled, he asks his golem for advice as to how to rectify the situation he has created. And the artificial man replies: “All you have to do is to un-make me, just as you made me.” Jeremiah does this, but not without drawing the following lesson: we should not renounce attaining the perfect knowledge that makes us capable of creating a man, but once we attain the knowledge, we

⁴⁴ Henri Atlan, *Les Etincelles de hasard*, op. cit., p. 49.

⁴⁵ Jerome Lettvin, “Warren and Walter”, unpublished; personal archives of Heinz von Foerster. Quoted in Jean-Pierre Dupuy, *The Mechanization of the Mind: On the Origins of Cognitive Science*, Princeton, Princeton University Press, 2000, p. 137.

should abstain from acting on it. Atlan concludes: “A great lesson, which we would do well to reflect upon.”⁴⁶ That is what I will take the liberty of urging us to do, before it is too late.

⁴⁶ Story told in *Les Etincelles de hasard*, op. cit., p. 49.