



Technology and human finitude¹

Tecnologia e finitude humana

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Abstract

In this text I discuss the fundamental problem of human finitude. This is an issue that comes up in both sources of Western ethical tradition, both the Judaic and the Greek source. The ancient wisdom teaches human finitude and enjoins human beings to avoid hubris, the belief that they are gods. Despite, or rather because of the many advances in technology that have occurred in the past century, we can still draw on this tradition for wisdom. The text is divided into three parts: ontological finitude, epistemological finitude and democracy as recognition of finitude. A systems-theoretic concept of human action and the concept of “entangled hierarchy” are introduced to explain the relevance of finitude to technology.

Keywords: Technology. Finitude. Ethic.

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Resumo

Neste texto eu discuto o problema fundamental da finitude humana. Essa é uma questão que vem à tona em ambas as fontes de tradição ética ocidental, tanto a judaica quanto a de origem grega. A antiga sabedoria ensina a finitude humana e ordena os seres humanos a evitar o excesso de confiança e a crença de que eles são deuses. Apesar de, ou melhor, por causa dos muitos avanços na tecnologia que ocorreram no século passado, ainda podemos recorrer a essa tradição de sabedoria. O texto está dividido em três partes: finitude ontológica, finitude epistemológica e a democracia como reconhecimento da finitude. É introduzido um conceito teórico-sistêmico da ação humana e o conceito de "hierarquia emaranhadas" para explicar a importância da finitude em relação à tecnologia.

Palavras-chave: Tecnologia. Finitude. Ética.

Introduction

This is a text about human finitude as it relates to technology. Finitude is an important theme in both the Judaic and the Greek source of the Western ethical tradition. The Bible describes human beings as created beings and as such they have responsibilities they must fulfill. They are, furthermore, enjoined not to worship idols, that is, false gods they have themselves created. One of the most ancient sayings of Greek ethics was inscribed on the Oracle of Delphi. The command, "Know Thyself," instructed human beings to recognize their mortality, the fact that they are not gods and must not strive beyond their natural limits. The Greek word for such overweening striving is *hubris*. *Hubris* is going to be the theme of this text. Presumably, Asian ethics has equivalent concepts. The critique of *hubris* is the basis in our tradition for an ethic for technology. I believe we can still draw on this tradition for wisdom.

The field of applied ethics addresses questions such as the moral responsibility of scientists and engineers, medical perplexities such as the definition of death, and politically sensitive issues

such as the rights of whistle blowers. But the most important role for ethics in a technological society is to help us to identify and avoid *hubris*. The more successful our technology, the stronger is the temptation to violate the ancient wisdom. Technology gives the illusion of godlike power. We think we can master nature and bend it to our will. Dreams of absolute technologies have haunted the human race from very early. Archimedes, for example, claimed he could move the world if only he had a long enough lever and a place to stand. Contemporary technological fantasies are no less wild. We hear that we will soon be able to transform our bodies and minds with nanotechnology, download our brains into computers, alter the climate with geo-engineering, move asteroids out of their orbits, send astronauts to alien planets, and so on.

Are we then like gods, controlling the universe from outside? Obviously not. We know from environmental crisis and many other problems that we are not gods but limited beings just as the Jews and Greeks claimed in ancient times. A dramatic example of this realization occurred in the life of J. Robert Oppenheimer, the leader of the atom bomb project in World War II. As he witnessed the test of the first bomb in the New Mexico desert, a phrase from the Baghavad-Gita flashed through his mind: "I have become death, destroyer of worlds." Death, or Shiva, is the God of destruction and for a brief moment Oppenheimer identified himself with that God. However, very soon afterwards he was engaged in negotiations with the Soviet Union to try and limit the spread of nuclear weapons. He realized that the destroyer can be destroyed, that neither he nor even a well armed America enjoy the immunity of a God.

In what follows I will treat the theme of finitude under two different headings: ontological and epistemological. Ontological finitude has to do with what we are as human beings. Epistemological finitude has to do with what we can know. Intertwined with both is our technological finitude, the inherent limits of technical power. Technology is implicated in both what we are and what we know. In conclusion I will argue that recognition of finitude implies a democratic ethic of technology.

Ontological finitude

Ontology has to do with being, the ultimate nature of the things that belong to the world. Ontologically considered, human beings are living beings with natural limits set by the world in which they are situated. All living beings have limits and belong to an environmental niche. Beyond their limits and outside their niche living things break up and die. Human beings are indeed unique among living things in that they have the power to modify their niche to an extraordinary extent. This supports the illusion that they are in fact independent of the world to which they belong. But that this is an illusion is clear from the long term consequences of ignoring all limits.

Finitude is evident in the paradoxical structure of human action. For the most part, it is well described by a metaphoric corollary of Newton's Third Law of motion. Newton's law states that for every action there is an equal and opposite reaction. This law is verified every time two billiard balls bounce off each other, and also by much human behavior. It most obviously applies in interpersonal relations where anger evokes anger, kindness kindness, and so on. Every one of our acts returns to us in some form as feedback from the Other. But this means that *in acting we become the object of action*.

In more formal philosophical language this paradox of action says that human beings can only act on a system to which they themselves belong. Because we belong to the system any change we make in it affects us too. This is the practical significance of our existence as embodied and social beings. Through our body and our social belonging we participate in a world of causal powers and meanings we do not fully control. We are exposed through our body to the laws of nature. And we are born into a cultural world we largely take as given. In short, we are finite beings. Our finitude shows up in the Newtonian reciprocity of action and reaction.

But technical action appears to be non-Newtonian, an exception to the rule of reciprocity. When we act technically on an object we experience very little feedback, certainly nothing proportionate to our impact on the object. Modern technologies are perceived as purely

instrumental and separate from their past, the environment in which they function, and their operator. But these apparent separations hide essential aspects of technology. I call ignorance of this principle the illusion of technology. It blinds us to three reciprocities of technical action. These are causal side-effects of technology, changes in the meaning of our world and changes in our own identity.

The illusion is less of a problem in traditional societies. There craft knowledge and everyday experience are in constant communication. The lessons learned from using technical devices are absorbed into the craft tradition where they limit and control technical activity. From a modern standpoint this appears to be an obstacle to development, but there may be wisdom in restraint. Certainly our recent experience with technologies such as nuclear weapons and toxic chemicals indicate a need for restraint.

Most modern technology has developed under a different dispensation from craft. In a capitalist society, control of technology is no longer in the hands of craftsmen but is transferred to the owners of enterprise and their agents. Capitalist enterprise is unusual among social institutions in having a very narrow goal — profit — and the freedom to pursue that goal without regard for the social and natural environment. Once technology has been delivered over to such an institution, the lessons of experience are ignored. Workers, users of technology, victims of its side-effects, all are silenced throughout the industrialization process. Technological development can proceed without regard for the more remote aspects of its own context. This makes possible the development of sophisticated technical disciplines and very rapid progress but with unfortunate consequences. In communist countries, this same pattern prevailed under government control where the goal assigned to state enterprises — meeting a quota — was similarly narrow.

Instead of correcting the illusion of technology, modern societies take that illusion for reality. They imagine they can act on the world without consequence for themselves. But only God can act on objects from outside the world, outside the system on which He acts. All human action, including technical action, exposes the actor. The illusion of godlike power is dangerous.

Consider first the question of side-effects. Our niche must include a way of absorbing the impact of our technology, including its waste products. But attention to this aspect of technology is obscured by a narrow conception of technical action. The feedback that is invisible at first becomes visible when a wider or longer range view is available. It is only when we narrowly define the relevant zone of action that we appear to be independent of the objects on which we act technically. In context, action always conforms to my version of Newton's law and comes back to affect the actor. The illusion of independence arises from the nature of technical action which dissipates or defers causal feedback from the object. Indeed, the whole point of technology is to change the world more than the actor. It is no accident that the gun harms the rabbit but not the hunter, that the hammer transforms the stack of lumber but not the carpenter. Tools are designed to focus power outward, on the world, while protecting the tool user from that equal and opposite reaction Newton proclaimed.

But Newton cannot be defied for long. In one way or another the reaction will manifest itself. In the case of pollution the reaction becomes visible as soon as one enlarges the context in space and time. Barry Commoner's ecological corollary of Newton's law declares that "Everything goes somewhere." Indeed, all the poisons produced by industry end up in someone's backyard even if it takes years to notice. As technology grows more powerful its negative side effects become more difficult to ignore and finally impossible to deny.

Our actions not only come back to us through causal feedback, they also change the meaning of our world. New technologies of transportation and communication offer the most dramatic examples of such transformations of meaning. Railroads and later automobiles and airplanes have radically diminished the experience of distance. Regions once remote were suddenly made close by these technologies. The spatial coordinates of our lives, what we mean by "far" and "near," are completely different from what they were for all of earlier human history. Added to these changes, electronic communication has radical consequences as a multicultural world gradually emerges from the monocultures of old. Ordinary people now know more about foreign

lands and cultures from movies, encounters with immigrants, and tourism than all but a few adventurers and colonial administrators a century ago. What is more, such familiar distinctions as those between public and private, work and home, are subverted as new technology brings the office into domestic spaces and extrudes creative activities and private fantasies into public arenas.

Even the meaning of nature is subject to technological transformation. Consider the example of amniocentesis. It allows the sex of the fetus to be identified early in pregnancy. Relatively few parents abort fetuses because of their sex, but the fact that this is possible at all transforms an act of God into a human choice. What formerly was a matter of luck can now be planned. Even choosing not to use the information has become a choice in favor of "nature" whereas before no choice was involved. Our society is now capable of technologizing reproduction and has thus changed its meaning for everyone, including those who do not use amniocentesis.

The paradox of action also holds in the case of identity. The hunter kills a rabbit with his gun and all he feels is a little pressure from the kickback of the weapon. But the rabbit is dead. There is an obvious disproportion between the effect of the action on the actor and his object. But the action does have consequences for the hunter: his identity is determined by his acts. That is to say, he is a hunter insofar as he hunts. This reverse action of technology on identity is true of everyone's productive activity in one way or another. In sum, you are what you do.

Consumer society has brought the question of identity to the fore in another way. The technologies we use in daily life, such as automobiles, iPods, mobile phones, signify us as the kind of people we are. They are not merely useful means. We now "wear" our technologies just as we wear clothes and jewelry, as forms of self-presentation. Today, not only are you what you do, but even more emphatically you are what you use.

For example, automobile ownership involves far more than transportation. It symbolizes the owner's status. In poor countries, it has an even greater symbolic charge than in rich ones, signifying the achievement of modernity and its vision of a rich and fulfilling life.

It cannot be said in such cases that the means are separate from the ends. Possession of the means is already an end in itself because identity is at stake in the relation to technology. Indeed, assuming a new identity is often the most important effect of technological change, and not its ostensible purpose as a means.

This discussion shows how deeply we are implicated in the technologies we create. In the 20th century these ever more powerful technologies achieve the status of what Michel Serres calls “world objects,” that is to say, objects that affect the parameters of the world as a whole and not just a small corner of it. The first such world object was the atom bomb. But even as the atom bomb dramatized the potential power of human beings to change the world, fossil fuels were quietly altering the climate. Getting these world objects under control has proven extraordinarily difficult. We control the world with technology but do we control ourselves? The lack of self-control shows up as *hubris* in a wide variety of technological problems.

Epistemological finitude

Let me turn now to epistemological finitude. As I noted earlier this has to do with the limits of human knowledge. We strive for true knowledge and think of objectivity as a view of the world independent of the influence of prejudice and emotion. Our ideal of objectivity is a kind of view from nowhere, a God's eye view of the universe of the sort that we imagine science provides. But in the final analysis we must recognize the limits of our ability to transcend time, place, body, culture, prejudices, and all the other factors that affect our ability to get at the truth. The philosophical doctrine that recognizes these limits without denying the possibility of knowledge is called fallibilism. We are by nature fallible.

Fallibilism applies to technology as to every other form of knowledge. Technical disciplines are influenced by traditions and interests and often contain errors despite all the efforts of experts to purify them. These limits of technical knowledge show up in the flaws

of technological designs. Some designs are unintentionally biased to privilege the interests of a given social group while others contain unsuspected dangers for those who use them.

The bias of technology is enacted in the blind spots of tradition. Technical designs that appear neutral as between social groups may actually embody an unconscious preference. Right handed tools offer a good example of such bias. A tool such as scissors that is easy to use with the right hand is a clumsy fit in the left hand. The designer was likely to be right-handed and no doubt unaware of the problem. Similarly, sidewalks designed with curbs at intersections obstruct the movement of wheelchairs. In recognition of the rights of the disabled, legislation has obliged cities in North America to introduce ramps to facilitate the movement of wheelchairs. Again, the designers of traditional sidewalks can hardly be blamed for their oversight.

In such cases the bias is hidden in a technical specification that cannot be suspected of harboring prejudice or narrow interests. And yet the apparently innocent specification functions exactly like a prejudice or narrow interest. The technical disciplines perpetuate these limitations which are handed down from generation to generation of specialists. Public criticism is difficult insofar as the problems are encoded in disciplines that claim a legitimate independence of public opinion. Even so, progress must often come from outside the technical fields, blinded as they are by their traditions. Technical accidents occasion a similarly complex relation of technology to the public.

We are confronted by ever more complex technologies and have great difficulty anticipating the accidents to which they are prone. These "normal accidents" can have disastrous consequences. The example of Fukushima Daiichi is very much present in everyone's minds. This is an exceptional case at the limit of technical feasibility. But just for that reason it is a revealing case that makes clear the importance of fallibilism in technical culture.

The Fukushima accident shows that there are technical problems that are simply too hard to solve. Of course provisional solutions may be found even for such a difficult problem as generating electricity with nuclear reactors. But we need solutions that are not merely provisional

but permanent. When dealing with a complex system we arrive at a permanent solution, or something close to it, only through experiencing, analyzing, and responding to a succession of unanticipated problems and accidents. This is what the aircraft industry has done and as a result flying is now quite safe. But we cannot imagine undergoing such a succession of accidents with nuclear power. The consequences of each accident are too costly and frightening.

Technological finitude is recognized in the famous precautionary principle formulated at the Rio Summit in 1992 as follows. "In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." The precautionary principle is a cure for *hubris*, the overconfidence that leads to technological disaster. But exactly how to apply it has remained subject to controversy. It is not intended to arrest all innovation but it is unclear how to distinguish serious risks from the tolerable ones inescapably associated with technological development.

The real world test of technology is public acceptance. There must be a "reality check" on the work of technologists in the everyday experience of workers and users and even in some cases unintended victims. This is the ultimate feedback from bias and risk. It operates along Newtonian lines as I explained earlier. As technology grows more powerful and pervasive, it becomes more and more difficult to insulate it from such feedback. Workers, users, victims, and potential victims all have their say at some point. Their feedback, provoked by maladaptation, negative side effects or unrealized technical potential, leads to interventions that constrain development and orient its path.

Once mobilized to protect themselves, protesters attempt to impose the lessons of their experience with technologies on the technical experts who possess the knowledge necessary to build working devices in a modern society. The interaction recalls the dynamics of craft development but now the institutional separation of the public from technical experts creates obstacles to communication. It appears superficially

that two separate things, technical knowledge and everyday experience interact in a clash of opposites. Technical experts sometimes decry what they think of as ideological interference with their pure and objective knowledge of nature. They protest that values and desires must not be allowed to muddy the waters of fact and truth. Protesters may make the corresponding error and denounce the experts in general while nevertheless employing their technology constantly in everyday life.

But in fact technical knowledge and experience are complementary rather than opposed. Technical knowledge is incomplete without the input from experience that corrects its oversights and simplifications. Public protests indirectly reveal the complications unintentionally caused by those blind spots, that is, aspects of nature and social life so far overlooked by the experts.

Protests formulate values and priorities. Demand for such things as safety, health, skilled employment, recreational resources, aesthetically pleasing cities testify to the failure of technology to adequately incorporate all the constraints of its environment. Eventually those values will be incorporated into improved technical designs and the conflict between the public and its experts will die down. Indeed, in years to come the technical experts will forget the politics behind their reformed designs and when new demands appear will defend them as a product of pure and objective knowledge of nature!

Values cannot enter technology without being translated into technological language. Simply wishing away inconvenient technical limitations will not work. The results of such a voluntaristic approach are disastrous as the Chinese discovered in the Cultural Revolution. For something useful to come out of public interventions, experts must figure out how to formulate values as viable technical specifications. When that is accomplished a new version of the contested technologies can be produced that is more responsive to its context. In the process values are transformed into technical facts and the technology fits more smoothly into its niche.

The structure of this process is a consequence of a technology cut off in modern times from the experience of those who live with it and use it. But the experience of users and victims of technology eventually

influences the technical codes that preside over design. Today, as we have seen, such interactions are becoming routine and new groups emerge frequently as “worlds” change in response to technological change. This overall dynamic of technological change closes the circle described in the paradox of action: what goes around comes around.

Sometimes the problem is not the harm technology does but the good it might do if only it were reconfigured to satisfy unmet demands. This case is exemplified by the Internet. It was created by the US military to test a new type of networked computer time sharing. But a lowly engineer came up with the idea of networking not only the computers but also their users and introduced email. Since then one generation of users after another has developed and explored new ideas for social interaction on the Internet. Home pages were followed by web forums and web forums by social sites dedicated to music sharing and photography. These sites were integrated into blogs and now social sites such as Myspace and Facebook pull together many social resources. At each stage programmers have worked to accommodate the new demands of users with the corresponding technical solutions. This is a process repeated endlessly as technologies develop.

In a sense then we could say that values are the facts of the future. Values are not the opposite of facts, subjective desires with no basis in reality. Values express aspects of reality that have not yet been incorporated into the taken for granted technical environment. That environment was shaped by the values that presided over its creation. Technologies are the crystallized expression of those values. New values open up established designs for revision.

Technology and democracy

Social groups form around the technologies that mediate their relations, make possible their common identity and shape their experience. We all belong to many such groups. Some are defined social categories and the salience of technology to their experience is obvious. A worker in a factory, a nurse in a hospital, a truck driver in his truck,

are all members of communities that exist through the technologies they employ. Consumers and victims of the side effects of technology form latent groups that surface when their members become aware of the shared reasons for the problems caused by the technologies that link them. The politics of technology grows out of these technical mediations that underlie the many social groups that make up society. Such encounters between the individuals and the technologies that connect them proliferate with consequences of all sorts. Social identities and worlds emerge together and form the backbone of a modern society.

In the technology studies literature, this is called the “co-construction” of technology and society. The examples cited here show this “co-construction” resulting in a tight feedback loop, like the “Drawing Hands” in M. C. Escher’s famous print of that name (Figure 1). I will use this image to discuss the underlying structure of the technology-society relationship.



Figure 1 - Drawing Hands

Source: ESCHER, 1948.

Note: Available at: <http://en.wikipedia.org/wiki/Drawing_Hands>.

Escher's self-drawing hands are emblematic of the concept of the "strange loop" or "entangled hierarchy" introduced by Douglas Hofstadter in his book *Gödel, Escher, Bach*. The strange loop arises when moving up or down a logical hierarchy leads paradoxically back to the starting point. A logical hierarchy in this sense can include a relationship between actors and their objects, such as seeing and being seen or talking and listening. The active side stands at the top and the passive side at the bottom of these hierarchies.

The famous liar's paradox is an example of a strange loop in which top and bottom trade places. Like all declarative statements, "This sentence is false" refers to an object. The statement itself is the actor at the top of the hierarchy. But the object to which it refers is also itself and in describing itself as false it reverses the direction of action. When one claims that something is false that claim is the actor and what it describes as false is the object. But that object is itself. Now the sentence is only true if it is false and false if it is true. A strange loop indeed!

In the Escher print, the paradox is illustrated in a visible form. The hierarchy of "drawing subject" and "drawn object" is "entangled" by the fact that each hand plays both functions with respect to the other. If we say the hand on the right is at the top of the hierarchy, drawing the hand on the left, we come up against the fact that the hand on the left draws the hand on the right and so is also located at the top level. Thus neither hand is at the top or both are, which is contradictory.

On Hofstadter's terms, the relation between technology and society is an entangled hierarchy. Insofar as social groups are constituted by the technical links that associate their members, their status is that of the "drawn" object in Escher's scheme. But they react back on those links in terms of their experience, "drawing" that which draws them. Once formed and conscious of their identity, technologically mediated groups influence technical design through their choices and protests. This feedback from society to technology constitutes the paradox of democracy: the public is constituted by the technologies that bind it together but in turn it transforms the technologies that constitute it. Neither society nor technology can be understood in isolation from each other because neither has a stable identity or form.

This paradox is endemic to democracy in general. Self-rule is an entangled hierarchy. As the French revolutionary Saint-Just put it, “the people is a submissive monarch and a free subject.” Over the centuries since the democratic paradox was first enacted, its reach has extended from basic political issues of civil order and defense to embrace social issues such as marriage, education, and health care.

The process of extending democracy to technology began with the labor movement. Its demands around health and safety at work and the length of the workday were a first public intervention into technology. Socialists generalized these challenges and called attention to the contradiction between democratic ideology and the tyranny of the factory. This was the first expression of a politics of technology at a time when technical mediation was still confined to a single sector of society. Later, such issues as food safety and environmental pollution signal the widening circle of affected publics. Concerns about privacy and free communication on the Internet are the latest manifestations of the aspiration for democracy in the technological domain.

The dream of control of technology by those who build it with their brains and hands has never been fully realized. But today, around the many issues raised by technology, something very much like that dream is revived in new forms. Those who demand environmentally compatible production, a medical system more responsive to patient needs, a free and public Internet, and many other democratic reforms of technology, follow in the footsteps of the socialist movement whether they know it or not. They are broadening democratic claims to cover the whole social terrain covered by the technological system.

In the end we must rely on democratic processes informed by honest discussion among experts. Democracy is itself a kind of recognition of finitude. Citizens give up the claim to know and control everything. They accept the limits of their knowledge in submitting to a process of discussion among diverse views. It is appropriate then to address the problem of technological *hubris* with a democratic alternative. But this requires a change in the concept of the strange loop I have introduced to understand democracy. That concept, it turns out, is not paradoxical enough. We must introduce a paradox into the paradox.

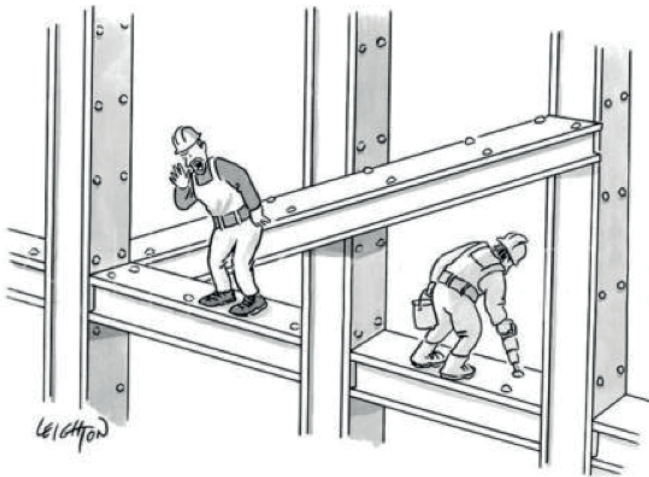
Hofstadter's notion of the strange loop has a limitation that does not apply in the case of democracy. The strange loop is never more than a partial subsystem in a consistent, objectively conceived universe. Hofstadter evades ultimate paradox by positing an "inviolable level" of strictly hierarchical relations above the strange loop that makes it possible. He calls this level "inviolable" because it is not logically entangled with the entangled hierarchy it creates. The person who says "This sentence is false" is not entangled in the paradox he announces. In the case of the Escher drawing, the paradox only exists because of the unparadoxical activity of the actual printmaker Escher who drew it in the ordinary way without himself being drawn by anyone.

The notion of an inviolable level has its place in logic but not in life in a technological society. In fact this notion precisely defines the illusion of technique. The illusion of an inviolable level gives rise to the popular belief that through technology we "conquer" nature. But human beings are natural beings and so the project of conquest is self-contradictory. As F. Scott Fitzgerald remarked in another context, "the victor belongs to the spoils." The conqueror of nature is despoiled by its own violent assault. This paradox has two implications. On the one hand, when "humanity" conquers nature, it merely arms some humans with more effective means to exploit and oppress other humans who, as natural beings, are among the conquered subjects. On the other hand, as we have seen, actions that harm the natural environment come back to haunt the perpetrators in the form of pollution or other negative feedback from the system to which both conqueror and conquered belong. In sum, the things we as a society do to nature are also things we do to ourselves.

This inability to stand above and outside our creations is illustrated in this cartoon (Figure 2), which implies a paradoxical answer to Escher.

As the cartoon shows (Figure 2), there is no inviolable level, no equivalent of "Escher" in the real world of co-construction, no godlike agent creating technology and society from the outside. The technical actor, in this case Escher, can always be called to account. He is responsible for his creations. Responsibility is the specific form of democratic accountability in the technical sphere. The technical creator is not a politician with opinions who can be voted in and out of office, but

the generational bearer of an irreplaceable tradition. He must integrate that tradition in his time to the social and natural world in which he finds himself. All the creative activity thus takes place in a world that is itself created by that activity. Only in our fantasies do we transcend the strange loops of technology and experience. In the real world there is no escape from the logic of finitude.



“Escher! Get your ass up here.”

Figure 2 - “Escher! Get your ass up here”

Source: LEIGHTON, 2013.

Note: Available at: <<http://www.art.com/products/p16921197243-sa-i6994635/robert-leighton-escher-get-your-ass-up-here-new-yorker-cartoon.htm>>.

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