

Technology

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Abstract

The term *technology* is derived from the Greek words *tékhne* and *lógos*. *Technique* and *technic(s)* also come from *tékhne*. This Greek word and its Latin equivalent *ars* both belong to the same semantic field, referring primarily to a skill or practical process, a know-how and its products, be they objects or actions. Technology can, therefore, mean two things: *i*) either a scientific knowledge of *tékhne* or *ii*) a *tékhne* accompanied by science, that is, a know-how accompanied by a know-why. We shall normally understand technology to have this second meaning, as *tékhne* accompanied by or derived from science. *Clin Ter* 2010; 161(6):?-?

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Introduction

TACT-Glossary (TACT, Thought in Action) was part of a research project financed by the European Union's NEST-Adventure Program. The main aim of TACT was to analyze goal-directed actions that are typically performed by infants, using instrumented toys. The new devices and tools may allow earlier diagnosis of neurodevelopmental disorders with possible therapeutic benefits. We present here and in the successive issues of the journal the entries of the Glossary realized by the Ethical Working Group. These entries have been written by experts in the relevant field with to goal to provide a common conceptual ground, and to avoid ambiguities in the discussions that took place within the project.

Entry: Technology

Linguistic Considerations. The term *technology* is derived from the Greek words *tékhne* and *lógos*). *Technique* and *technic(s)* also come from *tékhne*. This Greek word and its Latin equivalent *ars* both belong to the same semantic field, referring primarily to a skill or practical process, a

know-how and its products, be they objects (such as those produced by woodworking, pottery, etc.) or actions (rhetoric, medicine, dramatic art, etc.). In as late a work as Diderot and D'Alembert's encyclopaedia, the word *arts* appears with this wide meaning (*Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts et des Métiers*, 1751). The same is true of Rousseau's *Discours sur les sciences et les arts* (1750). Nevertheless, in the main modern European languages, a phenomenon of semantic specialization has occurred, whereby the words derived from *ars* are reserved for *les beaux-arts* (fine arts), that is, for those practices and products with a predominant aesthetic component. Now, the initial equivalence of *tékhne* and *ars* should be remembered, for it explains that such words as *artefact* and *artificial* refer to products of *tékhne* and should therefore be analysed here. Moreover, today many areas of overlap between technology and art are arising, such as design.

On the other hand, the word *lógos* is extremely polysemic. For present purposes, however, we are interested only in its meaning of *science* or *knowledge*. *Technology* can, therefore, mean two things: *i*) either a scientific knowledge of *tékhne* (as geology is the science of the Earth, and sociology is the science of society) or *ii*) a *tékhne* accompanied by science, that is, a know-how accompanied by a know-why, a technique and its products resulting from the application of science. We shall normally understand *technology* to have this second meaning, as *tékhne* accompanied by or derived from science. It may refer both to a specific kind of *tékhne* (hydraulic technology, high technology, biotechnology, etc.) or to the whole technical universe of skills, methods, processes and products.

Nevertheless, although the etymological distinction is clear, in practice the words *technique/technic(s)* and *technology* share a common semantic field distributed differently by different languages. Thus, French uses *technique* and German *Technik* more frequently and with a wider meaning than *technologie* or *Technologie*, which have a more restricted use, while in English, *technology* clearly predominates over *technic(s)* and has a different meaning from *technique*. This last word does not refer in English to the whole technical universe, but always to a concrete skill. In Italian, Spanish

and Portuguese, *tecnologia/tecnología* and *tecnica/técnica* are used almost indifferently to denote *tékhne* accompanied by or derived from science, but *tecnología/tecnologia* is not of application when the scientific component is not present (1, 2).

Anthropological and Historical Considerations. From the anthropological point of view, *tékhne* is not a recent or new reality, but an anthropological constant. *Tékhne* and the human being are mutually dependent (3). It is true that in some animals we may find practices and products that by analogy may be called technical, but we can only speak of *tékhne* properly insofar as the human being is involved. In a complementary way, we know that human evolution has in fact been a biological and technical co-evolution. Our organism could not survive without clothing, our digestive system depends on the use of fire, on instruments for cutting and grinding and other culinary techniques. It is significant that the first species of the genus *Homo* should be called *Homo habilis* by palaeontologists. The prehensile hand, the brain and sight-motor coordination were ready for, when self-consciousness should arrive, and with it will, conscious intention, argumentative language, critical reflection and the deliberate correction of mistakes, the full coming into being of *tékhne* should happen (4). The Biblical worldview also links the human being with technical work. In Genesis, humankind is entrusted with the task of looking after Nature (Genesis 1, 28-30) and is given the task of working as something specific to the human beings (Genesis 2, 15).

Science, on the other hand, is a recent reality, the product of humanity's historical development. Moreover, there is no necessary connection between science and *tékhne*. Several civilizations have known technological development with hardly any connection with science (China, Rome, pre-Columbine cultures, the High Middle Ages in Europe, and others). Conversely, the science of ancient Greece had almost no technological application. The link between science and *tékhne* arose at a certain moment in history, between the closing centuries of the Middle Ages and the first ones of the Modern Period, and within the context of European culture. Perhaps the best propagandist of this link was the philosopher Francis Bacon (1561-1626). It was thought then that the technological applications of science would bring progress and welfare. From that moment on it becomes correct to speak of *technology*, that is, of a type of *tékhne* aided by science and resulting from its application. Today, science also depends on technology. Without computers, without sophisticated instruments of observation, science would not be possible. With this mutual dependency we have gone beyond technology and now begin to speak of *techno-science*. Science and technology now form part of one and the same activity, *techno-science*, within which distinctions may only be made on the conceptual level.

Today we know that the symbiosis of science and *tékhne* has brought major benefits, and has also led, especially recently, to reasonable worries. Thence there derives the present crisis of modernity. Now our task consists not only in dominating Nature technically, but also in dominating the domination of it by technology.

Philosophical and Ethical Considerations. The development of technology has entailed drastic changes,

especially in the field of new materials, energy resources and the processing and communication of information. We live surrounded by artefacts and we have altered our relationship with the natural world. This new ontology, and the consequent changes to our way of life, have been analysed by philosophers of technology. The most classical and seminal writings in this regard are those of Ortega y Gasset (3) and Heidegger (5), to which there have been added those of Mumford (6), Rapp (7), Winner (8), Ellul (9) and Mitcham (10). All this obliges us to rethink the relationship between the artificial and the natural. Traditionally they were taken as separate domains of objects (a tree is natural, a table artificial). In this division, living things fell without fail on the side of the natural. This division is no longer useful. Many living things are partly natural and partly artificial. It is more accurate to think of the artificial and the natural as two types of cause converging on the same objects and processes (a tree, selected, cultivated, grafted and even transgenic, has much of the artificial, while a table has its natural part, at least as far as its basic raw materials are concerned). Many living beings also participate in the artificial and so it has been since Neolithic times, when the growing of plants and domestication of animals began. But today, human intervention in living things is very far-reaching and profound thanks to biotechnology. On the other hand, thanks to robotics, certain artefacts are beginning to emulate characteristics of living things.

Nevertheless, it is very important to determine how far the artificial goes in living things (cells, organisms and ecosystems). It is important because our ethical responsibility goes as far as our capacity for action. It is the degree of artificialness that determines our degree of responsibility. As our technological power has grown in a spectacular manner, so has our responsibility—as Jonas states (11). Nevertheless, the value of beings has nothing to do with their artificialness, but with their “livingness” and the kind of living thing in question. An animal has the same value from the moral viewpoint whether it has been genetically modified or not. And, of course, a human being has the same value and dignity from the embryo on, however biotechnologically it was conceived. On the other hand, a robot is in no way a living being, nor does it have the same moral value as one, however well it emulates one. The key is in the inevitable ontological difference between simulation and the genuine production of intelligence or life.

The extreme degree of ethical responsibility is reached when we try to intervene technologically in the human being itself, for it also possesses value and moral dignity in the extreme. Some of these interventions are of a therapeutic nature. Others, though, verge on eugenic selection or manipulate human beings as though they were mere laboratory material. We are already acting on the genome and the nervous system, and biotechnological interventions must always respect the human condition, that is, personal dignity and freedom.

The day may come when our technologies are able to shape the genome and the brain. Will we be able to take on such a degree of responsibility? From the myth of Prometheus to Mary Shelly's *Frankenstein*, taking in *The Sorcerer's Apprentice*, stories warn us of the danger of what we

might call *techno-hybris*. But an antitechnological attitude along Neo-Luddite lines does not seem reasonable, either. Where is the limit of equilibrium? In no case should we play with the basic anthropological features that make genuinely human action possible. This would be tantamount to playing God, to taking on total and absolute responsibility for people's destiny, a responsibility that is not ours to take and for which we are not prepared. When our desire to intervene or to experiment starts to affect human faculties, intellectual and moral ones, which actually permit experimentation and technology, then it becomes something extremely dangerous, for it will be irreversible. Regarding the bases of human nature we must definitely say *noli me tangere*.

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