Moral Issues and Technology
Possible Lessons from Ancient Greece

T. P. Tassios
National Technical University of Athens

Preamble
According to the organizers of these “Dialogues,” the legacy of ancient Greek culture may still potentially offer solutions to problems faced by the world today. Something similar happened during the Renaissance period, when the Greek culture was used both as a source of information, and as inspiration for and expression of new ideas. I subscribe to the hope that a dialogue between ancient Greek experience and modern situations may indeed be productive, and I propose that we test this expectation in the case of moral aspects of the technological process.

1. Mythology
It is nowadays recognized that mythology does reflect reality slightly more than was thought in the past. This is why it seems profitable to explore ancient Greek mythology on the issue of “morality and technology” as well.

a) The passions of deities
The view that technology does not produce immorality, but merely accentuates previously known moral issues, seems to be confirmed also in the case of the various automata described in Greek mythology.

Hephaistos, for example, invented a contrivance to entrap the illicit lovers Aphrodite and Ares in bed (Odyssey Θ 272–281). This understandable reaction by a cuckold, however, does not match Hephaistos’ other invention: two automata of “almost real naked beautiful young girls” helping him to walk (Iliad Σ 417–420). Such seems to be a very early relationship of high tech with some ethical issues.

A giant automaton, the metallic android of Greek mythology, the famous Talos, patrolled the coast of Crete thrice a day, and protected the kingdom by throwing rocks at any foreign ship approaching the island. Talos, however, was mechanically disabled and destroyed by the witch Medea, suffering from Jason’s infidelity. In this case, however, technology was not to blame.
b) The Protagorean Prometheus

The Protagorean version of the Promethean myth probably expresses an important development in the Greeks’ views on gods and men: it is no longer the cruel παιγνιον between Zeus and Prometheus (who was called for this purpose)—a game deciding the fate of men through successive devices such as the artful distribution of the sacrificial animal or the concealment of fire in the hollow of the ash tree (Hesiod *Theogony* 548, 566).

On the contrary, in the version of the platonic Protagoras, we are dealing with a series of events of surprising rationality for a myth. Prometheus, a legitimate partner in the creation in the present version of the myth (Plato *Protagoras* 320d), makes a critical assessment of the outcome of the first creation of man: “Prometheus sees humans naked, barefoot, unarmed, and nestless” (321c). That is, he ascertains the Need, the mother of all technology. And how does he respond to this realization? As a partner in creation, he saves the situation with a correction of the first creation, by offering *expertise* and *energy*. Here, the mythical-religious projection of the known complementarity of technology to nature is obvious. And indeed, “thus, prosperity in man’s life is produced” (322a); survival has been achieved—and such a fundamental potential for technological advancement can hardly be underestimated by developing countries today.

However, consequences of major sociological importance ensue. Thanks to technology and the prosperity that followed, people “wished to gather together and be saved by building cities” (322b); civilization had begun—together, alas, with all its failings: “They were wrongdoing to each other and then they were dispersed again and destroyed” (322b). Thus the city appears as “the Tree of the Knowledge of Good and Evil,” as a path to Ethos in the old tradition of the East.

Then Zeus, in the face of this second mistake of creation, takes upon himself a further correction, and complements the creation of man with another element, the necessity of which was revealed after the consequences of technology became evident: “Zeus sends Hermes to bring to men the feeling of responsibility and justice” (322c).

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1 So, the city is turned into a paradise of a trading people, and replaces conceptually the heavenly garden of the nomadic and pastoral people in the Old Testament.
Here we have the earliest historical warning of the “side effects” of technology—though in this respect technology acts only as an agent accentuating disproportionately the intensity of existing moral problems. And this is another lesson to be learnt from Greek antiquity.

It is also of great importance that, after the manifestation of the human immorality in the city, people were leaving “Paradise”—but not due to divine intervention, as in the case of the Old Testament. On the contrary, God, instead of “punishing,” accepts his own omission as evil, and offers the therapy himself. So while the first scenes of creation are similar to those of the Hebrew tradition, the final position of the Greek god seems to be more human. Even more so as to Hermes’ (rather senseless) question “to whom shall I bestow these new (moral) goods?” the father answers (not without a slightly reproving tone perhaps) “to every one—since cities could not be established if only few were taking part” (Plato Protagoras 322d); an early lesson in democracy, possibly.

Finally, perhaps the even more philanthropic utopia of Aristotle, who envisioned the liberation of our wretched kind from labor two millennia before Campanella, belongs here: “If a machine (being ordered or having a foreboding) were able to perform its own work, engineers would not anymore need servants nor rulers need slaves” (Aristotle Politics 1253b35).

Here, technology is offered as a remedy against the immorality of slavery—an option frequently underestimated nowadays, under the pressure of stereotyped elitistic technophobic thinking.

2. Technology and Economy

a) Moral aspects

I wish to discuss first the moral aspects of a persisting prejudice against people practicing technology. We are witnessing this strange phenomenon in some modern societies, where politicians should preferably hold a degree in law or economics—as if technology were not one of the basic components of actual political decision-making.

Xenophon can be considered as the only (somehow analogous) ancient Greek example of such a prejudice: he maintained that Technicians were not capable of taking part in political affairs “because a technical job ruins their souls” (Economics
I will not comment on the oddness of the justification Xenophon uses; suffice it to say that such a prejudice is nowhere else repeated in Greek literature. Besides, Plato himself, despite his idealism, admired the Technicians as “creative people, starting from the conception of a product and reaching harmony through a synthesis” (Plato Gorgias 503e, 504a).

b) Technology and slavery

Technology and slavery is another ethical issue frequently addressed. In the case of ancient Greece, we should first examine the question of the possible rivalry between technological development and slavery. I propose that the Greeks’ innate technophilia (since Mycenaean times, up to the technological peak of the Hellenistic period) was the motive force behind technology’s continuous development, for purely economical reasons, independently of the availability of slaves: slaves were only entrusted with the execution of lower quality work, and the time needed was not always available. Consequently, the invention, for instance, of dewatering machines, military machines, sophisticated measuring devices, etc. would have probably taken place anyway, independently of the use of slaves. On the other hand, the cost of acquisition and living expenses of slaves in the Greek cities was increasing disproportionally. It is therefore not surprising (i) to hear Aristotle dreaming of his utopia of replacing slavery with robotic machines (Politics 1253b35), or (ii) to see Heron of Alexandria replacing the slave operator of the ὑδραυλις pump with wind energy (Pneumatics 1.43)!

A second moral aspect of the slavery/technology interface in ancient Greece was the potential of technical activities to improve some slaves’ social status, thanks to their capacity to specialize in a technical field. Pseudo-Xenophon (Constitution of the Athenians 1.11) describes the class of “slaves living apart,” i.e. slaves authorized by their masters to live outside the house and exercise a technical profession for another employer, keeping their wages for themselves, except for a certain percentage paid to the master. Thanks to their specialization in technical matters, slaves were therefore able to improve their lot and their status, or even succeed in redeeming their freedom. In some cases, highly specialized slaves were emancipated.
and inherited factories, as in the cases of Lysias’ father’s iron industry and Demosthenes’ father’s weapons factory.²

From these historical Greek data, I propose we draw an example of broader significance: developing countries may find in technology a great ally, not only in development but also in opportunities for social justice.

c) Military technology

Military technology, with its unrestricted financial means, cannot serve as the best area in which to seek moral examples. But it may be interesting to mention some cases in ancient Greek history where technology disproportionately accentuated the consequences of war operations—and where this could be considered as “immoral” if compared to a direct man-to-man fight.

The systematic deviation of a river by the Spartans, resulted in rapid erosion of Mantineia’s defense walls, without much fighting.

The _helepolis_ (the multistoreyed tank), full of protected soldiers and catapults, captured cities from above the walls, in Sicily, in Rhodes, etc. These military technological achievements were backed by very robust economies. But in this field, modern man hardly needs to take any lesson. We have our own monstrous technological achievements—like the atomic bomb or intercontinental missiles—undermining the economies of the countries that own them well before they destroy the enemy’s land.

d) Monopolies

Monopolies may be more easily imposed by people owning a special technology. This was, for instance, the case of the great mathematician, engineer, and philosopher Thales of Miletus, who for one year rented all the olive presses of the region, and earned a fortune out of this monopoly (Aristotle _Politics_ 1259a12–17). A more bold speculative proposal was submitted by Pythokles (fourth century BCE) to the Athenian State, namely to monopolize the sale of the lead produced in Lavreion, and thus increase its price by 200% (Aristotle _Economics_ 2.1353a:15–18). In modern

times, technology assessments always seek to instate alternative technologies, in order to minimize monopolistic tendencies.

e) Technology-related corruption

Technology-related corruption may be another interesting field in which to look for possible ancient Greek examples. My first example will be the case of Dionysios the Elder, tyrant of Syracuse (fourth century BCE) who, preparing his final attack against the Carthaginians in Sicily, paid extremely high fees to military engineers: non-Greek engineers were also recruited, with even Carthaginians among them (Diodorus Siculus Library of History 14.41.3). Money before patriotism, that is.

Another example is related to one of the most profitable technological enterprises in history, the mining and metallurgical industry at Lavreion, owned by the ancient Athenian State; many hundred tons of silver were produced there, through the centuries. Obviously, the most basic fuel for this industry was wood, feeding hundreds of metallurgical furnaces; it was rare, it was mainly imported, and it was expensive. And here comes the almost unbelievable story of corruption of a rich man, Medias, commander of a trireme of the Athenian fleet: disobeying the orders given to all commanders patrolling the Euboean Gulf to return immediately to Piraeus, Medias sails to the Euboean coast, loads a large quantity of wood onto his military ship, and goes first to Lavreion to sell his load, before arriving (with considerable delay) in port (Demosthenes Against Medias 167). Here again, in a highly technological environment, money trumps duty!

It is not too encouraging to observe that, nowadays too, selling high-tech products is frequently the cause of corruption, even in developed countries.

f) Aristocracy

Finally, it is interesting to note that whenever the economy of a small Greek city was based mainly on technical professions, there was no room for an aristocracy. In fact, in such cases, technical specialization itself offered a “knowledge-capital” to each single citizen, as opposed to masses of unskilled agricultural workers who would more easily submit to “protection” and despotism. Trading of technical products in exchange for agricultural goods allowed such small cities to settle in less fertile areas, less enviable to possible invaders. Moreover, there was not enough accumulation of wealth to attract foreign usurpers, and consequently a simple
citizens’ army was sufficient for the city’s defense, without recourse to aristocratic military leaders. Although there are not many examples of such emblematic cases in Ancient Greece, it is worth noting the most characteristic of them, that of the island of Pithekoussai (eighth century BCE), a colony of the Euboeans in the gulf of Naples.

3. Technology and Environmental Moral Issues

Although technological development and overpopulation did not yet threaten the planet, it seems that ancient Greeks already had a sense of unease regarding their relationship to nature. Let us then briefly examine this category of data.

a) Mythology

In mythology first, we note that the “Mother of all gods,” Gaia (the Earth), has fabricated a technical product (a giant, extremely sharp steel sickle) as a weapon against oppressive Ouranos (the Sky), to free herself and her children; technology as a protection of the Earth, perhaps? On the contrary, technology will play a threatening role in the case of the mythical king Erysicthon: his greediness to build enormous palaces, consuming more and more timber cut from the sacred forest of Demeter, was made insatiable by the goddess, and he ended up devouring his own flesh. We might therefore coin the term “erysicthonism” for our modern tendency to build excessively, to the detriment of the environment.

b) Classical times

In classical times, we note the general view of pre-Socratic philosophers that “all beings belong to a common world.” This view permeates the entire Greek philosophy: “A commonality connects sky, earth, gods, and humans” (Plato Gorgias 507e, 508a). I maintain that such a persisting holistic sentiment could also be helpful in today’s ecoproblems.

Moreover, Socrates appears to deny any natural difference between humans and animals, since they may mutually be transformed into each other through reincarnation (Timaeus 92b). Plato will additionally introduce vegetation into this society of living beings: plants “are another kind of animals,” including “a substance akin to human nature,” he says (Timaeus 77a).

I took the liberty of starting this paragraph with such generalities, in order to allow a better appreciation of Plato’s deep interest in the consequences of some
technical developments against nature. In fact, in *Kritias* (111g), Plato recalls the good old times, when Attica had intact hills full of forests, but deforestation resulted in soil erosion and loss of rainwater into the sea (111d).

c) The Hellenistic period

During the Hellenistic period, following the surprising Aristotelian view confirming the existence of soul both in animals and plants (*Aristotle De Anima* 1.5.411b27–29), let us recall the very modern opinion of Theophrastus, who considered technology as a “perfection of nature when it is incomplete and [is supplemented] by means of technology” (*On the Causes of Plants* A 16.11)! Theophrastus himself, however, was aware of the fact that “violating Nature is dangerous” (*On Plants* 4.14).

4. Transparency and Public Works

The wealth of the Greek cities was rapidly translated into many public works. Their management, however, had to observe the rules of the democratic regimes extant across Greece after the classical period. Transparent use of public money, as well as open procedures for selection of designers and contractors, contributed to further improvements in the field of construction. In some of our countries, however, the public works sector is not the best example of transparency; that is why recalling ancient Greece may be profitable.

a) Call for bids and selection of contractors

The Assembly’s resolutions, engraved on stone, regarding large public works were also used as a “call for bids.” Otherwise, oral announcements, as well as special envoys sent to other cities, served to advertise the call.

Specialized technicians and contractors (εργώνες) coming from abroad to demonstrate their skills or to bid were entitled to receive their travel expenses, independently of the competition’s final result—a very intelligent provision: more and better bidders were participating; thus both quality and economy of the work were enhanced. Examples of this provision are found in the contract of the
Epidaurian tholos, which involved fourteen contractors from several Greek regions (Epidauros, backface lines 50–55; EMAET 2002:24).

After the assignment of important works to a contractor, one or more Guarantors (εγγυηταί) were needed for each contract; their names and affiliations were mentioned in the resolution of the Assembly (βουλή) of the City. Obviously, the guarantors were citizens, whereas contractors were most frequently μέτοικοι (settlers from other towns) or just specialized contractors invited from other cities; this was for instance the case of Athenians working the marble (from Mount Penteli) in Epidauros.

Apparently, a contractor’s previous experience and reputation were taken into account. In the case of the Epidaurian tholos, several well-known metal technicians were repeatedly appointed by the authorities—some of them (like Nikostratos from Argos and the Athenean Molossos) having worked also on the construction of the temple of Apollo at Delphi (Tsuli M., EMAET 2002:30).

b) Supervision and fines

In the specific case of hydraulic works, the Επιμεληταί των Κρηνών (the “curators of aqueducts”) were responsible for supervision. In some other cases of large and durable works, a committee of managers was assigned as job directors; their generic name in Epidaurus was εγδοτήρες, or, depending on the kind of construction they were dealing with, they were called ναοποίαι, θυμελοποίαι, θεατροποίαι, etc. This committee had several responsibilities:

Locating and purchasing materials (even abroad)
Collaborating with technicians and contractors
Collecting the penalties imposed on some contractors and suppliers

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4 Examples: Κηφισοφών (from Afidnes) in the case of Eleusis (line 34; EMAET 2002:64), Ηρακλείδης (from Oēs) in the case of Erechtheion (line 101; EMAET 2002:54), and six names of Eretrian citizens in the case of the Ptechai lake drainage (Ptechai, line 41; EMAET 2002:74).
Except for the BOT (build, operate, and transfer) works (like the Ptechai drainage), the whole construction was split into several components; thus several contractors worked on the site. The concept of a general contractor was not frequently used. Thus, the need for continuous and highly specialized supervision was obvious. Except for the quantity survey and financial administration undertaken by the committee, purely technical supervision was performed by the engineer (αρχιτέκτων) and his staff (also called αρχιτέκτονες). In most cases the engineer was the designer himself; he was also frequently supposed to explain to contractors numerous technical details of his project or even to show them his models for specific works. In some specific works, the supervisor (επιστάτης) was constantly present during the relevant technical activity. This was for instance the case of the preparation of the copper alloys used for the construction of the poles of column drums (Eleusis, lines 28–31, EMAET 2002:64).

One of the characteristics of the system of supervision used in public works in ancient Greece is the very severe and repetitive penalties imposed on contractors. These disproportionately high penalties may reflect rather severe lapses in business ethics:

Lusiadas paid 540 drachmas because of delays in cutting the black stones for the wall-stanchions (Epidauros, line 74; EMAET 2002:24). Note that the same person was fined three times during the building of the tholos of Epidauros (c. 370 BCE)! Megakleidas, the contractor for the transportation of marble from the harbor to the temple, received in advance the sum of 1775 drachmas (Epidauros, line 68). Nevertheless, the same person paid the sum of 1070 drachmas (i.e. 60%) for delaying this transportation (Epidauros, line 100)!

c) Detailed and publicized accounts

It is remarkable that in all cases (at least under democratic regimes in Greek cities), spending of public money was thoroughly followed by the authorities. To this end, a detailed system of accounting was devised. Continuous control of finances was

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5 Incidentally, those supervisors were also assisted by secretarial facilities: A ὑπογραμματεύς (“undersecretary”) on the job site of Erechtheion (line 111; EMAET 2002:54) received a salary about eighty percent of the supervisor’s.
carried out by a person named Κατάλογος (in Epidauros), Απόλογος (in Thasos), or Λογιστής (in Attica). This person was a representative of the Assembly and had to perform this duty only for one month. His name is always reported in the written final accounts of the public work. These persons checked the finances of the entire city; and since the city was financing all public works, the control process encompassed the payments and expenses of these works too.

It is impressive to see that every payment made by the managing committee was carved on a stele (“stone archive”) and publicly exhibited forever, during and after the construction period. Such archives were incorporated in a partition of Erechtheion (Kritzas C., EMAET 2002:59). It is also characteristic that even small money was systematically recorded: for example a payment of 3 oboluses (0.5 drachmas) to workers to put down a scaffolding at Erechtheion (line 155; EMAET 2002:56). This is also an indication of the “ethos” of public works management in ancient Greece.

Based on ample written evidence, we may conclude that in ancient Greece, not only was technology well advanced, but its practical application in public works was carried out in a meticulous way, making use of most of the administrative, financial, and quality-assurance methods known today, thus contributing to considerable transparency and discouraging possible corrupted relationships, currently rather frequent in this economic sector.

4. Possible Lessons to be Learned

Technology does not “create” new moral problems; it merely accentuates—(sometimes disproportionately) existing moral issues, both in terms of their intensity and their number. Besides, economic development that is based mainly on technological growth encounters several ethical dilemmas; most of them may have important consequences of an economic and political nature. That is why moral issues related to technology continue to be of interest to modern societies. Hopefully, some of the ancient Greek examples mentioned above may also be useful in facing some of these issues today:

Regarding individual morality related to technological developments, we have shown (1.b above) that humans are not always ready to handle the occasionally controversial consequences of such developments.
Collective responsibility ("social morality") was challenged on several occasions in ancient Greece in relation to technology, economy (2.a, b, c) and the environment (3.a). Interesting solutions were given, and some examples may be profitably followed.

Managerial and administrative measures (2.c, d and 4) related to technological activities were successfully taken in some cases in ancient Greece. We should recall, however, that despite their possible similarities to ancient situations, problems facing us cannot be solved merely by copying an ancient solution. What is being suggested is only a possible improvement of our decision-making capacity, by means of a more systematic study of the ancient Greeks’ long experience of similar conditions.