TECHNOLOGY AS A POSSIBLE CONTRIBUTOR TO IONIAN RATIONALITY

T.P. Tassios
Nat. Tech. University, Athens

Preamble

Since a discussion on the question of origins of the Ionian Greeks' scientific spirit now starts afresh, it is reasonable to first legitimise the question itself: Everything has a cause, including radical changes of human attitude towards Nature and towards our own concept of Being; by considering such an activity to be "philosophical", one cannot place it beyond causality.

The obvious difficulty in this particular case, however, is the absence of any explanatory written evidence, contemporary with this "epistemic" turn in Ionia. This is why only "weak" working hypotheses may be formulated on this issue; at the same time it must be admitted that we do not possess many data to help us check the validity of such hypotheses. Therefore, some tolerance is begged for – and it is only in this spirit that the present paper proposes possible explanations based on "analogical" thinking and using the rather loose criterion of mere "suitability" in testing working hypotheses.

My intention is to examine the following probable steps, realised in some Greek cities of free-thinking settlers[1]:

– Initially, some doubts about the validity of traditional historical **knowledge** emerged.
– Next, criteria were sought regarding the effectiveness of technical **knowledge** in producing artificial goods.
– Subsequently, under the favourable influence of these changes, a two-fold path was probably followed: First, the creation of the Cosmos was conceived as possibly a simulation of the "dēmiourgia" of technical goods. And, second, inquiries about the validity of technical **knowledge** were also expanded to the field of natural phenomena.

I shall now proceed to examine these three putative steps one by one.

1. Doubts regarding the validity of historical knowledge

I take the liberty to start with a rather remote analogy: the Greeks' view before the 6th c. BCE about the truth of available **historical** information. In the absence of an established rule for checking the validity of historical information, mythical thinking tended to resort to deities as sanctioning its truth. According to Homer (*Iliad* II.484), the Muses were thought to be the only sources of historical truth – as opposed to us humans, "who know nothing".

1 In fact, it is reasonable to assume that such people would by character be opposed to unaccountable mythical authorities, such as ruled the cities where the settlers had escaped from.

Yet, a little later, a relativistic alternative is introduced by Hesiod (*Theogony* 27-28) who hears the Muses admitting that "we know to speak **many lies** similar to the truth, but whenever we want, we do know how to sing the truth". This rather impious statement is frequently considered as moralistic criticism against the false statements contained in poetry – as a kind of precursor of Platonic opinions, three centuries later. However, we should recall that the Muses were daughters of Mnēmosynē (Memory); and since, in the relevant passage, Hesiod (like Homer) is simply offered this gift of memory to write history ("to celebrate future and past events", *Theogony* 32), the aforementioned explanation may seem rather irrelevant; it is not connected to the main issue, memory. Instead, an alternative meaning could be given to this text of Hesiod, reflecting **human** doubts about the validity of traditional, 'Muse-inspired', narratives. After all, one or two centuries later (~ 600 BCE)[2], in the *Homeric Hymn to Hermes* (552-563), a more practical explanation of this inconsistency of the Muses is given: When they are satiated (having eaten honey), they eagerly speak the truth, but if they are deprived "of this godly food, **they lie**". This, we might interpret, in less mythical terms, as follows: self-preservation (i.e. eating) must come first, and self-confirmation (the moral need to speak the truth) cannot occur without "external" goods. I won't necessarily insist on this somehow vulgar (but so human) explanation, but I would argue that this persisting concern of the Greeks about the veracity of the Muses, may be a first sign of a gradual change of mind in favour of checking the truth of knowledge.

Besides, just after this time, in the 6th c. BCE, the harsh opinion of Milesian historian Hekataios seems to confirm this view – with respect to historical knowledge: "I write these things only if they seem true; because the histories told by the Greeks are unconnected and completely absurd, in my opinion" (*FGrHist* 1 F 1). The vocabulary applied by Hekataios to the field of historical knowledge is already epistemic, as if he were talking about the field of natural phenomena. My preliminary conclusion here would be that, between 8th and 6th c. BCE, a broad concern seems to emerge regarding checking the validity of knowledge in History. If this is so, it is easier to maintain that (by way of analogy) a similar mental attitude could also obtain, by the 6th c. BCE, regarding the validity of other specific knowledge. In other words, the preceding concern about the validity of **History** may have reasonably opened the door for also doubting the validity of knowledge regarding **Technology** and, later on, regarding more specific phenomena of **Nature.**

2. **Checking the validity of technical knowledge**

a) In the preceding section, I proposed that, as early as the 8th c. BCE, the absolute confidence of Homer in the truth of myths was shaken; moreover, around 600 BCE, humanised criteria regarding the veracity of the Muses were formulated. A radical change in the Greeks' spirit towards historical knowledge

2 A. Vergados: *A commentary on the Homeric Hymn to Hermēs*, Doct. Diss., Dept. of Classics, Virginia University, USA, 2007: p. 27.

seems to have taken place, if we believe the great historian Hekataios who rejected mythical narratives.

If this was true, at least within some Greek communities (as in the case of the Ionian cities, founded by free-thinking settlers), it is reasonable to expect that a s i m i l a r change of mind could have occurred in relation to other categories of knowledge, too. The oldest and most useful set of knowledge was about Technology: whenever a human Need cannot be satisfied by available natural means, artificial means are invented to this end (Fig. 1). This fundamental technological process was followed since the beginning of time in the everyday life of mankind; empirical Technology had flourished in Mesopotamia, in Egypt and in the Mycenaean civilisation.

It is interesting to consider the various sub-categories of knowledge used in the technological process: (i) knowledge about materials, (ii) skills in using tools, and (iii) experience in making appropriate combinations in order to invent the means to satisfy a particular Need. This is a complicated and delicate process which for hundreds of thousands of years ensured the survival and progress of mankind. From small artifacts and up to giant land-reclamation works, pre-historic humans gained confidence in the technological process to such an extent that the Greeks dared to think even of robots (the Phaeacians' ships). Thus a complicated technical system was constructed each time, with a completely new product at the end – new, that is, when compared to the existing objects of Nature. Humans were proven to be **creators**. But their artifacts were feasible thanks to the natural behaviour of natural materials, submitted to external mechanical, hygrothermal or chemical actions. Thus, it was shown that, despite their complexity or size, technical products were conceived, constructed and functioned **without any mythical** interference.

I submit that because of the (albeit out of scale) similarity between some objects/systems in *physis*[3] and objects/systems in ***technē***, it is reasonable to assume that certain technically minded people were encouraged to (i) liberate themselves from Myth, and (ii) imagine cosmic objects/systems being created in a way *similar* to that for functional technical products – that is, in a rational way. I will further elaborate on this in paragraph…

*** NA BPEΘEI !!!

b) On the other hand, it is certain that, each time, several failures would also occur before a successful technical solution became feasible. Now, given the basic importance of technology in everyday life, it is reasonable to think that, sooner or later, the question "Why did this failure happen?" was raised. Thus, it is likely that the issue of the **effectiveness** of technical knowledge emerged much earlier than any theoretical question regarding the **truth** of knowledge.

3 The tragic poet Moschion (~ 4th c. BCE) attributes Technology (i) to the pressure of the Need and (ii) to the experience offered by the Nature (*Tragicorum Graecorum Fragmenta* 97 F 6 [ed. Snell]).

My intention is to elaborate on this intellectual inquiry regarding the "effectiveness of knowledge", and subsequently to argue that (most probably) this also opened the way to a broader quest for rationality, after confidence in human intellectual capacity was gained. After all, every knowledge is of a **unique** nature; it is only its use that can distinguish it as either practical or theoretical (Plato, *Philebos* 55d, used the terms "technical" and "cultural"). Consequently, doubts about one category of knowledge can easily spread to the other category.

It is true, however, that only an **overall** check can be carried out, regarding the various sub-categories of knowledge used in solving a particular technical problem:

If the intended final result is not achieved, one should ask "Which part of the composite technical knowledge used was wrong?" But this is not easily answered: while only one datum is known ("the process was not effective"), the unknowns are numerous (materials, manufacturing, the manner in which they were combined). However, checking the effectiveness of technological knowledge was so vital that it had to be performed again and again, irrespective of the difficulties just mentioned. This is also reflected in Greek mythology, where Technology played a fundamental role: (i) The very basic myths of the *Theogony* are permeated by technological applications: Gaia was liberated from the suffocating embrace of Ouranos by means of a steel sickle that she had manufactured herself[4] (Hesiod, *Theogony* 161). Zeus put an end to theomachy by means of a technical innovation offered by his allies, the Cyclops' smiths: the thunderbolt (Hesiod, *Theogony* 141). (ii) The Greek *dodekatheon* (12 gods) included two technical divinities, Hephaistos and Athena, offering their services to, and exercising their technical powers in favour or against both[5] gods and mortals.

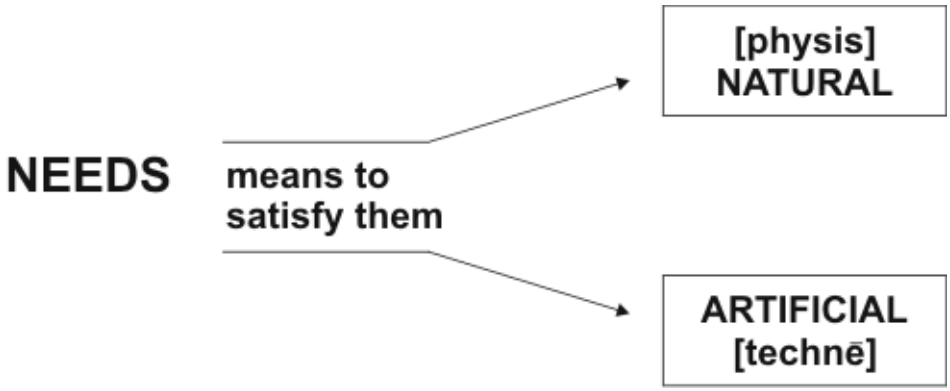

Fig. 1: *Technology emerges when natural means are inadequate to satisfy a Need.*

4 This technological solution does not appear in the corresponding Babylonian myth, *Enuma Eliš*, where the old god Apsu is killed during his magical sleep.

5 Hephaistos was even able to tie Ares by means of automatic chains (Odyssee viii, 274), whereas Athēna was the first to teach human technicians how to construct carriages and chariots (*Homeric Hymn to Aphrodite* 5.l, 12).

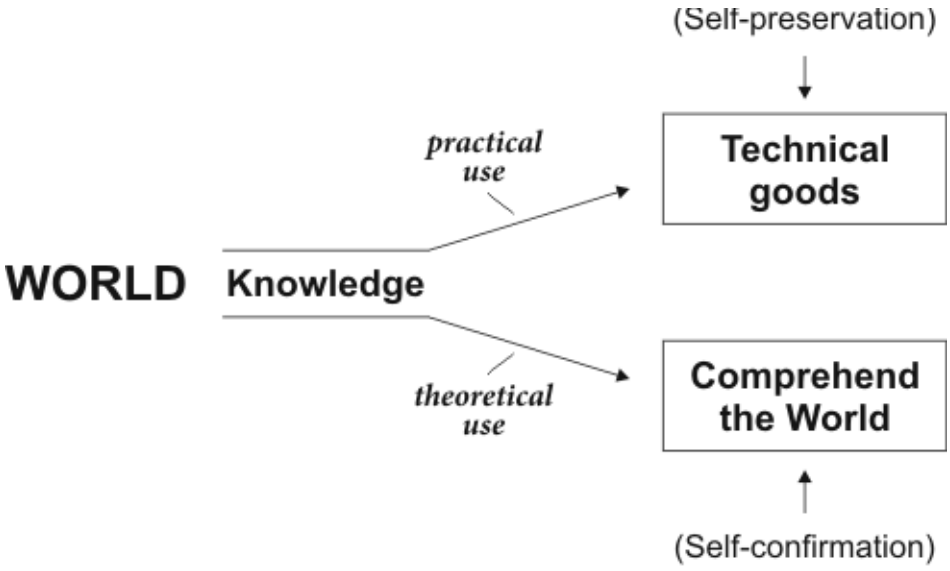

Fig. 2: *Uses of knowledge to serve broader existential needs.*

Such was the recognized importance of Technology to the Greek tribes; note that, in the aforementioned mythical cases, knowledge towards the satisfaction of Needs was always effective – as expected, since the entire enterprise was in divine hands.

But, as soon as h u m a n s start to be implicated in the process, **doubts** above the soundness of knowledge become inevitable; failure cannot be excluded:

- In the last version of the Promethean myth (Plato, *Protagoras* 322c) technical know-how and energy[6] that were offered by the gods to the humans in order to remedy the latter's physical weaknesses, resulted in the creation of rich cities – but created another problem: humans were so inimical to each other that finally they were again dispersed, going back to their previous misery. The test of the use of knowledge to satisfy human needs had **failed.** In the first phase of this 'historical' test, engineering proved to be effective; however, the final (social) engineering was not successful. The test showed that technical knowledge was 'wrong' (i.e. ineffective) without the provision of "respect and justice"[7] as well.
- In the case of the mythical human effort to fly, appropriate materials were used by Daidalos, together with the correct functional specifications; but Ikaros' knowledge about thermal resistance of the glue used, proved to be insufficient.
- Similarly, the giant robot Talos (mythical protector of the island of Crete) was destroyed when its technically weak point (a small valve in his foot) was disclosed by a clever woman (Morford et al., 1971, p. 527).

6 Τεχνογνωσία και πύρ.
7 Αιδώς και δίκη.

It therefore seems that the mythical background of archaic narratives included both successful and unsuccessful cases, regarding the **effectiveness** of the use of knowledge; stated differently, an indirect check of acquired technical knowledge is insinuated in the myth. This probably reflects a broader attitude of the Ancient Greeks. It was not an explicit –a "strong"– questioning of the validity of knowledge in general, but it was perhaps sufficient to produce **suspicions** about the possibility of error in the knowledge used to comprehend the World.

3. **Technically minded Milesians**

The exegetical line followed in this paper (in sections 2a and 4a) will be partly corroborated by the practical interests of some Ionian philosophers. Thus, at least those philosophers familiar with Technology may have an additional incentive to be inspired by the technological process and its problems when they will describe the Cosmos or when they will attempt to rationalise natural knowledge. Here is a brief reminder of Milesian philosophers' technical interests:

a) I maintain that the manner in which Plato expresses his admiration for **Thales** (as an engineer, rather than as a mathematician) may be significant for the analysis attempted in this paper: "[The] deeds of an ingenious (σοφός)[8] man [and] many technical inventions, as in the case of Thales the Milesian", [*Republic* 600 a]. It seems that Thales possessed some maritime experience, since he had suggested to Ionian sailors the importance of the small stars of the Wain [DK 11 A 3a], and had measured the distance of ships out at sea [DK 11 A20]. It is also said that he had written a book called "Nautical Star-guide" [Kirk et al. 86]. On the other hand, the combination of his meteorological and technological knowledge allowed him the possibility to predict a large olive-crop and to pay deposits on all the olive presses in Miletus and Chios, finally making a large profit from this acute business move [Aristotle, *Politics* 1259 a9]. The most emblematic of his technical endeavours, however, is the deviation of the Halys river behind a temporary campsite of the Lydian army, so that the army could pass through a dry riverbed, given the unavailability of bridges [Herodotus, I.75]. I estimate that, for 10,000 soldiers camping on a land-strip 40 meters wide, the excavation of a new riverbed 1 km long would be needed, together with a large earth dam upstream. This is a large-scale civil engineering work, necessitating previous experience, design knowledge and management capacities. Besides, "in all likelihood, Thales and probably also his most famous pupil, Anaximander, were responsible for the whole re-planning of Miletos in the earlier 6th c. BCE" (Herda, 2016; Ex Ionia Scientia conference, Athens, 12-14 De. 2016).

My impression is that, in fact, the elder of the Ionian thinkers was much influenced by Technology in its broadest sense.

8 The greek term «σοφός» in this context had the meaning of a man experienced in a technē: cf. "Σοφοί technicians have fitted [items] together", (Pindar, Pythian 3.113). Or "You would not be σοφός yet, knowing only these from music" (Plato, Philolaos 17c).

b) There is no direct evidence about possible influences of Thales' technological mentality on his Milesian successors, except for **Anaximander.** He showed additional technical interests, constructing clocks and models of the celestial globe, and drafting a map of the earth [DK 12 A1]; he also warned the Spartans that an earthquake was imminent [DK 12 A5a].

c) Regarding **Anaximenes**, there are no indications of direct technical activities; one may however appreciate his deep knowledge of multiple changes in the condition of matter under different mechanical and thermal actions.

I wish to close this short section by subscribing to the opinion of Kirk et al. (p. 78): "Such versatility (activities as statesman and engineer and astronomer) seems to be typical to the Milesian thinkers". I shall now argue that such technical familiarity will facilitate (i) concepts of more consequential and non-deistic cosmic narratives, as well as (ii) the emergence of doubts about the validity of knowledge. That is why R. Hahn "urged readers to see Anaximander and Thales in the community-of-practical-interests" (2010, p. 179).

4. Technical "*dēmiourgia*" as a possible model for creation of the Cosmos

a) To a technically minded thinker (as it is believed the Milesian philosophers were), the creative process is well known: A final technical good is the product of a concept and of a subsequent synthesis of materials, submitted to natural actions. If one is familiar with this process (repeatedly applied in practical life), she or he may reasonably think of it when they come to consider the creation of the Cosmos as well.

Note that Plato himself applied this kind of **analogical** thinking to a certain extent, when, in *Gorgias* (503 E), he wanted to evaluate the "structure" of a human soul: he referred to the successful production of a building, a ship and a human body. Plato did not extend this simulation to the Universe – but it is of great interest that he seriously used such analogue-thinking: "All professionals[9], directed at their work, offer to it not incidental but [appropriate] efforts, so that it takes its form. See the […] masons, the shipbuilders and all other professionals, how each puts everything in order, so that every [component] matches to others fittingly, up to the moment that the whole becomes orderly and attractive. […] If therefore a building is orderly and attractive, it is useful […]. And a ship, the same. […] The same for our bodies […]. And what about our soul? According to the above, we recognize that the soul is fine if it possesses some order and adornment".

Thus Plato evaluates the quality of the soul by means of a simulation with the production of a technical good.Similarly, in the 6th c. BCE, one could possibly

9 Δημιουργοί = technicians of all kind, including physicians, gymnasts and others.

imagine that a system of bodies in Nature could be produced like a technical good – e.g. the way a building system is constructed:

(i) by selecting basic materials,
(ii) by means of their gradual transformation (when submitted to specific actions) and
(iii) by combining them appropriately.

Such could be, for instance, the case of the successive transformation of primeval matter (e.g. water or air), submitted to condensation/rarefaction or freezing/thawing, and combinations thereof. This example is close to the cosmology of Anaximenes. It is true that a similar example of a global cosmic "system" proposed by other Ionians is not that easy to locate; their complete views are not known to us. And their fragmentary (and doubtlessly doxographical) presentation does not constitute a system of mutually interacting elements, that could eventually be assimilated into a technological system. Nevertheless, all cosmic processes proposed by the Ionians share some **characteristics** with technical systems:

– Materials are selected first .
– Their interaction and their amenability to natural forces are recognized.

Thus, what these philosophers proposed was a more or less "explained" process.

One more thing is clear: that in this explained[10] cosmic process (resembling a technical production), there is no need for mythological interference; thus, the first step of rationalisation is made.

There lacked, however, a reference to a first cause for the existence of primeval matter. But, on this point, the silence of philosophers is not surprising; Hesiod too had never spoken about the "provenance" of Chaos.

The proposed possible explanation of the almost rational cosmic views of the Milesians, however, may be more convincing only in a climate of a broader questioning of the validity of knowledge, as examined in the previous sections, 1 and 2. Doubts about myths can more easily trigger a change of the cosmic model – provided that such an alternative model is indeed already available, as we maintain was the case with knowledge of the technological process by the Milesians.

Finally, in favour of such a "technological" vision of the World, we may also consider the survival of the technical term "δημιουργία" up to Hellenistic and Christian times, when this purely technical word took the meaning of "creation" by God – though unwittingly still referring to an Ancient Greek non-mythological genesis of the Cosmos.

10 A sequential description of the Genesis was also provided by Hesiod (*Theogony* 116-125), but there no explanation was offered regarding the described drastic changes – except, of course, of the mythical force of Eros. Nevertheless, we may well subscribe to the opinion of C. Ramnoux (2000): "In comparing the **structure** of this construction [of the Hesiodic world] with that of the Ionian physicists, we observe that the comparison is possible and fruitful".

b) This possible mental procedure followed by the Ionians becomes much clearer if the application of the Technology's analogical model is considered with respect to more **concrete** views of these philosophers, about specific details of their cosmic inspiration from pertinent human technical achievements. This is the method R. Hahn has successfully introduced some time ago (see i.a. “Archeology and the Origins of Philosophy”, 2010), regarding resemblances between celestial bodies and **architectural** members.

The broader modelling proposed in this section is an attempt to enlarge the original method used by R. Hahn: “A series of architectural events […] informed and illuminated the cosmic thought [of Anaximander]. Watching the architects work, Anaximander was inspired to become an ‘architectural historian’ of the cosmos”. (R. Hahn, 2010, p. 12). For example, the shape of the Earth and column construction; cosmic distances and intercolumnar techniques; cosmic breathing and the bellows; solar form and chariot wheels; etc.. This proposed extension of R. Hahn’s method attempts to identify broader (more systemic) cosmic views of the Milesians, inspired by “similar” technical global **systems**; but this will prove to be a less easy task. On the contrary, if such a (mainly morphological) similarity is sought between more **specific** “objects”, the confirmation of the “technical modelling” hypothesis becomes easier.

c) Because of the productivity of this approach, it was suggested that some further examples of important technical achievements known to the Ionians, could easier explain the “new spirit of natural philosophy”, (A. Herda, op. cit.) of them.

In selecting such examples, it is reasonable to refer first to the deeds of Mycenaeans, since their achievements had survived the possible loss of the memory of their historical existence: Their large scale land reclamations[11] (ca. 1300 BCE) in Tiryns (Peloponnesus) and in Kopaïs (Boeotia) included precise rectilinear tracings of torrent derivation works (new riverbeds or earth dams, both one kilometer long, approximately). It is maintained that some basic characteristics of these works may encourage a more rational conception about the physical world: (i) Their large scale makes them “comparable” to natural creations. (ii) Their geometrical precision insinuates order and rationality. And (iii) because of the disproportionate utilitarian consequences for the neighboring cities, these technical achievements largely contribute to the self-confidence on human intellectual capacities.
Even during the loosely called “Dark Ages”, one may observe the survival of basic technical achievements, such as eg. the geometrically elegant “absidal house”, from Mycenaean times up to the Dark Ages[12] – i.e. till the beginning of 6th c. BCE. A more important survived great deed was the “pentecontors” (fifty oared), a typical Mycenaean trade and war ship[13]. The colonists of Cuma in

[11] Knauss J. “Spaethelladische Wasserbauten”, Bericht 90, Inst.f.Wasserbau, Techn. Univ. Muenchen, 2001, (p. 69, 42).
[12] Coulson W.D.E., “The Greek Dark Ages”, Athens, 1990, (pp. 17, 18).
[13] Bach L., “Le muse imaginatire de la marine antique”, Athènes, 1987, (pp. 142, 146).

Italy, coming from Cuma of Euboia[14], for their very long and dangerous trip, have apparently used the same category of ships, (pentecontor was still in use in the sea-battle of Salamis!). Ionians also knew this remarkable ship, as it is indicated by a fragment of an Ionian "dinos" (ca. 650 BCE)[15]. The capacity of man to produce such a complicated technical object, able to secure the **"transplantation"** of a city after a travel of two thousand kilometers, may have greatly impressed the thinkers of Ionia (after all, Ionians had also founded several colonies in Mediterranean and in the Black sea). And, to use the words of F. Zevi, "The 'technae' [of the Greek colonists] expressed the spark of creativity of man and his domination over the Nature"[16]. It is precisely this feeling of "domination" that may offer (i) emancipation from the myth and (ii) confidence in the rationality, inherent in Technology.

Coming back now to the urbanistic innovation of insula-street grid-system of Miletos (a system probably initiated in Miletos well before the times of Hippodamos), it is rather obvious that the system was designed in order to satisfy certain human needs regarding traffic and sanitary conditions, as well as aesthetical needs of the inhabitants; moreover, once established, the system could also be regarded as a symbolism of logic. Here again, one may think of Technology as a kind of **transitory** vehicle towards broader Rationality that generated Science. Our last example in this context will be the confidence of Eupalinos (the Engineer of the one kilometer long tunnel of Samos) in his capacities to calculate the geometrical conditions that would ensure the return of the tunnel's driving on its initial rectilinear tracing, after a provisional isosceles triangular deviation, at the section 300 m. from the north entrance (Kienast, p. 142). In this technical problem, one may say, the human inability to see through the mountain by natural means, was remedied by theoretical Geometry, applicable to **any** triangle. In this case, Technology may be considered either as an inceptive towards scientific developments, or as merely fertilized by means of already available scientific knowledge.

In all these examples, we maintain that Technology is proved to be a considerable contributor to the rationality of Ionian Philosophers.

Nevertheless, as was explained in sections 1, 2 and 3, without the doubts regarding the validity of knowledge, and without the practical Milesian mentality, the liberties these philosophers took in order to be emancipated from myth, would be harder to explain.

5. **Further rationalisation due to Technology**

An additional possible consequence of technological development favouring the development of rational thinking should also be mentioned.

a) First, artifacts used as **measurement instruments** may be considered as important contributions to rationality, since measurements are essential for

[14] "The ship-famous Euboia", according to the Homeric Hymn to delian Apollo, 21.
[15] Bach, op.cit., p. 248.
[16] F. Zevi, "Fra mito e storia", in "I campi Flegrei", Napoli, 1987.

more **objective** concepts of Nature and for the demonstration of opinions. Ancient Greeks had a similar view: Plato (*Philēbos* 55e) asserts that "if we remove enumeration, measurement and weighing from any activity, what remains is insignificant". And it is easy to understand that even a *chorovatēs* (the large spirit-level) used by Eupalinos (Samos, 6th c. BCE) to achieve the remarkable horizontality[17] of the two opposite drives of his 1 km long tunnel, serves an **abstract** concept. Even more convincing is the case of Anaximander's improved sun-dial, "such a small thing representing the passage towards a rational mode of orientation in time" (Ramnoux, 2000, p. 749).

b) On the other hand, in the technological process (briefly described in section 2.a above), such existing empirical knowledge is each time sought, that will be appropriate to help solve the problem at hand; the localisation and selection of such "appropriate" knowledge is part of the creative technical process. But what if such knowledge **does not exist**? Such an unpleasant situation must have occurred very frequently during the history of Technology. The answer is very simple: the "designer" proceeds to **search** for it. And I shall maintain that such certainly numerous situations will have, on occasion, facilitated the emergence of "scientific" thinking: in order to minimise the probability of error, criteria about the correctness of knowledge were **pressingly** needed.

We do not have written evidence on Thalēs' incentives to develop a general method for similar triangles: was it in order to measure the distance between two inaccessible objects? At the very least, it is reasonable to recognize the "suitability" of such a hypothesis. And, in the debate between Seneca and Posidonios (Humphrey et al., 1998, p. 594), we will not subscribe to Seneca's idealistic view that technological inventions are not the product of wisdom but of ingenuity – a lower form of knowledge. Only one kind of intellectual innovation is recognized nowadays.

c) Besides, there are two historical occurrences favouring the validity of the technological hypothesis for Ionia in the 6th c. BCE. First, remarkable technological developments were observed in Greek cities about the same time: the spreading of sophisticated water supply systems, the invention of the trireme, systematic city planning (Thales being one of its inventors), and the building of impressively large bridges and temples. Second, the remarkable *technophilia* of Milesian philosophers, as summarised in section 3 above.

The probability that a quasi-scientific spirit had emerged specifically in Ionia, is further increased by the fact that, around 510 BCE, the totally anti-mythical views of Hekataios (section 1 above) were most probably broadly shared by his co-citizens in Miletos. I would therefore suggest that the possible contribution of Technology towards rationality in Ionia, was due to:

(i) the search for new knowledge, necessary in inventing artificial means to satisfy human needs, and

17 Kienast, 1995, 148: At the meeting point of the two independent drives, the difference in level was equal to 0.3 m (and locally 0.6 m).

(ii) the construction and use of measuring devices.

6. **Putative conclusions**

a) Initially, the present attempt to contribute to the question of the origins of the Ionians' scientific spirit, briefly addressed better known arguments regarding human disengagement **from myth.** First, passing mention was made to the expected opposition of the free-thinking settlers of Ionian cities against any obscure powers.

Second, the older doubts about the validity of traditional mythical-historical knowledge were commented on, including its complete rejection by the Milesian historian Hecataios (ca. 510 BCE).

b) The possible two-fold influence of archaic Greek Technology on Milesian philosophers was subsequently examined. First, this significantly developed Technology made it quite clear that large and elaborate new systems could be produced and could function without any mythical interference. This broadly established understanding could reasonably be a second cause for the **emancipation** from myth.

Moreover, the inevitable failures of some attempted technological projects will possibly have accentuated the need for **checking** human knowledge – including knowledge of natural phenomena; hence, the need for some kind of demonstration will have been felt. Since Technology was well spread in the Hellenic World during that period, it is reasonable to expect from Technology such cultural by-products also.

c) On the other hand, it was suggested that the Milesian philosophers (characterized by a remarkable *technophilia*) may have been inspired by the technological process when they imagined their cosmology. More specifically, some of them have directly used technical objects as **models** for the proposed cosmic bodies or functions; this is at least the case of Anaximander, as R. Hahn (2010) has shown.

d) Finally, two additional possible technological contributions to scientific thinking were discussed. The construction of measuring devices and the **search** for new knowledge to be used in solving a problem to satisfy a human Need.

We may thus be allowed to think that a tendency towards rationality was established in Ionia early enough.

e) It must however be admitted that (inevitably weak) working hypotheses on such an open question can rarely be counter-checked by means of well established data. Thus, the criterion of the "level of suitability" is frequently used, with more or less debatable results. The hypothesis of Technology as a possible "vehicle of rationality" belongs to this category.

Acknowledgements

I am indebted to Prof. R. Hahn and to Dr. A. Herda for their generous comments and suggestions. P. Ioannidis offered valuable corrections. All remaining weaknesses are, inevitably, mine.

References

Bach, L. “Le musee imaginaire de la marine antique”, Athenes, 1987.
Coulson, W.D.E., “The Greek Dark Ages”, Athens, 1990.
Hahn, R. “Archeology and the Origins of Philosophy”, State Univ. of N.Y. Press, 2010.
Herda, A. “How a Sage would build a City: Thales of Miletos and the Invention of Greek Urbanism”.
Humphrey J.W., Oleson J.P., Sherwood A.N. “Greek and Roman Technology”, London, 1998.
Kienast, H., “Die Wasserleitung des Eupalinos auf Samos”, Mainz, 1995.
Morford M.P.O., Lenardon R.J.,“Classical Mythology”, London, 1971.
Kirk, G.S. – Raven, J.E. – Schofield, M., “The Presocratic Philosophers”, Cambridge, 1983.
Ramnoux, C., “Ioniens”, in: Dictionnaire de la Grèce antique”, Encyclopedia Universalis, Paris, 2000, p. 749.
Vergados, A., “A commentary on the Homeric Hymn to Hermēs”, Virginia, USA, 2007.
Zevi, F. “Fra mito e storia”, in “I Campi Flegrei”, Napoli, 1987.