ΠΑΛΑΙΟΝΤΟΛΟΓΙΑ.— **The first step of Paleontology (A statement confirmed after 25 centuries),** *by Leo Imperatori**. Ἀνεκοινώθη ὑπὸ τοῦ Ἀκαδημαϊκοῦ κ. Ἰ. Τρικκαλινοῦ.

«In each Era, with time, the earth is dissolved by water and carried down into the sea as mud». Among the proofs that Xenophanes of Colophon adduced in confirmation of this theory, one only refers to a mainland plant: «In Paros an impression of a bay (-leaf) was found in the depth of the rock», an impression that was marked in the mud and was preserved when this became dried up and subsequently converted into rock.

With said hypothesis and such observations the great Greek poet-philosopher-naturalist founded at the same time Geology and Paleontology.

When after more than two thousand years these sciences started their accelerated progress but the island of Paros had not yet been studied in all its surface, it was thought that an error had been made in handing down Paros instead of Pharos (now Lesina or Hvar near the coast of Dalmatia, where fossils are abundant, or the other Greek colony of Pharos in Egypt), the soil of Paros being thought to consist exclusively of eruptive or metamorphic rocks in which not a single fossil could have been preserved.

Yet, at the beginning of the present century, the great geologist Philippson had observed near the Eastern coast of the island some strata that, owing to their general tectonic characteristics and their lithological constitution, were a sure indication of an ancient presence of the sea. He did not succeed, however, in finding fossils, for lack of time in his short stay there.

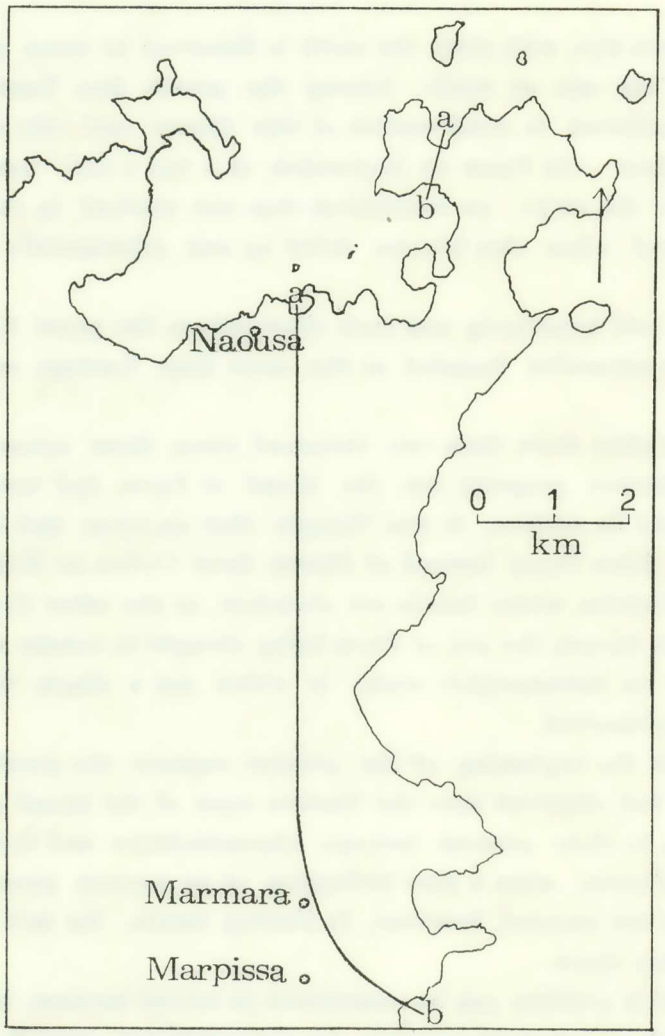
Now this problem can be considered as solved because, in the point marked with an arrow in our map, we were fortunate enough to pick up the fragment of rock of which a photograph is reproduced in Fig. 1.

In the number of vegetable remnants of Pliocene age that constitute

---

* LEO IMPERATORI, **Τὸ πρῶτο βῆμα Παλαιοντολογίας (Δήλωσις ἐπιβεβαιωθεῖσα μετὰ 25 αἰῶνας).**

it, a tiny piece of bay twig can be seen, a young one for its diametre and ornamentation which changes in time with the growing of the plant (see Fig. 3).




The Eastern part of the Island of Paros
a — b = The Western boundaries of the Neogenous formation.
The arrow indicates the point where the bay twig fossil was found.

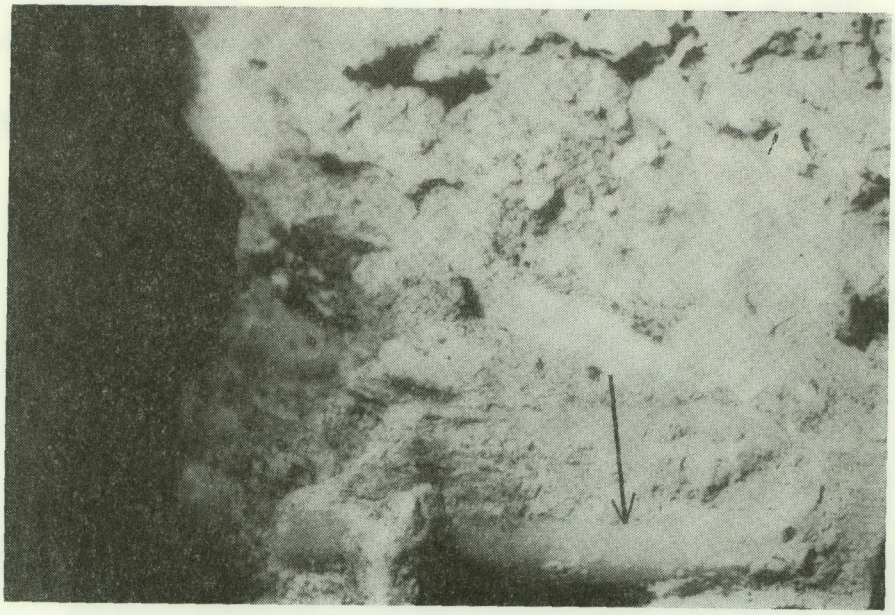


Fig. 1.

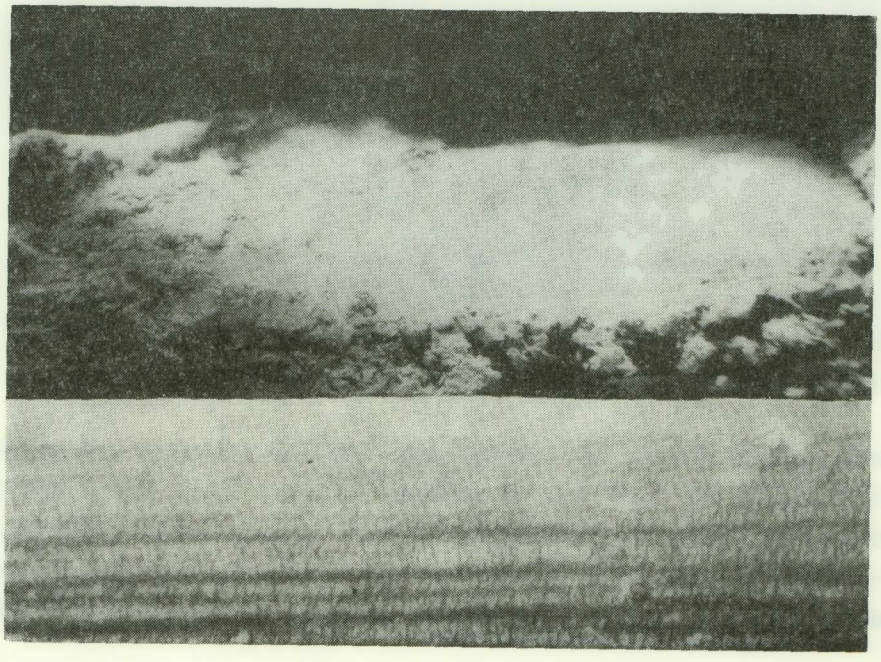


Fig. 2.
Above, enlarged, the piece of fossil bay twig from Paros.
Below, more enlarged, a modern bay twig of corresponding age.

This has been possible thanks to the valuable work of Roesler [1] to whom we owe the delimitation of the neogenous formations as it appears in the same map and the first discovery of land fossils there.

Owing to the deposition of silica that filled up its cellular cavities,

Fig. 3. Pliocene non-marine shells that accompany the vegetable remnants.

the tiny piece of twig has resisted some millions of years and possibly will maintain for hundreds of millions of years more every delicate detail of its structure. And that not because in such cases a replacement has happened molecule by molecule of the wood with the mineral matter that petrified it, as can still be read in many textbooks, but because

1. Gerd Roesler: «Das Neogen von Naxos und den benachbarten Inseln», in the Z. Deutsch. Geol. Ges., Vol. 123, p. 523 - 525, Hannover 1972.

the silica usually fills up the empty wood cells thus protecting their original walls, the most delicate organic tissues of which reappear in all their microscopic details once the silica is dissolved away in hydrofluoric acid.

No doubt the impression to which Xenophanes referred was of a

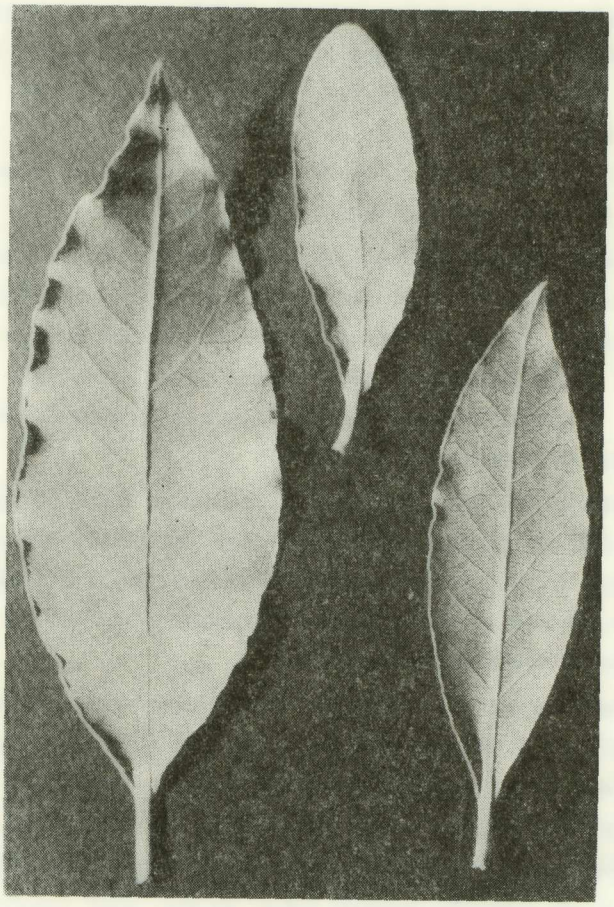


Fig. 4. Different shapes of bay leaves.

bay-leaf, though he spoke of bay in general. In consequence, now that the existence of said species in the Pliocene of Paros has been confirmed, it ought not to be difficult, for the relative richness of the deposit, to repeat the discovery of an impression of a bay-leaf just as it happened

25 centuries ago. For this end we have distributed among inhabitants of the locality copies of Fig. N. 4 in order that the search may be prosecuted, what we propose to do also ourselves as soon as possible to see whether we are Fortune's favourites once more.

We suspect that not far from the small town of Paroikia, the capital of the island, another occurrence of neogenous deposits exists, as marine shells are visible in a block of Miocene age in the wall that borders the path beyond the local cinema. It seems really unlikely that such a block has been brought from the other side of the island, while to erect the wall it was so easy to take advantage of the stones of the place: discarded blocks of that Parian marble that offered the raw material for so many masterpieces of the Greek art.

The proofs adduced by Xenophanes are not restricted to the impression of the bay-leaf observed in Paros: from the mention of the sea shells that can be found inland and even on the mountains they extend, through half of the Mediterranean, to the fossil fish and sea-weeds of the quarries in Syracuse and to the flattened remnants of all kinds of ancient marine beings found in Malta.

So prominence was given to a common characteristic of facts observed in distant places, a quality that permitted their being used together to test a general hypothesis. Once science was launched by him on this route, it had to wait for the appearance of Galileo in order that it could begin to accelerate its motion.

As all other findings quoted by Xenophanes refer to marine fossils, it was thought fit to correct the word dáphnē (bay) into aphyē (sardine) in the mention corresponding to Paros. We do not find justified this violence to all the ancient texts we possess, in particular after having found the above mentioned impression of a fossil bay in the island.

There is no actually reason why, in the mud resulting from the mixture of earth with water, the organic remnants ought to originate exclusively from the sea. On the other hand it is not rare to find encased in the same rock remnants both of marine and land beings.

The human propensity to express oneself in a dogmatic way, to considerate unquestionable one's authority — a tendency that was then

reaching the peak in the Pythagorean sect — is rejected by Xenophanes who, for the first time since science was born in Miletus, a d d u c e s p r o o f s to support his hypothesis. This is his most eminent title to glory in the realm of science, a glory that can be valued in all its impressive greatness if one thinks that for a whole period of twelve centuries only one case of direct observation of nature is known as a proof to a scientific statement : that of St. Albert (to be rightly called the Great also from this point of view) who, after having said that a species of eagle in his country rarely breeds more than one eaglet at a time although the female lays two eggs, added : «It is a fact I checked visiting the nest of the same eagle during six years in a row».

The Treatise by Jean Piveteau and those of others in his wake ascribe to Pythagoras, a contemporary of Xenophanes, the first observation of marine invasions and regressions basing this opinion on a passage of Ovid's Metamorphoses where reference is made to marine shells and an old anchor having been found on mountain tops. The specialist critics however have not approved of this rash testimony of the Latin poet who lived five centuries later.

On the other hand in a work published in 1974 it can be read that Xenophanes did not know what a fossil was. No doubt nobody had taught him, but it was he who, having been informed of the presence of the impression of a bay-leaf «in the depth of the rock», genially concluded that there must have been a slow transformation into coherent rock of the original mud with the organisms or their traces possibly included.

It can be added that Xenophanes' insatiable mind had admirably thought both of Cuvier's hypothesis of catastrophies with the disappearance of life and its successive reappearance, as well as of Lyell's hypothesis that those same causes which imperceptibly are in action now on the surface of our planet could radically change its aspect by their influence during an immense length of time.

It is also noteworthy that Xenophanes considered as fossils not only the remnants of other epochs but even their simple impressions although the plant or animal had disappeared.

We are even entitled to say that in the scarce surviving fragments of his work the germs of all the fundamental principles of the geological sciences can be found, as they can be seen exposed in a masterly manner

in the «Principes» by Fourmarier, the only exception being the experimental method, that even to-day is unreliable if applied to geology and quite negligible in comparison with the observation of the position of the rocks, of their constitution and of the paleontological remnants encased in them: an observation that must be made with rigorous criteria to confirm a scientific hypothesis.

Briefly, Xenophanes is much more our contemporary than those scientists who for so many intervening centuries continued to explain the fossils as a freak of Nature.

But Xenophanes' mind, universal like that of Leonardo, went beyond that. It was precisely he who took into consideration the limitations of human knowledge, that will never enable us to attain absolute reality.

We must be satisfied with conjectures, he said, because even if we could enter into the deep reality of the world of which we are a peculiar part we could not be sure of our success nor have the means to communicate to others the sure and complete truth so reached.

This is certain also in the case of the connections between phenomena, that the gods did not even reveal all at once to us: they permit men always better to discover such connections through the fatiguing accumulation of research by subsequent generations. Each individual, on the other hand, must find out ex novo and equally a little at a time what reaches him by tradition and by personal experience. This thirst for knowledge, even if it is to be fulfilled only slowly, is surely the greatest gift made to our exceptional, restless species of mortal beings.

How far Xenophanes' reflections have enlightened this fundamental point can be thrown into relief by comparing, for instance, what he left to us in a concise way with the elements of the modern theory of Karl R. Popper on the possibilities of scientific knowledge :

| XENOPHANES | POPPER |
|---|---|
| In the course of time men discover by research what is better. | Our theories appear to us at a certain moment of time to be better approximations to truth. Much of what is hidden from us may be discovered. |
| Let these things be accepted as resembling the truth. | The actual procedure of science is to operate with conjecture. Induction makes theories only probable rather than certain. |
| No one knows, or ever will know, the truth about the universe I speak of. For even if a man should chance to say the complete truth, yet he could not know it himself. On any point there is only mere conjecture. | Even if we could, by a lucky chance, hit upon a theory describing essence, we could never be sure of it, because our tests can never be exaustive. |

The more original part of Popper's thought is that the boldest conjectures, the farthest from the reasonable ones, are exactly those from which we can learn most effectively, even and especially if they turn out to be false: this is a statement rather subject to discussion, while those that are a development of Xenophanes' theories have a much more solid foundation.

So it is confirmed once more that the Greeks had expressed all that can be thought about the great problems and in consequence the modern thinkers are only allowed to improve what the ancients had already reached in general.

## ΠΕΡΙΛΗΨΙΣ

Ἡ παροῦσα ἀνακοίνωσις ἀναφέρεται εἰς τὴν ἀνεύρεσιν ὑπὸ τοῦ συγγραφέως πυριτιωμένου φύλλου πικροδάφνης (bay leaf) ἐντὸς πλειοκαινικῶν ἰζημάτων τοῦ νεογενοῦς τῆς ἀνατολικῆς Πάρου. Τὴν ἀνεύρεσιν ταύτην ὁ συγγραφεὺς παρουσιάζει ὡς ἐπιβεβαίωσιν παρατηρήσεως τοῦ Ξενοφάνους, ὁ ὁποῖος μεταξὺ τῶν

προβαλλομένων ἐπιχειρημάτων πρὸς ὑποστήριξιν τῆς πρὸ 2.500 ἐτῶν διατυπωθείσης θεωρίας του περὶ σχηματισμοῦ τῶν πετρωμάτων, ἀναφέρει τὴν ὕπαρξιν ἀποτυπώματος φύλλου ἑνὸς βράχου τῆς νήσου Πάρου. Συμφώνως πρὸς τὴν ἐν λόγῳ θεωρίαν ἡ γῆ διαλύεται ὑπὸ τοῦ ὕδατος καὶ μεταφέρεται εἰς τὴν θάλασσαν ὑπὸ μορφὴν ἰλύος, ἡ ὁποία ὅταν ξηραίνεται μετατρέπεται εἰς βράχον.

Ἄλλα ἐπιχειρήματα τοῦ Ξενοφάνους ὑπὲρ τῆς θεωρίας του ταύτης ἀναφέρονται εἰς κελύφη θαλασσίων ὀργανισμῶν, ἀπολιθώματα ἰχθύων κλπ., τὰ ὁποῖα ἀπαντοῦν μακρὰν τῆς θαλάσσης εἰς διαφόρους Μεσογειακὰς Χώρας.

Κατὰ ταῦτα τὰ πρῶτα βήματα τῆς Παλαιοντολογίας ἐγένοντο ὑπὸ τῶν Ἀρχαίων Ἑλλήνων.

Ὁ Ξενοφάνης ὁ Κολοφώνιος ἐγεννήθη ἐν Κολοφῶνι τῆς Μικρᾶς Ἀσίας τὸ 570 καὶ ἀπέθανε τὸ 480 π. Χ. Ἡ φιλοσοφία τοῦ Ξενοφάνους εἶναι μεταφυσικὴ καὶ τοῦ πολιτισμοῦ. Ἐδέχετο ὡς ἀρχικὰ στοιχεῖα δημιουργίας τὴν γῆν καὶ τὸ ὕδωρ.