## THEOPHRÁSTUS ON STONES

## INTRODUCTION, GREEK TEXT, ENGLISH TRANSLATION, AND COMMENTARY

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τατον, τὸ δὲ δεύτερον ἐκ τῶν παχυτάτων μελάντατον, ταῦτά τε 56 δή τέχνη γίνεται καὶ έτι τὸ ψιμύθιον. τίθεται γὰρ μόλυβδος ύπερ όξους εν πίθοις ήλίκον πλίνθος. όταν δε λάβη πάχος, λαμβάνει δὲ μάλιστα ἐν ἡμέραις δέκα, τότ' ἀνοίγουσιν, εἶτ' ἀποξύουσιν ώσπερ εὐρωτά τινα ἀπ' αὐτοῦ, καὶ πάλιν, ἔως ἂν καταναλώσωσι, τὸ δ' ἀποξυόμενον ἐν τριπτῆρι τρίβουσι καὶ ἀφηθοῦσιν ἀεί, τὸ δ' ἔσχατον ὑφιστάμενόν ἐστι τὸ ψιμύθιον. παραπλησίως δὲ καὶ ὁ ἰὸς γίνεται χαλκὸς γὰρ ἐρυθρὸς ὑπὲρ τρυγὸς τίθεται καὶ ἀποξύεται τὸ ἐπιγινόμενον αὐτῷ ἐπιφαίνεται γὰρ ὁ ἰός. γίνεται δὲ καὶ κιννάβαρι τὸ μὲν αὐτοφυὲς τὸ δὲ κατ' ἐργασίαν. αὐτοφυὲς μὲν τὸ περὶ Ἰβηρίαν σκληρὸν σφόδρα καὶ λιθώδες, καὶ τὸ ἐν Κόλχοις, τοῦτο δέ φασιν είναι (ἐπὶ) κρημνῶν ὁ καταβάλλουσι τοξεύοντες, τὸ δὲ κατ' ἐργασίαν ὑπὲρ Ἐφέσου μικρὸν έξ ένδς τόπου μόνον. έστι δ' άμμος ην συλλέγουσι λαμπυρίζουσαν καθάπερ ὁ κόκκος ταύτην δὲ τρίψαντες ὅλως ἐν ἀγγείοις λιθίνοις λειστάτην πλύνουσιν έν χαλκοῖς [μικρὸν έν καλοῖς] τὸ δ' ὑφιστάμενον πάλιν λαβόντες πλύνουσι καὶ τρίβουσιν, ἐν φπερ έστι τὸ τῆς τέχνης οἱ μὲν γὰρ ἐκ τοῦ ἴσου πολὺ περιποιούσιν, οἱ δ' ὀλίγον ἡ οὐθέν ἀλλὰ πλύσματι (τῶ) ἐπάνω χρώνται εν πρός εν άλείφοντες. γίνεται δε το μεν υφιστάμενον 59 κάτω κιννάβαρι, τὸ δ' ἐπάνω καὶ πλείον πλύσμα. καταδείξαι δέ φασι καὶ εύρεῖν τὴν ἐργασίαν Καλλίαν τινὰ ᾿Αθηναῖον ἐκ τῶν άργυρείων, δε οιόμενος έχειν την άμμον χρυσίον διά τὸ λαμπυρίζειν επραγματεύετο καὶ συνέλεγεν. επεὶ δ' ήσθετο ὅτι οὐκ έχει τὸ δὲ τῆς ἄμμου κάλλος ἐθαύμαζε διὰ τὴν χρόαν οὕτως ἐπὶ την έργασίαν ηλθε ταύτην, οὐ παλαιὸν δ' έστιν άλλά περί έτη μάλιστ' ἐνενήκοντα εἰς ἄρχοντα Πραξίβουλον 'Αθήνησι. φανερον δ' έκ τούτων ὅτι μιμεῖται τὴν φύσιν ἡ τέχνη, τὰ δ' ἴδια ποιεῖ, καὶ τούτων τὰ μὲν χρήσεως χάριν τὰ δὲ μόνον φαντασίας ὥσπερ τὰς †ἄλπεις. ἔνια δὲ ἴσως ἀμφοῖν ὥσπερ χυτὸν ἄργυρον. ἔστι γάρ τις χρεία καὶ τούτου. ποιείται δὲ ὅταν τὸ (κιννάβαρι) τριφθή μετ' όξους ἐν ἀγγείω χαλκῷ καὶ δοίδυκι χαλκῷ. τὰ μὲν οὖν τοιαθτα τάχ' ἄν τις λάβοι πλείω.

61 Τῶν δὲ μεταλλευτῶν τὰ ἐν τοῖς γεωφανέσιν ἔτι λοιπά, [περὶ] ὧν ἡ γένεσις ὥσπερ ἐλέχθη κατ' ἀρχὰς ἐκ συρροῆς τινὸς καὶ ἐκκρίσεως γίνεται καθαρωτέρας καὶ ὁμαλωτέρας τῶν ἄλλων. χρώματα δὲ παντοῖα λαμβάνουσι καὶ διὰ τὴν τῶν ὑποκειμένων † ...διὰ τὴν τῶν ...ουντων διαφορὰν, ἐξ ὧν τὰς μὲν μαλάτ-

like glowing charcoal. And its origin is itself a proof of this; for it would seem that all these substances change under the influence of fire, if it is right to consider that the red ochre made in this process is the same as the one made by nature or very similar to it.

Just as thiere is a natural and an artificial red ochre, so there is a native *kyanos* and a manufactured kind, such as the one in Egypt. There are three kinds of *vanos*, the Egyptian, the Scythian, and the Cyprian. The Egyptian is the best for making pure pigments, the Scythian for those that are more dilute. The Egyptian variety is manufactured, and those who write the history of the kings of Egypt state which king it was who first made fused *kyanos* in imitation of the natural kind; and they add that *hyanos* was sent as tribute from Phoenicia and as gifts from other quarters, and some of it was natural and some had been produced by fire. Those who grind coloring materials say that *vanos* itself makes four colors; the first is formed of the finest particles and is very pale, <sup>45</sup> and the second consists of the largest ones and is very dark. These are prepared artificially, and so is white lead.

Lead about the size of a brick is placed in jars over vinegar, and when this acquires a thick mass, which it generally does in ten days, then the jars are opened and a kind of mold is scraped off the lead, and this is done again until it is all used up. The part that is scraped off is ground in a mortar and decanted frequently, and what is finally left at the bottom is white lead.

Verdigris is made in much the same way. Red copper is placed over grape-residues<sup>48</sup> and the matter that collects on it is scraped off; for it is verdigris that appears there.

There is also a natural and a prepared kind of cinnabar. The cinnabar in Iberia, which is very hard and stony, is natural, and so is the kind found in Colchis. They say that this is found on cliffs and is brought down by arrows that are shot at it. The prepared kind comes from one place only, a little above Ephesos. It is a sand that shines brightly and resembles scarlet dye; this is collected and ground in stone vessels until it is as fine as possible; then it is washed in copper ones . . . , " and what remains is taken

<sup>&</sup>lt;sup>45</sup> This translates  $\hat{l}$ »Â«/ $\hat{l}$ ° $\hat{l}$ I $\hat{l}$ ė $\hat{l}$ i $\hat{l}$ °, which has been accepted as an emendation in the text.

<sup>&</sup>lt;sup>46</sup> The literal translation of *IIII* would be "wine-lees," but see Commentary.

<sup>&</sup>lt;sup>47</sup> The words  $ii > \hat{\mathbf{l}}^{\circ}\hat{\mathbf{l}} \pm \hat{\mathbf{l}} \times \hat{\mathbf{l}}_{c}\hat{\mathbf{l}}^{-}$ ? (after  $\hat{\mathbf{l}} \times \hat{\mathbf{l}} \hat{\mathbf{l}}^{\circ} \hat{\mathbf{l}} = \hat{\mathbf{l}} \times \hat{\mathbf{l}} =$ 

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and ground again and then washed. Skill is needed for this process; for some people make a great deal and others little or nothing out of an equal amount of sand. The washing is done from the top, and separate portions are wetted one after the other; what is left at the bottom is cinnabar, and the washings are what remains above in larger quantities.

They say that Kallias, an Athenian from the silver mines, discovered and demonstrated the method of preparation; for thinking that the sand contained gold because it shone brightly, he collected it and worked on it. But when he saw that it did not contain any gold, he admired the beauty of the sand because of its color and so discovered this method of preparation. This did not happen long ago, but about ninety years before Praxiboulos was archon at Athens.

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It is clear from these facts that art imitates nature and creates its own peculiar products, some of them for use, and some only for show, such as paints, <sup>48</sup> and others for both purposes equally, such as quicksilver; for this has its use too. It is made when cinnabar mixed with vinegar is ground in a copper vessel with a pestle made of copper. And perhaps several other things of this kind could be discovered.

Among the substances obtained by mining there still remain those that are found in earth-pits; these are caused, as we said in the beginning, from some conflux and separation of matter which is purer and more uniform than that of the other kinds. And all sorts of colors are obtained from them owing to the differences of the matter they contain . . .;<sup>49</sup> some of them are softened and others are ground and melted, and in this way the stones that are brought from Asia are constructed.

The natural kinds of earth, which are useful as well as superior in quality, are three or four in number, the Melian, the Kimolian, the Samian, and a fourth in addition to these, the Tymphaic or *gypsos*. <sup>50</sup> Painters use only the Melian kind; they do not use the

<sup>&</sup>lt;sup>48</sup> This translates  $\hat{I} \neg \langle \hat{I}' \hat{I} \hat{I} - \hat{I}'; \& \rangle wcis$  is unknown. The emendation d\i7reis (lit., "without fat") must refer to the type of earth mentioned in sec. 62; this was not greasy and was suitable for painting.

<sup>&</sup>lt;sup>49</sup> If  $\hat{I}$ ° $\hat{I}$ ± $\hat{I}$ 1 $\hat{Z}$ 1 $\hat{I}$ 1 $\hat{Z}$ 1 $\hat{I}$ 1 $\hat{Z}$ 1 $\hat{I}$ 1 $\hat{Z}$ 1 $\hat{I}$ 2 $\hat{I}$ 2 $\hat{I}$ 2 $\hat{I}$ 1 $\hat{Z}$ 1 $\hat{I}$ 2 $\hat{I}$ 2

 $<sup>^{50}</sup>$  A much broader term than the English word gypsum. It included not only the