

**[Theophrastou peri tōn lithōn biblion] = Theophrastus's history of stones. With an English version, and notes ... Also, Observations on the new Swedish acid, and of the stone from which it is obtained; and with an idea of a natural and artificial method of fossils / By John Hill.**

### **Contributors**

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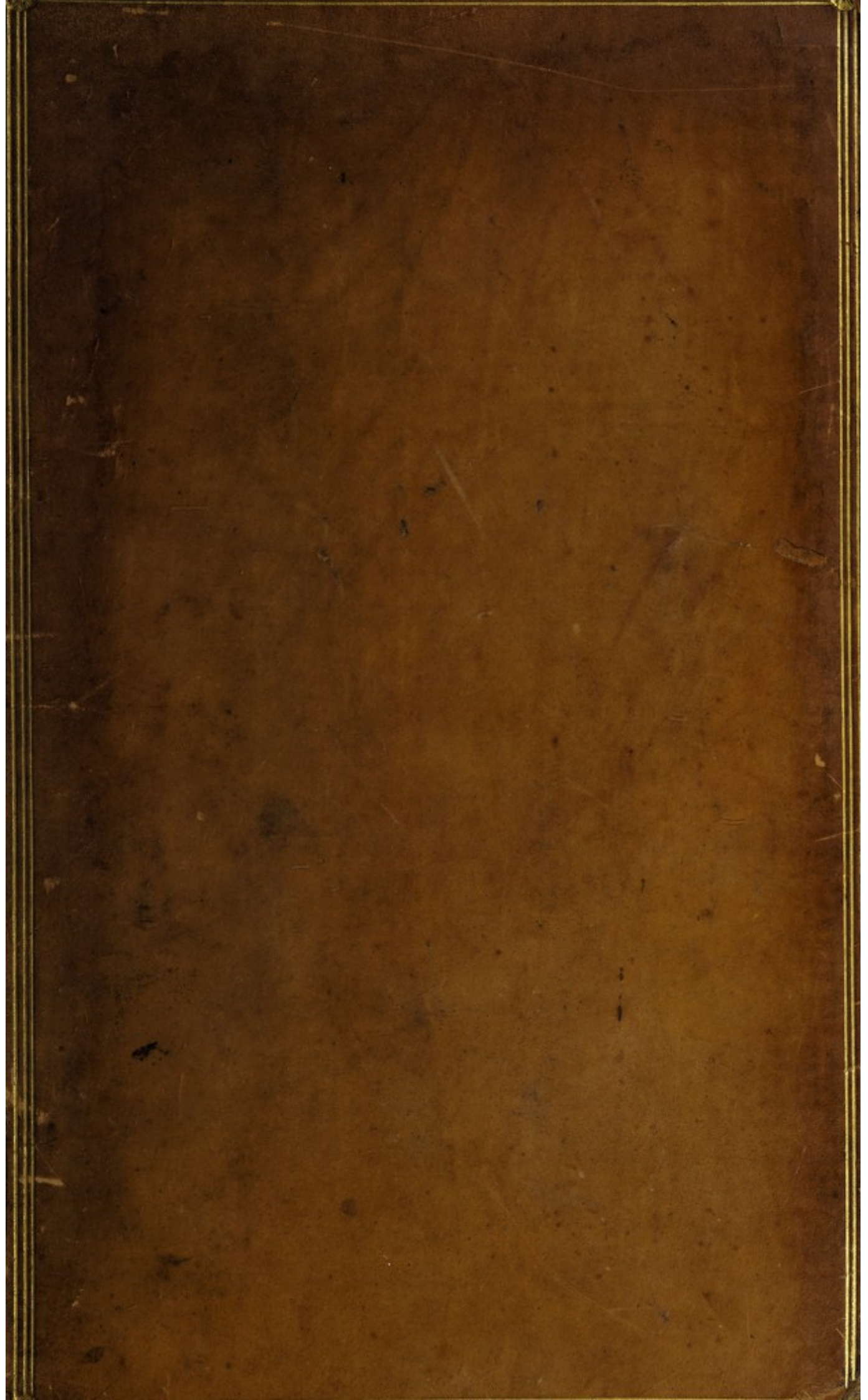
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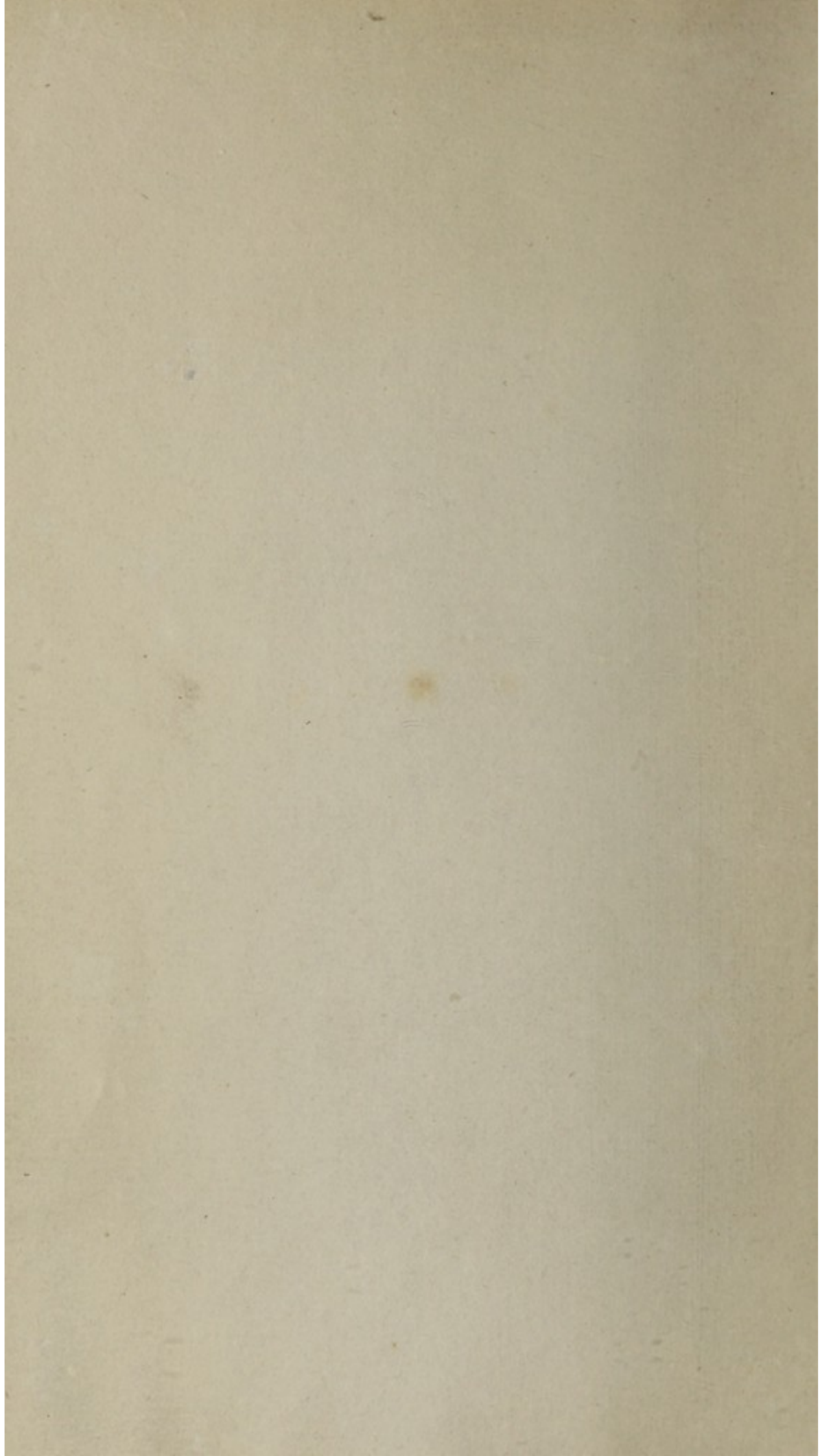





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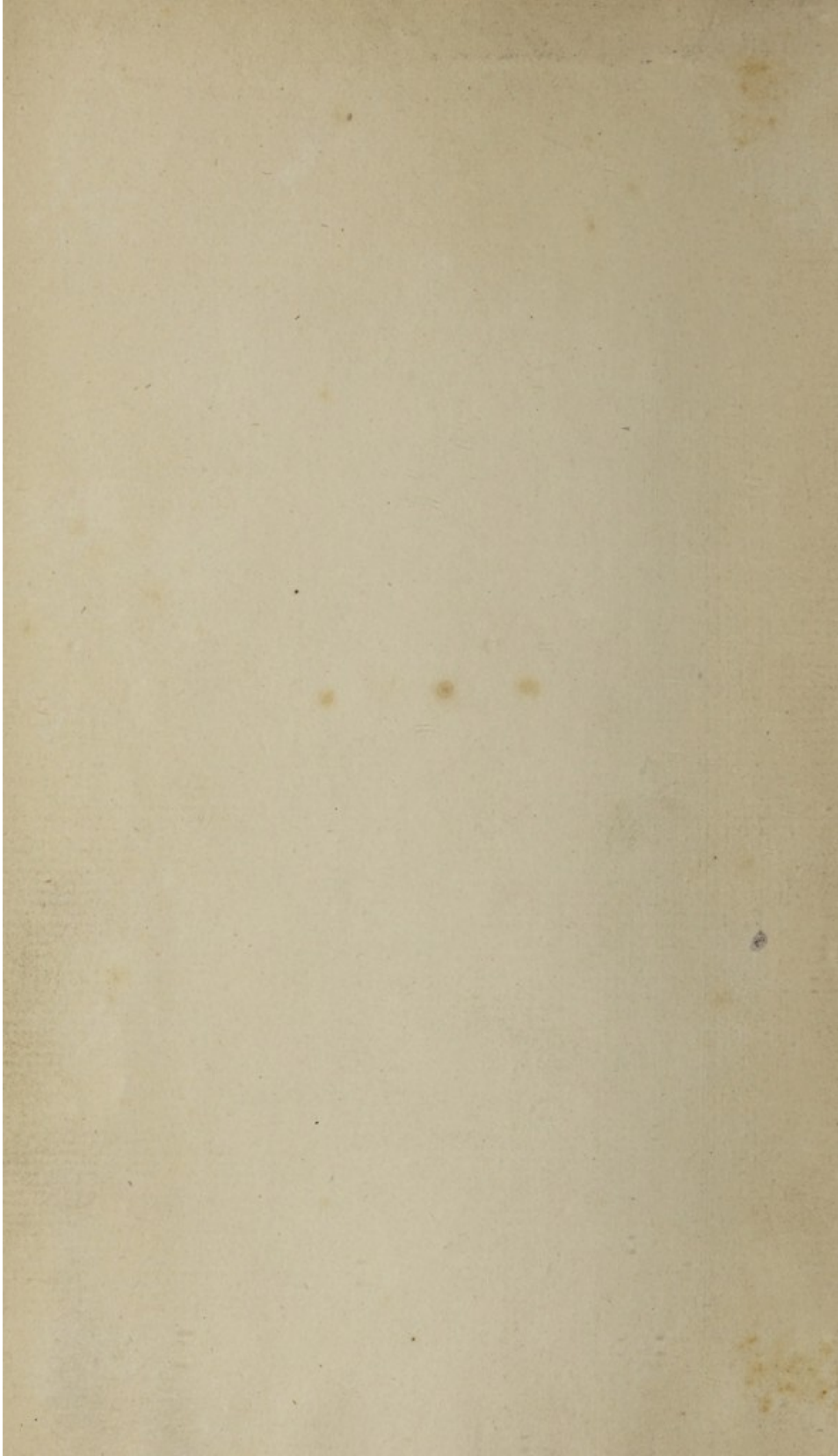
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Θ Ε Ο Φ Ρ Α Σ Τ Ο Υ  
Τ Ο Υ Ε Ρ Ε Σ Ι Ο Υ

Π Ε Ρ Ι Τ Ω Ν

Λ Ι Θ Ω Ν

Β Ι Β Λ Ι Ο Ν .

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**THEOPHRASTUS'S  
HISTORY OF STONES.**

With an ENGLISH VERSION, and NOTES,  
Including the Modern History of the GEMS described by  
that Author; and of many other of the Native FOSSILS.

TO WHICH ARE ADDED,

**T W O L E T T E R S :**

- I. On the Colours of the SAPPHIRE and TURQUOISE.  
II. Upon the Effects of different Menstruums on COPPER.  
Both tending to illustrate the Doctrine of the GEMS being  
coloured by METALLINE PARTICLES.

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THE SECOND EDITION;  
Enlarged by the Addition of a GREEK INDEX of all the  
Words in THEOPHRASTUS.

ALSO

OBSERVATIONS on the New SWEDISH ACID,  
and of the STONE from which it is obtained;

AND WITH

An IDEA of a Natural and Artificial Method of FOSSILS.

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By SIR JOHN HILL.

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M DCC LXXIV.



GEORGE P. A. ZOTY  
T. O. T. H. E. S. I. O. N.  
A. I. O. N.  
R. I. B. A. I. O. N.

THEOPHASTUS  
HISTORY & STORIES

With an English Version, and the  
Latin of the Greek Edition of the  
Text, and a new edition of the  
Text.

THE SECOND EDITION  
I. On the basis of the second edition of the  
H. Upon the basis of the second edition of the  
Text, leading to the second edition of the  
Text, by the second edition of the  
Text.

THE SECOND EDITION  
I. On the basis of the second edition of the  
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Text, leading to the second edition of the  
Text, by the second edition of the  
Text.

OBSERVATIONS ON THE SWEDISH ACID  
and of the first edition of the  
Text, leading to the second edition of the  
Text, by the second edition of the  
Text.

By JOHN HILL

THE SECOND EDITION

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## P R E F A C E.

**T**HE References to THEOPHRASTUS, and Quotations from him, so frequent in the Works of all the later Writers of Fossils, would make one believe, nothing was more universally known, or perfectly understood, than the Treatise before us: But when we enquire into the Truth, we shall find, that though no Author is so often quoted, few are so little understood; or, indeed, have been so little read: Those who are free with his Name, having given themselves little Trouble about his Works, and only taken upon trust from one another, what was originally quoted from him by *Pliny*. As to



that Author, whoever is acquainted with the Works of more antient Writers, must know that however much Praise he may deserve for that Treasure of Knowledge he has collected; yet he is very little to be depended on for the Correctness of his Quotations.

It is no Wonder that the genuine Work of this Author, on Fossils, should have been so much neglected to be read; since whoever shall take up the best Editions we have at present, will find enough in every Page to dishearten him from making farther Progress: The numerous Defects, where whole Words, Parts of Words, and even many Words together are wanting; and the many Sentences, either by the Preservation of old Errors, or injudicious Corrections of Editors, rendered perfectly unintelligible, will soon shew, that it is a Work not to be read to any Advantage, with-



out a more than ordinary Attention, a Knowledge of the Subject, and a continual Consultation of others of the Antients.

In such Condition has this Treatise lain; full of excellent Matter, but rendered almost unintelligible. The Author is remarkable for using very few Words; and where it was common to find some of those few wanting, it seemed no easy Task to understand him. On this Occasion, as also in regard to the Errors, so frequent and perplexing, I have been at the Pains of consulting the rest of the Antients; in order to find what it was most likely he should say, by what they have said on the same Occasion: In these Undertakings, *Pliny* also, where he could be depended on, has been of singular Service; a Passage from him, frequently a literal Translation of this Author, shewing evidently



ly how he had read the Original, who had the Advantage of seeing it, at least before the Rise of many of the Errors that have made it unintelligible to us. This, and examining his Words by, and comparing them with, the Substance he is describing, are the two great Methods I have taken to understand him.

By these Means, and with these Assistances, I have undertaken to give a new Edition of the *Greek* Text; in which whatever may be the Service I have done, I promise myself I shall, at least, be liable to no Censure; since tho' I have filled up all the Defects, and amended the Errors, so as to make the Work now plain, intelligible, and easy to be read; I have every where in the Notes mentioned where the Defects were, and what were the Words, that I have ventured to alter.

Thus



Thus much for the *Greek* Text: In regard to the *English*, as my Intent was to render the Work intelligible to the *British* Reader, I have not tied myself down to a bare verbal Translation. I have attempted to give, not only his Words, but his Meaning; and in many Places have translated a single Syllable into a whole Sentence, by giving, where that Syllable referred to something said before, a short Recapitulation of the Matter referred to; and by that Means preserving the necessary Connection of Thought; without which, what followed might have appeared obscure,

To the present Edition I have added a *Greek* Index of all *Theophrastus's* Words, for which I am obliged to Mr. *Newberry*: As also the Account of a new Acid, from a Stone first produced in  
*Sweden*;

*Sweden*: And some Hints toward new Ways of arranging Fossils, than which nothing in all the History of Nature is more wanted.



Θ Ε Ο Φ Ρ Α Σ Τ Ο Υ

Τ Ο Υ Ε Ρ Ε Σ Ι Ο Υ

Π Ε Ρ Ι Τ Ω Ν

Λ Ι Θ Ω Ν

Β Ι Β Λ Ι Ο Ν .

THEOPHRASTUS'S

H I S T O R Y

O F

S T O N E S .

Θ Ε Ο Φ Ρ Α Σ Τ Ο Υ  
Τ Ο Υ Ε Ρ Ε Σ Ι Ο Υ

Π Ε Ρ Ι Τ Ω Ν

<sup>a</sup> Λ Ι Θ Ω Ν

Β Ι Β Λ Ι Ο Ν .

α. ΤΩΝ ἐν τῇ γῆ συνισαμένων, τὰ  
μὲν ἔσιν ὕδατος· τὰ δὲ γῆς.

β. <sup>b</sup> Ὑδατος μὲν τὰ μεταλλευόμενα,  
καθάπερ ἀργυρὸς, ἢ χρῦσος, ἢ τάλλα.

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<sup>a</sup> THIS excellent Author, notwithstanding that he has made the Title of the Treatise before us promise no more than an Account of *Stones*, we shall find hereafter, did not mean to confine himself in it, strictly and literally to discourse of only that Part of the fossile Kingdom generally understood by this name: but to take into his Consideration, at the same Time, all those other mineral Substances which



## THEOPHRASTUS'S

## HISTOR Y

O F

<sup>a</sup> S T O N E S.

I. **O**F Things formed in the Ground, some have their Origin from *Water*, others from *Earth*.

II. <sup>b</sup> *Water* is the Basis of Metals; as Silver, Gold, and the rest: *Earth*

---

appeared to him to be formed of Matter of a like Kind with them; as the various *Earths*, &c. in short all those native Fossils, which, according to his Philosophy, had *Earth*, not *Water*, for the Basis of their Formation.

<sup>b</sup> Our Author's general System of the fof- file World I shall not, in these Times of greater Knowledge, attempt to vindicate in all its Parts; but must do him the Justice



γῆς δὲ, λίθος τε καὶ ὅσα λίθων περι-  
 τότερα. καὶ εἴ τινες δὴ τῆς γῆς αὐτῆς  
 ἰδιώτεραι φύσεις εἰσὶν, ἢ χρώμασιν, ἢ  
 λειότησιν, ἢ πυκνότησιν, ἢ καὶ ἄλλῃ τινὶ  
 δυνάμει.

---

to observe, that it was far from being either absurd, or improbable, at the Time when he wrote; when the Sciences, to which the present Age owes its Improvements in Natural Knowledge, were so little understood; and so few of the Experiments, which have now given Light into it, had been made; and that it carries at least, an equal Air of Probability, with many that have been since formed; and is absolutely more succinctly, clearly, and philosophically delivered than any of them all.

The Principles of mixed Bodies, as well those of the *fossile*, as of the *vegetable* and *animal* Kingdoms, are indeed so intimately united, and closely combined together, at their original Formation, that we are not to wonder, an Author, who wrote in such early Times, was not clearly acquainted with the exact Manner of their Composition: Those who have followed him, even after the Discoveries of many succeeding Ages, and with the Assistance of Chemistry, the



of Stones ; as well the more precious, as the common : and of the various *Earths* of peculiar Kinds, whether remarkable for Colour, Smoothness, Density, or whatever other Quality.

---

best and surest of all Means of judging, (and which, whatever some Men of fertile Imaginations may have thought, we have no found Reason to believe was much known in his Time) have yet been of late found to have run into great Errors about them : and even those of the present and last Age, who have been able to discover the Mistakes of these, and have the Advantage of yet greater and farther Improvements in that Science, if they will speak frankly and ingenuously, must own, that though they have discovered the Errors of their Predecessors, and are certain they are nearer the real Knowledge of the Mysteries of Nature than those of any other Age have been, they yet are sensible, that they are only making farther and farther Advances toward what, perhaps, it is not in human Nature ever perfectly to complete.

Chemical Analyfises, when judiciously and carefully made, are unquestionably the surest and best Methods we can use, towards the



γ. Περὶ μὲν ἔν τῶν μεταλλευο-  
μένων ἐν ἄλλοις τεθεώρηται. περὶ δὲ  
τέτων, νῦν λέγωμεν.

---

Attainment of that Knowledge; and yet, how imperfect our best Discoveries by these may appear to the industrious and ingenious of future Ages, may be guessed by the Errors we can discover in those of but a few before us.

When Chemistry became, some Time ago, better understood and more practised than it had probably ever been before, the Professors of it, finding a certain Number of different Substances, into which almost all mixed Bodies were resolvable, immediately looked upon these as fixed and unalterable in themselves; and as they found them, in a Manner, in all mixed Bodies, they determined that they were the true *Principles* or *Elements* of which all Bodies were compounded; fixed their Number, and their Names, *viz.* That they were five, *Spirit, Sulphur, Salt, Water, and Earth.* Here then the whole Work seemed effected, the Secrets of Nature opened, and the true, fixed, and unalterable *Principles* of mixed Bodies clearly known.

But what Figure does this boasted Philosophy, this Set of Principles now make?



III. The *Metals* have been considered in another Work: the *Stones* and *Earths* of various Kinds, therefore, are to be the Subject of this Treatise.

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when our own Experience, and the Discoveries of later Chemists give us even the unquestionable Testimony of our Senses, that no less than three of the five are so far from deserving the Name of *Principles* or *Elements*, that they are themselves mixed Bodies, and resolvable with proper Care into other distinct and different Substances. For the same Chemistry, which has brought *Sulphur* out of a mixed Body, will also separate that *Sulphur* into *Salt*, *Water*, and *Earth*; and when it has extracted from another, that *Salt*, they esteemed so true a *Principle*, will afterwards reduce it also into *Water* and *Earth*: *Spirit* also, we now find, is no other than Oil attenuated by Salts, and dissolved in Water. This appears by a plain and easy Experiment of Mr. Boyle's, viz. If Spirit of Wine be mixed with ten or twelve times it's Weight of Water, and set in a cool Place, the Salts will fly off, the Water will mix itself with the Water in the Mixture, and the Oil be left swimming at the Top.

Instead of the five Principles, therefore, of the Chemists before us, farther Disco-



δ. Ἀπανηα ἔν ταῦτα χρῆ νομίζειν,  
 ὡς ἀπλῶς εἰπεῖν, ἐκ καθαρᾶς τινος συν-  
 εσᾶναι ἢ ὁμαλῆς ὕλης, εἴτε ῥοῆς, εἴτε  
 διηθήσεως διὰ τινος γινομένης, εἴτε, ὡς  
 ἀνωτέρω εἴρηται, ἢ κατ' ἄλλον τρόπον

---

veries have reduced us to a Necessity of own-  
 ing only two, visible, obvious, and the Ob-  
 jects of our Senses: and even these two may  
 perhaps hereafter be proved to be more near-  
 ly allied to each other than we at present  
 imagine: these are *Water* and *Earth*; the  
 very *Principles*, and the *only ones* acknow-  
 ledged by this excellent Author, on whose  
 Works I am offering my Remarks; and  
 who, to his immortal Honour be it record-  
 ed, discovered that by Reason and Philoso-  
 phy alone, of which we owe the Knowledge  
 to a thousand tedious Experiments.

His System, though founded on this ex-  
 cellent Basis, I do not, as I before observed,  
 attempt to justify: Observations, which it  
 was impossible for him to make, have given  
 us the Testimony of our Senses, that Me-  
 tals do contain more or less of an absolute,  
 genuine, and vitrifiable Earth; and Stones,  
 it is as certain, are never wholly divested of



IV. All these we are (plainly speaking) to judge formed by the Concretion of Matter pure and equal in its constituent Parts; which has been brought together in that State by mere *Afflux*; or by means of some Kind of *Percolation*; or separated, as before observed, from the impurer Matter it was once among, in some other

---

that Water which once served to bring their constituent Parts together.

But to return to the Principles of mixed Bodies: Reason informs us, that these two, *Water* and *Earth*, alone can never have made all the Differences, and Virtues of them; we are compelled therefore to acknowledge a third, as obvious to our Reason as the others to our Senses; an active Something, to give that to the Mass, which Water and Earth alone could not: This unknown Principle is what some Chemists have called *Acid*, and the Metaphysicians *Fire*; Words which in their general and common Acceptation convey Ideas very different from those we mean to express by them on this Occasion, but in the Use of which we must be indulged, till a more perfect Knowledge of the Thing we mean to express has taught us to give it a more determinate Name.



ἐκκεκριμένης· τάχα γὰρ ἐνδέχεται, τὰ  
μὲν ἕτως, τὰ δ' ἐκείνως, τὰ δ' ἄλλως<sup>c</sup>.

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<sup>c</sup> The Author has here justly, clearly, and succinctly given the general Manner, in which the constituent Matter of Earths and Stones has been brought together; and hinted at the various other Means by which it is done in other particular Cases.

The two general Ways he allows are by *Afflux* and *Percolation*: and nothing is more certain than that, by these two Methods, the two great Classes of the Bodies he is here to treat of, have been brought into a State of Formation; the *Earths* and *Stones* of Strata by *Afflux*: and the *Crystals*, *Spars*, and other Bodies of that Kind, by *Percolation*.

The Agent, in the first of these Cases, has been Gravity; and in the other, the continual passing of Water through the solid Strata.

When we look up to the original Formation of these Substances, we find the Particles, of which they were to be composed, in loose Atoms, diffused, and floating in that confused and irregular Mass of Matter (for that is evidently the Sense of the Word תהום which we find translated the *Deep*) out of which this Earth was to be formed.



Manner; For perhaps it is effected in some Cases by one; and in others by other of these Means<sup>c</sup>.

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The great Agent in gathering these scattered Atoms into a Mass, and separating them from the Water in which they were before floating, seems to have been what in the *Mosaic* Account of the Creation is called the *Spirit of the Creator*.

On the Action of this powerful Minister, the constituent Particles of Matter were collected into a Body, by their own Weight separated themselves from the Fluid in which they before swam; and subsided, some sooner, some later, in Proportion to their different Gravities.

By this Means the Particles of Stone, for Instance, precipitated themselves and formed a Stratum entire, homogeneous, and pure; before those of Clay began to subside: and these afterwards falling in a Mass on the Stratum of Stone already formed, constituted another of Clay over it: After all this, a Quantity of yet lighter Matter, settling on the Surface of this last formed Stratum, added to that another of what we call vegetable Mould, or something of like Kind. In this Manner were the different Strata of the Earth formed, and the Difference of the Matter, which was to subside in different



ε. Ἄφ' ὧν δὴ καὶ τὸ λεῖον, καὶ τὸ πυκ-  
 νόν, καὶ τὸ σιλπνόν, καὶ διαφανές, καὶ  
 τὰλλα τὰ τοιαῦτα ἔχουσι. καὶ ὅσον ἂν  
 καὶ ὀμαλέστερον, καὶ καθαρώτερον ἕκαστον ἦ,  
 τοσέτω καὶ ταῦτα μᾶλλον ὑπάρχει.

---

Parts of the Globe, made that almost infinite Variety to be found in the Substance of the Strata.

This original Structure of the Earth, however, we are not now to expect to find: the universal Deluge has made many and wonderful Alterations in it, which are now every where obvious to our Senses, and are everlasting Records of that fatal Catastrophe, of which the Earth, in the Condition we now see it, is but the Ruin.

There are many and incontestable Proofs, that the Surface of the Globe, to a Depth beyond what we ever dig, was, in the Time of that fatal Calamity, dissolved and reduced nearly into the same Condition it was in at the Time of its original Formation: the stony, mineral, and even metalline, as well as earthy Matter: floating in the Waters that then covered it, in separate Particles. These, when the Tumult of that Immen-



V. From the Differences of the constituent Matter ; and of the Manner of its Coalescence, the *Concrete* assumes its various *Qualities*, as *Smoothness, Density, Brightness, Transparency*, and the like ; and according as it is more pure and equal, the more does it partake of these.

---

sity of Waters began to cease, were by the same Laws of Gravity again precipitated ; and they subsided in Proportion to their different Weights ; but this not in their original Purity, for the metalline and other heterogene Matter, nay and even extraneous Substances, the Shells of Sea Fishes, &c. if of about equal Gravity, subsided among the stony Matter amidst which they were before suspended, and made a Part of the Stratum that Precipitation formed : the lighter Matters, the Earths, Clays, &c. afterwards subsided into other Strata over these : and with them other extraneous Particles and Substances, of Gravities like theirs. Thus the present Surface of the Globe was formed, in Strata of different Kinds, and that again according to their different Gravities ; except where the Motion of the Waters prevented this Regularity, by lodging sometimes on lighter Strata already formed, other whole



ε'. Τὸ γὰρ ὅλον, ὡς ἀν ἀκριβείας  
 ἔχη κατὰ τὴν σύστασιν ἢ πῆξιν, ἔτως  
 ἀκολουθεῖ καὶ τὰ ἀπ' ἐκείνων.

---

Beds of weightier Matter, which its immense and irresistible Force had taken up, and now in its abating suffered to subside again.

This, allowing also for the Alterations made by Earthquakes, afterwards bursting, and elevating or sinking the Strata in many Places, is the present Condition of the outer Crust of this Earth to a certain Depth, far within which perhaps all our Researches lie; and in this Mass we find, according to the System of our Author, the Strata of Stone and Earth, formed by the Concretion of Matter, equal in Weight and many other of its Properties, and brought together in that State by mere Afflux, by means of the Action of Gravity: and in the perpendicular Fissures of those Strata, and some other Places, Crystals, Spars, and other like substances, separated by Percolation from the arenaceous, argillaceous, and other Matter, among which they subsided in their sepa-



VI. On the whole, the more perfectly the *Concretion* has been formed, and the more *equal* in its constituent Parts the concreting Matter was, the more does the *Concrete* possess the peculiar Properties which are owing to that Equality.

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rated Particles; being there brought together by the continual draining of Water through the solid Strata; which in its Passage had taken them up with it, and there deserted them in different Manners; and left them to assume the Figures which are the natural and necessary Consequences of their Concretions.

These then are the two general Methods of Formation of those Bodies mentioned by our Author; the various others, which he hints at as taking Place in some particular Cases, are too numerous to be all recited here: Terrestrial and sparry Matter, washed from the Strata by the Water of Springs in their Passage, and subsiding at some Distance from their Source, round various Substances in Form of Incrustations, is one: Matter of a like Kind, and separated in a like Manner, dropping from the Tops of Caverns with the Water; and either deserted by it at the Top, and left in Form of Icicles or



ζ. <sup>α</sup> Ἡ δὲ πῆξις, τοῖς μὲν ἀπὸ  
 θερμῆ, τοῖς δ' ἀπὸ ψυχρῆ γίνεται.  
 κωλύει γὰρ ἴσως εἶδεν ἕνια γένη λίθων  
 ὑφ' ἐκατέρων συνίσασθαι τέτων. ἐπεὶ  
 τάτε τῆς γῆς ἅπαντα δόξειεν ὑπὸ  
 πυρὸς, ἐπέπερ ἐν τοῖς ἐναντίοις ἢ πῆξις  
 καὶ ἢ τῆξις.

---

*Stalactitæ*; or at the Bottom, and left in  
 Masses called *Stalagmitæ*, or *Dropstones*, is  
 another very frequent one. Many others  
 there also are; but the Bodies formed by  
 these, as well as those, though not brought  
 together by mere Percolation, or mere Afflux,  
 are however, in general, of the Number of  
 those formed of Particles originally brought  
 together by the one or the other of these  
 Means, and therefore very justly reducible  
 under them as general Heads. What the  
 Author adds of the various Stones and  
 Earths, thus formed, owing their different  
 Qualities to the Variety and Purity of the  
 constituent Matter, and of the Manner of  
 their Concretion, is plain, evident, and in-  
 contestable.

<sup>α</sup> The Author has here, in his accustomed



VII. <sup>d</sup> The Concretion is, in some of these Substances, owing to *Heat*; and in others to *Cold*. There is perhaps nothing to hinder but that the Coalescence of some Kinds of *Stones* may be occasioned by the one, and of others by the other of these Causes: though that of the *Earths* of all Kinds seems owing only to *Heat*. From these contrary Causes, however, may happen the Concretion, or Dissipation of contrary Substances.

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clear and succinct Manner, given his Opinion in regard to the Causes of the Concretion of that Matter, the nature of which he had before described, for the Formation of the Bodies which are to be the Subject of the present Treatise.

The certain and immediate Cause of the Cohesion of these Particles, which had before, by their Gravity, been precipitated from among the fluid Matter in which they were at first suspended, was that universal Property in Matter called Attraction. The Pressure of the circumambient Atmosphere may serve to account for the Cohesion of large Masses of Matter: but the minute Contacts of lesser Particles of it, which sometimes cohere with a Force almost infinitely greater than the Pressure upon them can be supposed to influence, reduce us to a Necessity of having Recourse to this other



ή. Ἰδιότητες δὲ πλείους εἰσὶν ἐν τοῖς  
λίθοις· ἐν γὰρ τῇ γῆ χρώμασί τε, καὶ γλι-  
σχρότητι, καὶ λειότητι, καὶ πυκνότητι, καὶ τοῖς  
τοιούτοις αἱ ῥοαὶ διάφοροι· κατὰ δὲ τὰ  
ἄλλα σπάνιοι·.

---

Power of Attraction; a Property in all Matter, by which the Particles of Bodies draw one another with a certain Force, which acts infinitely more intensely at the Contact, or extremely near it, than at any determinate Distance.

How far the Heat, which is apparently manifest to our Senses at great Depths in the Earth; and is from thence, and from much greater Depths than we are ever likely to have Opportunities of being acquainted with, continually passing upwards to the Surface, may have been concerned in dissipating the remaining Part of the Water, which had served to bring the Particles of Stones and Earths together; and, by that means, been instrumental to the bringing them into their present State; and how far the Cold about the Surface may have assisted in the Formation of others, by preventing the Dissipation or farther Rise of their constituent Par-



VIII. There are in *Stones* of different Kinds many peculiar Qualities, which arise from this, that there are many very great Differences both in the Matter and Manner of the Affluxes of the terrestrial Particles from which they were formed; of which those in regard to Colour, Tenacity, Smoothness, Density, and the like Accidents, are frequent; though those in other more remarkable Properties, are not so common<sup>e</sup>.

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ticles, which had been washed from among the Matter of the Strata by the Water which continually also ascends from below towards the Surface, incessantly pervading them, and detaching and bearing up with it these Particles from among them, is a subject of too nice Enquiry, and too long to be particularly decided here. The bare mention of it may however serve to explain in what Manner Heat and Cold may be concerned in the reducing some of the fossile Substances into the State wherein we find them; and how Heat would have destroyed the very Means of Coalescence in those Subjects, to the Formation of which Cold has, according to this Philosophy, been essential; and Cold, on the contrary, must have prevented what Heat uninterrupted might have had Power of doing, in the others.

<sup>e</sup> The Author, having now treated of the



θ. Τοῖς δὲ λίθοις αὐταί τε· ἢ πρὸς  
 ταύταις<sup>f</sup> αἱ κατὰ τὰς δυνάμεις, τῆ τε  
 ποιῆν, ἢ πάσχειν, ἢ τῆ μὴ πάσχειν·  
 τηκτοὶ γὰρ, οἱ δ' ἄτηκτοί· ἢ καυσοὶ, οἱ δ'

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constituent Matter of these foffile Substances, and the manner and Causes of its Coalescence, in order to their Formation, comes here to the Consideration of the Differences of the distinct Classes, Genera, and separate Species of them. These he very justly and philosophically deduces from the different Matter of which they are formed, and the various Elaborations it has passed in the Affluxes by which it has been brought together. The terrestrial Matter, which serves as the Basis of their Formation, he observes, is very commonly found differing in Colour, Density, &c. and hence the Stones formed of it have very frequently these Differences; which make the many various Species of the common Strata of them: but that there are also other Varieties in this



IX. These Qualities *Stones* have, therefore, from the common Differences of the Matter, and Manner of the Affluxes of their constituent Parts: But besides these, they have others <sup>f</sup> which arise from the more peculiar Powers of their concreted Masses: Such are their acting upon other Bodies; or being subject, or not subject to be acted upon by them. Thus some are fusible, others will never liquify in the Fire; some may be calcined, others are incombustible;

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coalescent Matter, in regard to more peculiar Qualities, which are more rarely found, but which, wherever they are, make Differences in the Body formed from them, of other and more remarkable Kinds: this he goes on to shew in their proper Places.

Some Editions of this Author have it *πνοαὶ διαφοραὶ*, and others *πολλαὶ διαφοραὶ*, in the last Line of this Sentence; the *ροαὶ διαφοραὶ* is a very rational and judicious Alteration of *De Laet's*, and in all Probability was the true original Reading.

<sup>f</sup> The common Differences of the more frequent and large Masses of Stone having been now accounted for, from the frequent Diversities of the Earths of which they were formed; which are found to differ, like them, in the



ἀκαυσοί. ἢ ἄλλα τέτοις ὅμοια. ἢ ἐν  
αὐτῇ τῇ καύσει ἢ πυρώσει πλείους ἔχοντες  
διαφοράς.

ί. <sup>ς</sup> Ἐνιοὶ δὲ τοῖς χρώμασι ἐξομοιῶν  
λέγονται δυνάμενοι τὸ ὕδωρ, ὡσπερ ἡ σμά-

common Accidents of Colour, &c. and even much more than they, in every Pit; the Author now proceeds to enumerate the Differences of a more remarkable Kind, observable in the more rare and valuable Species, and occasioned, according to his System, by Diversities of less frequent, and therefore more remarkable Qualities in the Matter from which they were formed: which, together with the more singular Operations of Nature, in separating and afterwards bringing that Matter into a Mass, have imparted to the formed Substance *Qualities*, or, as he chuses to express it by a Word of greater Signification, *Powers* more singular and observable than those occasioned by less essential and more common Varieties in both.

<sup>ς</sup> After assigning the Causes of the various Figures and Qualities as well of the common, as the more rare and precious Kinds of *Stones* and *Earths*, the Author here enters into a Detail of what they are.



and in others, other such particular Properties are observable. To this it may be added, that in the Action of the Fire on them, they also shew many Differences.

X. Some are said to have a Power of making Water appear of their own Colour, as the *Emerald*. Others of petri-

The Emerald is the Stone whose Properties he begins with: but as he only hints in this Place, at what he more particularly explains himself upon some Pages after; I shall reserve what I have to offer, on this Subject, to that Part of the Work, where there will be a more immediate Opportunity of comparing it with his own Words.

The Stone he next mentions, and of which he has recorded the petrifying Power, but not the Name, is the *Lapis Assius*, or *Sarcophagus*. The *Assian*, or Flesh-consuming Stone. The *Sarcophagus*, Boet. 403. *Assius vel Assius Lapis*, Charlt. 251. *Sarcophagus, sive Assius Lapis*, De Laet. 133. *Assius Lapis*, Salmaf. in *Solin.* 847. *Plin.* Book 36. Chap. 17.

This was a Stone much known, and used among the *Greeks* in their Sepultures, and by them called *σαρκοφάγος* from its Power of consuming the Flesh of Bodies buried in it; which it is said to have perfectly effected in forty



ραγδος. οἱ δ' ὅλως ἀπολιθῶν τὰ τιθέμενα  
 εἰς ἑαυτῶς. ἕτεροι δὲ ὀλκὴν τινα ποιεῖν.  
 οἱ δὲ βασανίζουσι τὸν ἄργυρον, ὡς περ ἤτε  
 καλεμένη λίθος Ἡράκλεια, ἢ ἡ Λυδῆ.

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Days. This Property it was much famed for, and all the ancient Naturalists mention it : But the other, of turning into Stone Things put into Vessels of it, has been recorded only by this Author and *Mutianus*, from whom *Pliny* has copied it; and from him some few only of the later Naturalists. The Account *Mutianus* gives of it is, that it converted into Stone the Shoes of Persons buried in it, as also the Utensils, which it was in some Places customary to bury with the Body; particularly those the Persons while living had most delighted in. The Utensils he mentions are such as must have been made of many different Materials; whence it appears, that this Stone had a Power of consuming only Flesh; but that its petrifying Quality extended to Substances of very different Kinds. Whether it really possessed this last Quality, or not, has been much doubted; and many have been afraid, from its supposed Improbability, to record it. What has much encouraged a Disbelief of it is *Mutianus's* Account of its thus taking Place on



fyng, or converting wholly into Stone, whatever is put into Veffels made of them. Others have an attractive Quality; and others ferve for the Trial of Metals, as that called the *Heraclian*, or *Lydian* Stone.

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Subjects of different Kinds and Textures : But this, in my Opinion, is no Objection at all, and the whole Account, very probably, true. Petrifications, in those early Days, might not be distinguished from Incrustations of sparry or stony Matter; as even, with many People, they are not to this Day; the Incrustations of Spar on Moss and other Substances, in some Springs, being yet called by many petrified Moss, &c. and these might easily be formed upon Substances enclosed in Veffels, made of this Stone, by Water; if the Situation was in the Way of its passing through the Pores, dislodging from the common Matter of the Stone, and carrying with it sparry or other such Particles, and afterwards leaving them, in Form of Incrustations, on whatever it found in its Way. By this Means Things made of Substances of ever so different Natures and Textures, which happened to be enclosed, and in the Way of the Passage of the Water, would be equally incrufted with, and in Appearance



ια. Θαυμασιωτάτη δὲ ἢ μεγίστη δύνα-  
 μισ, εἶπερ ἀληθὲς, ἢ τῶν τίκτων<sup>h</sup>.

---

turned to Stone; without regard to their different Configuration of Pores or Parts.

The Place where this Stone was dug was near *Affos*, a City in *Lycia*, from whence it had its Name; and *Boetius* informs us, that in that Country, and in some Parts of the East, there were also Stones of this Kind, which, if tied to the Bodies of living Persons, would, in the same Manner, consume their Flesh.

The Stones mentioned next, as having an attractive Power, are the Load-stone, &c. but as these and the Lapis Lydius are hereafter described more at large by the Author, I shall reserve to that Place what I have to add in regard to them.

<sup>h</sup> This is one of the many Passages for which this excellent Author has been censured by Persons who had never sufficiently studied, or, perhaps, even read him (as I hope to prove has been the general Case in the Accusations to which he has been subject) and this has been as much misunderstood and misrepresented as any one of them all.

*Pliny* has given a Handle to the Accusations of him, in this Place, by saying, that he and *Mutianus* believed there were Stones which



XI. The greatest, however, and most wonderful of all the Qualities of *Stones* is that (if the Accounts of it are true) of those which bring forth young<sup>n</sup>.

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brought forth young. *Idem Theophrastus et Mutianus esse aliquos lapides qui pariant credunt.* This has been a sufficient Source of Censures on the Author: most of those who quote, or mention him, never having given themselves the Trouble of learning any Thing more of him than what *Pliny* has told them; as this, and many other Passages, frequently quoted from him, to be hereafter considered, will abundantly prove. But, with *Pliny's* Leave, I must observe, that I find no Reason here to imagine, that *Theophrastus* ever believed any such Thing. He mentions it, on the contrary, as a Thing which he did not believe; but which, as it was generally reputed true, and a very remarkable *Property* of a Stone, he could not avoid mentioning in a Place where he was professedly writing on that Subject. He would not however let it pass, even though he did allow it a Place, without frankly expressing his own Suspicion that it was but an idle and groundless Story.

The Stone meant is the *Ætites*, or Eagle Stone; the *Ætites Aquilinus*. *Linn. Ætites, seu Aquilinus Lapis, Worm. 77. Charlt. 31. Lapis Ætites, Boet. 375. De Laet. 114. Æti-*



ιβ'. Γνωριμότερα δὲ τῶν, ἢ ἐν πλείοσι  
κατὰ τὰς ἐργασίας. γλυπτοὶ γὰρ ἔνιοι,

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*tæ, Gesn. de Lap.* 10. famous for its imaginary Virtues in assisting in Delivery, preventing Abortions; and, which it at least equally possesses, of discovering Thieves. That the general Opinion was long what our Author records as reported of it, is easily proved: and we cannot wonder at that's being firmly believed, when we find such Virtues as the other, of choaking Thieves, &c. all certainly credited; and recorded by the gravest Authors.

That it was, long after, as well as before this Author's Time, believed to have this Property of bringing forth young, is evident from the Words *prægnans, gravidus, Uterus, ἐγκύμων, &c.* so constantly used in describing it. *Pliny* says of it, *est autem lapis iste prægnans intus, quum quatias, alio velut in utero sonante.* *Dioscorides, ἀετίτης λίθος ὡς ἕτερον ἐγκύμων λίθος ὑπάρχων.* And numberless Instances might be brought of the earliest as well as later Authors using the like Expressions; evidently testifying, that the Stone was, or had been generally believed to possess that so remarkable Quality; which perhaps this Author, who is accused of believing, was the very first who ever doubted.

In order to the establishing a more rational



XII. But the most known and general Properties of Stones are their several Fitnesses for the various Kinds of Work. Some of them are proper for engraving

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Account of the Nature and Formation of this Stone, it may not be amiss here to look into the Formation of Pebbles and Flints in general; of which Class this is a Species. By this Enquiry we shall find, that the Callimus, or included Stone, is, instead of a young one, indeed the older of the two; and has had some Share in the Formation of its Parent, as the outer one was generally esteemed; though that has nothing to do with its Production.

The Flints and Pebbles, we now every where see, have been all formed in the Waters of the Deluge, by the mere Afflux of their constituent Matter. The first Concretion of this was generally in small Quantity, and formed a little Lump or Nodule; and this afterwards encreased in Bigness by the Application of fresh Matter, in different Quantities, and at different Times to it. If this new Matter happened to be of different Textures and Appearances, the separate Quantities, that at Times affixed themselves, became different Crusts of various Colours; as may be observed frequently in our common Pebbles; if of the same Nature and Colour, and affixed nearly all at once, the Apposition became imperceptible af-



ἢ τορνευτοὶ, ἢ πριζοί. τῶν δὲ ἕδῃ  
 ὅλως ἀπλεται σιδήριον, ἐνίων δὲ κακῶς ἢ  
 μόλις <sup>i</sup>.

terwards; and the Mass formed of the whole appeared a Flint, or Pebble, of regular and similar Substance: and if, lastly, this Matter, before its Application, had received other various-coloured Affluxes into it, they are seen in the Concrete, in irregular Lines and Striæ, and it becomes an Agate, or other such Stone. In all these Cases the Matter first formed into a Mass, yet remains in Form of a central Nucleus, in or near the Middle of the Stone, according to the equal or irregular Quantity of the additional Matter which formed each Crust; this being sometimes all of the same Colour with that Nucleus, remains unperceivable, but sometimes, as before observed, being of different Colours, is evident to the Eye.

This Nucleus in some, indeed most of these Masses, being of the same Texture with the rest, has remained in its Place, and become a visible Spot of equal Hardness and Beauty with the rest of the Stone: in others, after the Application of some, or all the outer Crusts, it has shrunk into a smaller Compass, detached itself from the inner Crust, and become a loose,



on; others may be shaped by the Turner's Tools; others may be cut or sawed: Some also there are which no Iron Instruments will touch; and others which are very difficultly, or scarce at all to be cut by them<sup>i</sup>.

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separate Stone, rolling about in the Cavity, now too large for it; and rattling in it when shaken. This is our *Ætites*; and the central Nucleus so detached, and shrunk, is its *Calimus*. In others, this central Nucleus has crumbled into loose, sandy, or earthy Matter, and remaining in that Form, loose in its Cavity, has made what is called the *Geodes*, or *bastard Eagle Stone*. The *Geodes*, and the *Eagle Stone*, so much renowned for Virtues, and so fabulously talked of as to their Origin, are therefore no other than common Pebbles, the central Nuclei of which have, from the different Nature and Texture of the Matter of which they were formed, detached themselves from the superadded Crusts, and either shrunk, on becoming more dry, into smaller Dimensions; or fallen into the original Grit, or sandy Matter, of which they were first composed.

<sup>i</sup> I cannot but observe from this Passage of our Author, that, so early as in his Time, not only very many Species of precious Stones were in Use, and their different Degrees of Hardness familiarly known, but that the various



ιγ'. Εἰσὶ δὲ πλείους ἢ ἄλλαι κατὰ ταύτας ιδιότητας διαφοραί. αἱ μὲν ἔν κατὰ χρώματα, ἢ τὰς σκληρότητας, ἢ μαλακότητας ἢ λειότητας, ἢ τᾶλλα τὰ τοιαῦτα, διὰ τὸ περιττὸν, πλείοσιν ὑπάρχουσιν<sup>k</sup>.

Manners of working them were also well understood; even better than in the succeeding Ages, for he is here clear in the Distinction between the γλυπτοὶ and τορνευτοὶ, which much later Writers of his Nation are very justly accused of having confounded. The γλυπτὸν and τορνευτὸν of the Greeks, however confusedly misunderstood by some of them, and used as synonymous Terms by others, are really Words of distinct and determinate Sense; and signify the *Cælatura* and *Tornatura* of the *Latins*; which, I think, it is evident from this Passage, was well known to this Author, however it came to be forgotten afterwards.

<sup>k</sup> The Author, having now mentioned several very remarkable Properties in Stones, and their general Characters as to Difference of Texture, from the different Ways they are to be worked, proceeds here to relate the many other differences they have in their several peculiar Qualities, which they owe, as he has



XIII. There are also, besides these, many other Differences observable in them, according to their several Qualities; of which those in regard to Colour, Hardness, Softness, Smoothness, and the like Accidents, because of the Number and Diversity of those Qualities, happen to many<sup>k</sup>.

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before established it, to the different Matter and Manner of the Affluxes of their constituent Parts: and such of these as arise from the more common Varieties of terrestrial Matter, in Colour, &c. he again observes, are common to many and great Quantities.

This is only repeating, in its due Place, and at the Head of that Class of Stones to which it properly belongs, what he had before given as a Part of his general System: it was long, however, before this Passage was in a Condition to be thus understood; for after the Word ταύτας, there was by Defect in the Copy a Gap left, which some Editors had filled up with the Word διαφοραι only, but others, finding the Hiatus too large for that alone, have given their Opinion that the Word ιδιότηας is also to be added. In that Manner I have written it, and it appears evidently to me to have filled up a Gap in the Sense, as well as in the Writing; by making the Beginning, as well as all



εἶ. Καὶ ἐνίοις γε κατὰ τόπον ὅλον, ἐξ ὧν  
 δὴ καὶ διωνομασμέναι λιθοτομίαι, Παρίων  
 τε καὶ Πενθηλικῶν, καὶ Χίων τε καὶ Θηβαϊκῶν<sup>1</sup>.

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the rest of the Sentence, clearly refer to what I have observed the Author to have said before, Page 20, and of which this is no more than a Recapitulation, in its proper Place.

<sup>1</sup> The Author here gives an Account of the various Kinds of Marble and Alabaster known in his Time; and even so early as that, we find the *Parian* familiarly known, and, as may very rationally be guessed from its being named before all the other Kinds, most esteemed of any. This was originally dug only in the Island of *Paros*, and the Strata of it were always found so cracked, that it was scarce ever to be had in Pieces of more than about five Feet long; so that the finest Blocks of it only just served for Statues of a natural Size: they were extremely valued for the Elegance of their Colour, and the excellent Polish they would take.

A Marble of this Kind, but perhaps not exactly the same with this of the Ancients, is now dug in many Parts of *Italy*; and much esteemed for the same Qualities.

The *Pentelican*, the Kind he next mentions,



XIV. And to some indeed through whole Countries ; from which Quarries of them have obtained their Names ; as the *Parian*, the *Pentelican*, the *Chian*, and the *Theban*<sup>1</sup>.

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is now wholly unknown, and has been so for many Ages.

The *Chian* was a dead black Marble, so named from the Island of *Chios*, where it was dug ; something of the Kind of the *Lapis Obsidianus* of *Æthiopia*, and, like it, in some Degree transparent.

The *Theban* is a Marble well known to this Time ; it is red, variegated with other Colours, and is of two Kinds : The one softer, and marked only with yellow ; which is the *Brocatello* of the modern *Italians* ; the other extremely hard and variegated with Black, White, and many other Colours : This is the *Pyrrhopæcilus* and *Syenites* of *Pliny*, and the *Granate* of the Moderns. Many of the Works of the Ancients in *Greece*, *Italy*, and elsewhere, are of this Marble.

The Alabaster is the *Alabastrites*, *Boet.* 490. *De Laet.* 166. *Worm.* 42. *Matthiol.* 1386. It is a well known Stone, white, and approaching to the Nature of Marble, but much softer. The *Alabastrum* and *Alabastrites* of Naturalists, though by some esteemed synonymous Terms,



ιέ. Καὶ ὡς ὁ ἐν Αἰγύπτῳ περὶ Θήβας  
 ἀλαβασρίτης. ἢ γὰρ ἕτος μέγας τέμνε-  
 ται· ἢ ὁ τῷ ἐλέφαντι ὅμοιος, ὁ Χερνίτης  
 καλέμενος· ἐν ἧ πυνέλῳ φασι ἢ Δαρεῖον  
 κῆσθαι. ἢ ὁ πῶρος ὅμοιος τῷ χρώματι,  
 ἢ τῇ πυκνότητι τῷ Παρίῳ, τὴν δὲ κεφότηλα  
 μόνον ἔχων τῷ πωρῳ. διὸ ἢ ἐν τοῖς σπυ-  
 δαζομένοις οἰκήμασιν, ὥσπερ διάζωμα τι-  
 θέασιν αὐτὸν οἱ Αἰγύπτιοι.

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and by others confounded with one another, are different Substances; the *Alabastrum* is properly the soft Stone, of a gypseous Substance, burning easily into a Kind of Plaister; and the *Alabastrites* the hard, bearing a good Polish, and approaching to the Texture of Marble. All the later Authors confirm what *Theophrastus* here mentions, of its being found about *Thebes*. The Quarries of it there are not yet exhausted, and probably will not be in many Ages.

This Stone was by the *Greeks* called also sometimes *Onyx*, and by the *Latins*, *Marmor Onychites*, from its Use in making Boxes for preserving precious Ointments, which Boxes



XV. In *Ægypt*, about *Thebes*, there is also found the *Alabaster*, which is dug in large Masses; and the *Chernites*, which resembles *Ivory*, and in which, it is said, *Darius* was buried; as also the *Porus*, which in Colour and Hardness emulates the *Parian* Marble, though singular in its remarkable Lightness: in this it resembles the *Tophus*: and on Account of this the *Ægyptians* generally used it in the Partitions of their more elegant Edifices.

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were commonly called Onyxes and Alabasters. Thus *Dioscorides* ἀλαβαστίτες; ὁ καλούμενος ὄνυξ. And hence have been a thousand Mistakes in the later Authors of less reading; who have misunderstood *Pliny*, and confounded the Onyx Marble, as the Alabaster was frequently called, with the precious Stone of that Name. This Author, however, cannot be accused of having given any Occasion to the Confusion: for though the Onyx was, in his Time, sometimes called also Alabaster, as well as the Alabaster Onyx, from their common Use in these Boxes, he here clearly explains himself as to which Kind he is treating of, by observing, that it is that which is dug in large Masses; by way of Distinc-



ις'. Εὐρίσκεται ἢ μέλας αὐτόθι διαφανής, ὁμοίως τῷ Χίῳ, ἢ παρ' ἄλλοις δὲ ἕτεροι πλείους.

ιζ'. Αἱ μὲν ἔν τοιαῦται διαφοραὶ, καθάπερ ἐλέχθη κοινότεραι πλείοσιν. αἱ δὲ

tion from the Onyx or Alabaſter Gem, as what we now call only the Onyx was then ſometimes called.

The Chernites, or Chermites, was a white Marble, uſed in the Sepultures of the ancient *Greeks*, &c. and about which there have been many Miſtakes among the later Authors: theſe, as the Species of Marble is now unknown among us, it would be but idle to enquire into.

The Porus was alſo a Marble much in Eſteem with the Ancients, but unknown to us. Its peculiar Property, as our Author obſerves, was its Lightneſs. It cut well, and bore a tolerable Poliſh, and the Statues, &c. made of it, were common in *Greece*, and called Πώρινα, as thoſe of the Parian Marble were called Πάρια. The Tophus, to which our Author compares this Marble for Lightneſs, is a rough Stone of the Pumice Kind, brittle, and eaſily crumbling into Powder. It is not much known in *England*, but common in *Germany*, where it is uſed



XVI. There is also found in the same Place a transparent *Stone*, something like the *Chian*: and in others, there are many other Kinds.

XVII. These are the Differences which have been mentioned as common to many *Stones*. But those which arise

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instead of the Pumice, and called *Topffstein* and *Tugstein*. This was a Stone well known among the *Greeks*, and was what they called the *Porus*, without any Addition; whereas the other, here described among the *Marbles* by the Author, was called the *Porian Marble*; from its Resemblance to this *Porus*. The dark transparent Stone, next mentioned, was probably of the *Obsidianus* Kind; as well as the *Chian*. The *Antients* had two or three of these dark *Marbles*, of fine Texture, in great Use among them. They bore a good Polish, were transparent in some Degree when cut into thin Plates, and reflected the Images of Things as our *Looking-glasses* do: the finest Kind was, for this Reason, called ὀψιανὸς ἀπὸ τῆς ὀψέος, which was afterwards written by the *Latins*, *Opfianus*, *Opfidianus*, and *Obsidianus*. And the true Origin of the Name being forgotten from the false spelling the Word, After-ages thought it had received it from one *Obsidius*, whom they imagined the first Finder of it.



κατὰ τὰς δυνάμεις<sup>m</sup> τὰς προειρημένας, ἔτι  
 ἔτι τοῖς ὅλοις ὑπέρχουσιν, ἔδὲ συνεχείαις  
 λίθων, ἔδὲ μεγέθεσιν· ἔνιοι δὲ καὶ σπάνιοι  
 πάνπαν εἰσὶ καὶ μικροὶ, καθάπερ ἦτε,  
 σμάραγδος, καὶ τὸ σάραδιον, καὶ ὁ ἄνθραξ, καὶ  
 ἡ σάπφειρος, καὶ σχεδὸν λόγῳ τῶν εἰς τὰ  
 σφραγίδια γλυπτῶν. οἱ δὲ καὶ ἐν ἑτέροις  
 εὐρίσκονται διακοπτομένοις.

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<sup>m</sup> The Author, having now gone through the general Differences of the Strata of Stone, arising from common Causes; and having particularly mentioned, and in few Words described the various Species of Marble known in his Time, comes now to the Consideration of certain more extraordinary Qualities in Stones of smaller Size; arising from the Powers of more particular Combinations of Matter in their Formation. The particular Stones he mentions in this Place, as possessing these Powers, are hereafter treated of more at large. I shall therefore refer, what I have to observe in regard to them, to their proper Places, where they are separately described. To those particularly named the Author adds a great Number, which he also hereafter describes, in the Words τῶν εἰς τὰ σφραγίδια γλυπτῶν, which I



from the particular Powers<sup>m</sup> before named, are less frequent; nor do they, like these, happen to whole Strata, or vast Masses. Some of the Stones, in which they take Place, are very scarce and small, as the *Emerald*, the *Carne-  
lian*, the *Carbuncle*, the *Sapphire*; and, in general, all that are cut as *Gems*: and some of them are found in dividing other Stones.

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have chosen to translate "that are cut as Gems," not as the literal Meaning of the Words might seem to imply, limiting what are added only to those on which Seals were engraved.

It is evident, the Author meant himself no such Limitation, since he has afterwards described, among the Stones of this Class, many which he expressly says were too small for this particular Use. The Reason of his using the Word in this Place is, that the *Greeks* had no particular Name for the pellucid Stones, which we call distinctly *Gems*; they called all Stones, whether large or small, hard or soft, precious or common, by the general Name *λίθος*, and distinguished them, one from another, by their Epithets only, as *διαφανής* &c. and as the general Use of what we call *Gems*, and for



ιή. Ὀλίγοι δὲ καὶ οἱ περὶ τὴν πύρωσιν,  
καὶ καῦσιν. ὑπὲρ ὧν δὴ καὶ πρῶτον ἴσως  
λεκτέον, τίνας καὶ πόσας ἔχουσιν διαφορὰς.

ιθ'. Κατὰ δὴ τὴν πύρωσιν οἱ μὲν τή-  
κονται καὶ ῥέουσιν, ὥσπερ οἱ μεταλλευτοί·  
ρεῖ γὰρ ἅμα τῷ ἀργύρῳ, καὶ τῷ χαλκῷ  
καὶ σιδήρῳ καὶ ἢ λίθος ἢ ἐκ τέτων. εἰ τοίνυν

which they had no particular Name, was the serving for Seals; they sometimes, instead of distinguishing them by particular or descriptive Epithets, called them *Seal Stones*, and hence the Word Seal Stone, σφραγίς or σφραγιδίον, became with them a common Word for what we call Gem; and in that Sense it is evidently used here by this Author.

Most of the Stones of this Class were found to be of so compact a Texture, as to resist the Force of Fire; at least of common Fires; and even of the strongest known in this Author's Time; the solar indeed, which we are able to throw on Bodies, by reflecting Burning-glasses, no Stone, not even the Diamond, in all Circumstances and Positions, can withstand: But as some Stones, which he had yet to treat of,



XVIII. Some few of these Stones there are, which are subject to the Force of *Fire*, and may be burnt. These shall be first treated of, in Consideration of what their Differences are.

XIX. In regard to the Action of Fire on them, some are *fusible*, and melt by it; as the metalline Kinds. For the *Stones*, which partake of the Nature of *Metals*, as *Silver*, *Copper*, or *Iron*,<sup>n</sup> melt in the Furnaces with them; either

were subject to great Changes, from the Action of Fire, such as was then commonly used on certain occasions, whether culinary, or for the melting of Metals; these he first chuses to describe, and proceeds to give their several Differences.

<sup>n</sup> The Author is here treating of the various Kinds of *Spars*; formed near the Veins of different Metals, and assuming their Colours from, and partaking of the Natures of the particular Metals in the Mines of which they are found. All these are formed by the Percolation and Afflux of their constituent Matter, which is taken up by the Water continually pervading the Strata; and in its Way separated from the grosser Particles among which it was at first repositied; and finally tinged with a Co-



διὰ τὴν υἱρότητα τῶν ὑπαρχόντων, εἴτε καὶ  
 δι' αὐτάς. ὡσαύτως δὲ καὶ οἱ πυρομάχοι, καὶ  
 οἱ μυλῖαι ῥέουσιν, οἷς ἐπιθήασιν οἱ καίον-  
 γες.

---

four from, and in some Degree impregnated with the Virtues of the metalline Matter, among which it is deserted by the Water wherein it was before suspended; and left to coagulate, and assume the Form naturally arising from the Concretion of its Parts. Where these Spars are formed out of the Reach of metalline Matter, and have received, in their Passage through the Strata, no Impregnations from it, they are white: this is the natural Colour of their constituent Particles. But where they are formed in or about Mines, they, as our Author very justly remarks, partake of the Nature of, and, in some Degree, owe their Form and Mode of Existence to the particular Metal of the Mine. Their Shape and Virtues are often given them by the metalline Particles mixed with them in their Concretions; their Colours always; and that in a stronger or fainter Degree, as there has been more or less of that Matter mingled in their Masses\*.

\* See Appendix.



by means of the Humidity of the metalline Matter of which they partake; or of their own Nature: and in this Manner the *Pyritæ* also, and those Kinds of them called the *Molares*, melt with the Matter they are laid upon in burning.

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If the metalline Particles are in the Mixture in any considerable Quantity, the whole assumes a Shape peculiar to the Metal to which they belong; if that be *Lead*, the sparry Concretions are cubic; if *Iron*, rhomboidal; and if *Tin*, they shoot into the Form of quadralateral Pyramids. These are the Metals of which we can pretty certainly judge, from the Figure of the Spar about the Mine: as for the others, though they influence the shooting of it in no less Degree, yet they do not always throw it into such determinate or regular Figures.

But if the metalline Particles, assumed into the Spar at the Time of its Concretion, have a very great Power in determining it to a certain Figure; the Influence they have over it, in regard to Colour, is much greater; as all that it has of that is wholly owing to them: and as they are in greater or lesser Quantities in it, they give it different Degrees, from the slightest Tinge to the deepest Colour.

What Metal has been concerned in effecting



κ'. Οἱ δὲ καὶ ὅλως λείψι πάντας τήκεσθαι, πλὴν τῆ μαρμάρου. τῆτον δὲ κατακαίεσθαι, καὶ κονίαν ἐξ αὐτῆ γίνεσθαι. δόξειε δ' ἂν ἔτιως ὅλως ἐπὶ πλεῖον εἰρηθεῖται.

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this Change of Colour, is not less easily and certainly discoverable from the Colour itself ; than what has influenced the Shape, from the Form. If *Lead* has furnished the metalline Particles, the Spar is yellow ; if *Iron*, red ; if *Tin*, black ; if *Copper*, it is either greenish or blueish, according to the Quality of the Menstruum Nature has furnished for dissolving the Particles of that Metal, and bringing them into a State of mixing in the Concretion ; for Acids and Alkalis both dissolve Copper, but with this Difference of Colour, that the Solution with an Acid is green, and that with an Alkali is blue.

Though this Author was perfectly right, therefore, in his Opinion of these Substances partaking of the Nature of the Metals among which they were found ; he errs in imagining that they are fusible, and melt with those Metals. He may very well, however, be pardoned in this, since it has been an Error which many later Authors, who had more Opportunities of informing themselves of the Truth



XX. Some absolutely affirm, that all *Stones* will melt in the Fire except *Marble*, which by burning is reduced to *Lime*: But this is saying absolutely, and of all, what ought only to be said in general, and of the greater Number.

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than he can reasonably be supposed to have had, have also fallen into; nay, and many who imagine they understand these Things very well, from the constant Use of it in fluxing the Ores of Metals, believe the same of it even yet. This is however an absolutely erroneous Opinion, for Spar is not fusible, but calcines in the Fires used for melting the Ores of Metals. The Use it is of, in the fusing them is this: Those Ores are frequently clogged and loaded with Sulphurs, which make them very difficult of Fusion; and the Calx of Spar is of the same Use in that Case, that Lime, or any other fixed Alkali would be: That is, it absorbs those Sulphurs; and by that means destroying what would impede the Fusion of the Ore, does in some Sense assist its melting; but no one, who ever saw the Fusion of Ore with its Spar about it, ever yet observed the least Particle of that to melt.

The Pyritæ and Molares, as many Kinds of them were originally called, are no more capable of Fusion in the Fire than the Spars. They are Masses of mineral, saline, and sulphu-



κά. Πολλοὶ γὰρ οἱ ῥηγνύμενοι ἢ δια-  
πηδῶντες ὡς, ἔ μαχόμενοι (κατὰ) τὴν  
πύρωσιν, ὡσπερ εἰδὲ ὁ κέραμος. ὃ ἢ

---

reous Matter, either in detached Pieces of different Figures and Textures; or in whole Veins. The various Kinds of them contain different Quantities of different Metals, but generally too small to be worth the Charge and Trouble of working. Gold, Silver, Copper, and Iron are frequently found thus in them. But the principal Substances of which they are formed are Salts, Sulphurs, and Earths. The common Copperas of our Shops is made from different Kinds of them, in different Quantities; and no Species yields it in such Plenty as the echinated Kind of the Chalk Pits of *Kent* and *Surrey*. The Marchasites, as those are particularly called which are not in detached Pieces, but run in Veins, or fill the perpendicular Fiffures of Strata, often abound with Copper, and with a mineral, arsenical Juice, seldom found in the others; some of these also contain Antimony; others Bismuth, and some Iron and Tin. When they are very rich in these Metals, they lose the Name of Marchasites, and are called Ores. The Mineral, called in some Parts of *England Mundick*, is of this Kind, containing Copper and sometimes other Metals; but the Sulphur is so abundant



XXI. For some burst ° and fly in Pieces in the Fire : as, though not fusible, yet not of Power wholly to resist the Force of the Heat ; which is also

in these kinds of Ores, that they are not to be fluxed without great Trouble ; the Addition of Lime, or some similar Substance, is often necessary to bring them to fuse at all, and at best they are the most troublesome, and least profitable ; unless where very rich indeed, of any Ores in the World.

This Author however was not single, though erroneous, in his Opinion of the Pyritæ and Molares melting in the Fire ; his Master *Aristotle* had probably led him into it, who has, *Met. L. 4. c. 6.* τήκεται δὲ καὶ ὁ λίθος ὁ πυρίμαχος, ὡς εἰς σάζειν καὶ ῥεῖν, τὸ δὲ πηγνύμενον ὅταν ῥυῆ πάλιν γίγνεται σκληρόν, καὶ αἱ μύλιαί τήκονται ὡς εἰς ῥεῖν.

° Some few Species of Flints are Substances of this Kind, and above all others that found in whole Strata (not in detached Masses or Nodules, as our common Flints are) and called *Chert* or *Whern* in some Parts of *England* ; a Lump of this, put into a moderate Fire, will, as the Heat penetrates it, fly to Pieces in Scales or thin Flakes, which fall off, from Time to Time, till the whole is reduced to a Mass of coarse Powder : but it is an Error to infer from this, that these Stones are not fu-



κατὰ λόγον ἐσίν. οἳ τινες ἐξυγρασμένοι  
 τυγχάνουσιν. τὸ γὰρ τηκτὸν, ἔνικμον εἶναι  
 αἰ, ἢ ὑγρότητα ἔχει πλείω.

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fible ; for the same Stone, or even the very Powder, into which it has been shattered by the Fire, put into a Crucible with Salt of Tartar, or any other fixed alkaline Salt, and placed in a stronger Fire, will melt, and boil in the Vessel ; and form a very good Glass, as I have many Times experienced.

To learn the real Causes of the different Degrees of this Fusibility in different fossile Substances, it will be necessary, first, to consider the Cause of their Solidity, or, in other Words, of their Cohesion : and this, as I have before observed, is that Power residing in all Matter, called Attraction.

This Power, it has already been observed, is infinitely strongest at the Point of Contact : and therefore the Cohesion of all Bodies must be in Proportion to the Number of Points in which their constituent Particles touch one another. Those Particles therefore which have the least Solidity, with relation to their Surfaces, though they attract least at Distances,



the Case in earthen Vessels. This is an Effect no way repugnant to Reason; for these are absolutely dry, whereas whatever is fusible must be, at least in some Degree, moist; and retain, to the Time of its Fusion, more or less of its Humidity.

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yet, when they touch, cohere the most intimately; but where, from contrary Causes, the Cohesion is small, as in spherical Bodies, whose Surfaces can only touch in a Point, their Particles easily recede from one another on any Impulse; and whenever they are set in Motion, Fluidity takes Place.

By what means Fire is an Agent in bringing Things into this State, is easily understood. Its Particles, which are very powerful and very active, insinuate themselves into the Substance of the Matter to be melted, break and divide its Parts, and occasion a much smaller Contact of them than there was before, and of Course a weaker Cohesion: more fiery Particles continually getting in as the Matter continues on the Fire; more and more diminish the Degree of Contact, till at last there is not enough of it to keep the Particles from rolling one over another, that is coming into a State of Fusion.

This is the general Cause of the Fusion of fossile and other Substances; and the different



κβ'. Φασὶ δὲ καὶ τῶν ἠλιθίων τὰς  
 μὲν ἀναξηραίνεσθαι τελείως, ὡς ἀχρεῖς  
 εἶναι μὴ καταβρεχθέντας πάλιν καὶ συνικ-  
 μασθέντας· τὰς δὲ καὶ μαλακωτέρας καὶ δια-  
 θραύσας μᾶλλον. φανερόν δὲ ὡς ἀμφοτέ-  
 ρων μὲν ἐξαιρεῖσθαι τὴν ὑγρότητα. συμ-  
 βαίνει δὲ τὰς μὲν πυκνὰς ἀποξηρανομένους  
 σκληρύνεσθαι· τὰς δὲ μαλακὰς, καὶ ὧν ἡ φύσις  
 τοιαύτη, θραύσας εἶναι καὶ τηκτές.

κγ'. Ἐνιοὶ δὲ τῶν θραυστῶν ἀνθρακῶνται  
 τῇ καύσει, καὶ διαμένουσι πλείω χρόνον.  
 ὡσπερ οἱ περὶ Βίνας ἐν τῷ μετάλλῳ καὶ ἐς

---

Degrees of Fire, they require to bring them to it, are proportioned to their different Contact of Parts, or Degrees of Cohesion. Such as have least Contacts melt soonest, and for this Reason Lead melts more readily than Gold. The different Gravity of the Substances has nothing to do in this, since it is not according



XXII. It is said also, that on exposing to the Sun's Rays some are wholly dried up ; so as to be rendered useless, unless macerated and impregnated again with Moisture : while others by the same means become softer and more brittle. It is evident that the Humidity is extracted in both these Cases ; the Difference is, that the more dense and compact Stones harden by this drying ; whereas the looser, and those of a less firm Texture, become more brittle and soft by it.

XXIII. Some of the more brittle *Stones* there also are, which become as it were burning Coals, when put into a Fire, and continue so a long time : of this Kind are those about *Bena*, found

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to the Quantity of Matter they contain ; but the Number of Points in which the Particles of that Matter touch one another ; and for this Reason it is that Lead, which is heavier than most other Metals, notwithstanding its superior Quantity of Matter ; melts also more readily than most others.



ὁ πυριταμὸς καταφέρει. καίονται γὰρ ὅταν  
 ἄνθρακες ἐπιτεθῶσι, ἢ μέχρι τέττε χρείας  
 εἰς φυσᾶ τις. εἴτ' ἀπομαραίνονται, ἢ  
 πάλιν καίονται. διὸ ἢ πολὺν χρόνον ἢ  
 χρεῖσις. ἢ δ' ὀσμὴ βαρεῖα σφόδρα ἢ δυ-  
 χερής<sup>p</sup>.

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<sup>p</sup> The Stone here described is the Lapis  
 Thracius of the later Authors, a Stone much  
 talked of in all the Writings of the old Natura-  
 lists, and by some allowed a Place in the Ca-  
 talogues of the *Materia Medica*; but now  
 wholly unknown. There is, however, no  
 question, from our Author's Account of this  
 Substance, but that it was the very Thing after-  
 wards well known under that Name, *Bina*,  
 or *Bena*, the Place he mentions where it was  
 found, was a Town in *Thracia*; and every  
 Particular he has recorded of it has been since  
 applied to the *Lapis Thracius*: Its inflammable  
 Quality, disagreeable Smell, and the Manner  
 in which it was found, were the same with  
 those of the *Thracius* of the later Writers. This  
 was well known to *Dioscorides*, &c. as is evi-  
 dent from what they have said of it; but there  
 has been so much Confusion about it among  
 the Writers since, that little more than the



in Mines, and washed down by the Torrents, for they will take fire on throwing burning Coals on them, and continue burning so long as any one blows them; afterwards they will deaden, and may after that be made to burn again: they are therefore of long Continuance, but their Smell is troublesome and disagreeable<sup>p</sup>.

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Name has been handed down to us: some have been of opinion, that it was a kind of *Coal*, others of *Jet*, and others of the *Ampelites*. What is to be gathered from the oldest Writers about it is this; that it was a hard bituminous Substance, very inflammable, of a brittle Texture, and of a very disagreeable Smell when burning. It was sometimes dug, as our Author observes, but was principally found in the River *Pontus*, into which it had probably been washed from the Banks; in the Strata of which it was originally lodged; by the dashing of the waves in Storms, or dislodged by other Accidents. As is also the Case with the *Pyritæ*, *Lodus Helmontii*, Amber, and many other of the fossile Substances, which are now generally found on the Shores of the Sea or large Rivers: of these a diligent Enquirer will always find a much larger Quantity in the Strata of the neighbouring Land, than



κδ'. Ὅν δὲ καλέσι σπῖνον, ὃς ἦν ἐν τοῖς  
 μετάλλοις, τοιῶτος διακοπὴς ἢ συντιθεὶς  
 πρὸς ἑαυτὸν, ἐν τῷ ἡλίῳ τιθέμενος, καίε-  
 ται, ἢ μᾶλλον εἰάν ἐπιψεκάζῃ, ἢ πριερά-  
 νη τις<sup>9</sup>.

---

are seen washed on the Shore; and generally many standing out from among the Matter of the Strata of the Shores or adjacent Cliffs, and ready to be washed out by Rains, or dislodged by the Earth of the Strata cracking after Frost; and so rolled down into the River: though in their natural Situation out of the reach of its Waves; the dashing of which in Storms and high Tides against the Banks, are the more common Means of getting them out.

Most of the Editions have it ἀνθρακῆνται τῇ θραύσει; *Salmasius* first restored the Passage to its proper Sense, by altering it to τῇ καύσει, which there is no room to doubt was the original Reading. Nor is that the only Thing in which this Sentence is indebted to that excellent Critic for restoring it to its native Sense and Purity; as indeed are many other Parts of this Author's Works.

<sup>9</sup> The *Spinus*, or, as the excellent Critic just mentioned would have it called, *Spilus*, σπῖλος, was another indurated Bitumen of the *Lapis Tbracius* Kind, of which *Theophrastus* is not



XXIV. That also which is called the *Spinus*, is found in Mines. This Stone cut in Pieces and thrown together in a Heap, exposed to the Sun, burns: and that the more, if it be moistened or sprinkled with Water<sup>9</sup>.

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the only Author who has recorded this memorable Quality: but we have no Right either to confirm or question it, as the Substance is now wholly unknown to us.

The general Characteristics of these solid Bitumens, the Class of Bodies the Author is here describing, are, that they are dense, dry, and friable Substances, easily inflammable, fusible by Fire, and condensing by Cold. They are soluble in Oil, not to be disunited by Water, as the argillaceous Earths are; and yield in Distillation a large Quantity of fetid Oil.

The Bodies of this Class, known to the Antients and understood under this general Name, were, beside the *Thracius* and *Spinus*, 1. The *Asphaltum*, called also *Bitumen Judaicum*, and by *Serapion*, *Gummi funerum*; this was found in *Dioscorides's* Time about *Sidon* in *Phœnicia*, *Zant* in *Sicily*, and in *Judæa*. The Account in the sacred Writings, of its having been used as Mortar in the building the Tower of *Babel*, is unquestionable: *Strabo* and others of the Antients asserting, that it was found plentifully



κέ. Ο δὲ Λιπαραιῶς ἔκπρωρᾷται τῇ  
καύσει, καὶ γίνεται κισσηροειδής· ὡς ἅμα  
τὴν τε χροῖαν μεταβάλλειν καὶ τὴν πυκνή-  
τητα. μέλας τε γὰρ καὶ λεῖός ἐστι, καὶ πυκ-  
νός, ἄκαυτος ὢν. γίνεται δ' ἔτος ἐν τῇ κισ-  
σήρει διειλημμένος ἄλλοθι καὶ ἄλλοθι, κα-  
θάπερ ἐν κυτταρείῳ, καὶ ἐ συνεχής· ὡσπερ

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about *Babylon*; and that the Buildings of the  
old *Babylon* were of Brick cemented with this  
Substance.

2. The *Pissasphaltos*, found, according to  
*Dioscorides*, in the Ceraunian Mountains of  
*Apollonia*; this was not so hard as the former,  
and of a more pleasant Smell; it is now found  
in the Campania of *Rome*, near a small Town  
called *Catbo*, where it ouzes through the Cran-  
nies of Rocks, and is at first of the Consistence  
of Honey, but soon dries and becomes hard.

3. Amber, of which the Author treats here-  
after in this Work.

4. Jet, the *Gagates* of *Dioscorides*, and black  
Amber of the Shops; a dry, hard, shining Sub-  
stance, of a fine black, burning like Pitch, and  
emitting a thick black Smoke. Its Name it  
had from *Gagis*, a Town in *Lycia*, where it  
was originally found: it is now dug in *Prussia*,  
*France*, *Germany*, *Sweden*, and some Parts of  
*England*.



XXV. <sup>r</sup> But the *Lipara* Stone empties itself as it were in burning; and becomes like the *Pumice*: changing at once both its Colour and Density; for before burning it is black, smooth, and compact. This Stone is found in the *Pumices*, separately, in different Places, and as it were in Cells, no where continuous with the Matter of them. It is

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5. Cannel Coal, the Ampelites of *Dioscorides*, called also *Terra Pharmacitis* by some Authors, though its Use in Medicine at present is almost unknown. This is as hard as the foregoing, and takes an excellent Polish; we have it in many Parts of *England*, where it is turned into Toys of different Kinds. And

6. The Lithanthrax, or common Coal, well known to all,

These were the solid Bitumens, known as such to the Antients, and which, though they were not all known so early as in this Author's Days, I judged it not amiss thus shortly to mention here; that it may be observed from their Qualities and Descriptions, and those of the two mentioned by the Author, that it was neither of these that he knew, by either of the two Names of those he has here described: but that he did know the last is certain.

<sup>r</sup> The *Lipara* Stone (so called from *Lipara*, one of the *Æolian* Islands, from whence it was



ἢ ἐν Μήλω φασὶ τὴν κίσσηριν ἐν ἄλλῳ τινὶ  
λίθῳ γίνεσθαι. ἢ ἐκεῖνος μὲν τρίτῳ ὡσπερ  
ἀντιπεπονθώς. πλὴν ὁ λίθος ἕτος ἐκ  
ὅμοιος τῷ Λιπαραίῳ.

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usually brought among the Pumices, of which those Islands always furnished a large Quantity) is a small Stone, usually about the Bigness of a Filbert, of an irregular and uncertain Shape, and porous friable Constitution, like that of the Pumices, but more easily crumbling into Powder between the Fingers than even the softest Kinds of them. The Colour is generally of a dusky grey, and the whole external Face of it evidently shews that it has suffered a Change by the Fire. The Ancients had these Stones in great Esteem, and *Pliny* has recorded an idle Tradition concerning them, which, I suppose, was then generally believed, *suffita ea omnes bestias evocari*; but at present they are so little regarded, that the Writers on these Subjects have even forgot to name them: and *Wormius*, the only Naturalist of the more late ones, who had actually received them, and gave them a Place in his Museum, and a Description in the History of it, seems not to have known that they ever had any Name at all. I don't know that any Body else has observed that his *lapilli cinerei Ætnæ*, are the *Liparis*



said, that in *Melos* the Pumice is produced in this Manner in some other Stone, as this is on the contrary in it. But the Stone in which the Pumice is found, is not at all like the *Lipara* Stone, which is found in it.

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or *Liparæus Lapis* of the Antients; but his Description so exactly agrees with some Stones I have, which I received with some Pumices from *Hecla*, and have always judged to be the *Liparæi*, that I make not the least question of their being the very same: His Words are, *Ejusdem montis (sc. Ætnæ) et ab eodem tractu, ad me delati sunt Lapilli, cinerei, obscuri & adusti, qui vi ignis naturam suam plane amiserunt, & porosi sunt redditi, læves & inequales, ita ut ad naturam Pumicum quam proxime accedant, sed friabiliores sunt & facile in minutiores partes, vel digitorum compressu dissiliant.*

Besides those which I have from *Iceland*, I have sometimes seen of them among Quantities of Pumice. I cannot say I ever had the Fortune to find any one in a Mass of the Pumice; or ever had an Opportunity of observing their Texture before they had passed the Fire: but the Account this Author gives of them may probably enough be true in both Circumstances; it being very common to observe small Stones of the Flint, Pebble, and other Kinds, immersed in Masses of a different Texture; and



κς'. Εκπωρεῖται δὲ καὶ ὁ ἐν Τετράδι<sup>s</sup>  
τῆς Σικελίας γινόμενος. τῆτο δὲ τὸ χω-  
ρίον ἐστὶ κατὰ Λιπάραν.

κζ'. Ὁ δὲ λίθος ἐν τῇ ἄκρᾳ τῆ Ερι-  
νεάδι καλεσμένη πολλὸς, ὁμοίως ταῖς Βί-  
ναις καίόμενος, ὁσμὴν ἀφίησιν ἀσφάλτου.  
τὸ δ' ἐκ τῆς κατακαύσεως ὅμοιον γίνεται  
γῆ κεκαυμένη.

κή. Οὗς δὲ καλεῖσιν εὐθὺς ἄνθρακας,  
τῶν θρυπλωμένων διὰ τὴν χρείαν, εἰσὶ γεώ-  
δεις. ἐκκαίονται δὲ καὶ πυρεῖνται καθάπερ οἱ  
ἄνθρακες. εἰσὶ δὲ περὶ τε τὴν Λιγυσικὴν,

the intense Degree of Heat these, with the  
Pumices, must have suffered, might very pro-  
bably effect Changes as great or much greater,  
than between the present State of this Stone  
and what this Author describes to have been  
its Original.

As to what regards the Pumice itself, as the  
Author hereafter describes it more at large, I  
shall reserve to that Place what I have to ob-  
serve about it.

\* The Name of this Place is differently spelt  
in different Editions of this Author, some hav-



XXVI. Certain Stones there are about *Tetras*<sup>s</sup> in *Sicily*, which is over against *Lipara*, which empty themselves in the same Manner in the Fire.

XXVII. And in the Promontory called *Erineas*, there is a great Quantity of Stone like that found about *Bena*; which, when burnt, emits a bituminous Smell, and leaves a Matter resembling calcined Earth.

XXVIII. Those fossile Substances that are called Coals, and are broken for Use, are earthy, they kindle however, and burn like wood Coals. These are found in *Liguria*, where there also is

ing it *Τετραδι*, others *Τετραριδι*, and probably neither of them right; for there is no mention of any Place in *Sicily* of either the one or the other of these Names in the antient Geography: But however uncertain the Place of Production of these Stones be, what our Author observes of them is very well worth noting, that they became light, porous, and like Pumices from the Action of the Fire. It were much to be wish'd we were now acquainted with this Stone, since if we knew any which we could by Fire reduce to a Pumice, it would



ὅπερ καὶ τὸ ἤλεκτρον, καὶ ἐν τῇ Ηλείᾳ, βα-  
 διζόντων Ολυμπιάζει τὴν δι' ὄψεως. οἷς καὶ  
 οἱ χαλκῆς χρῶνται<sup>†</sup>.

give us a Light into the Origin of that Body ;  
 which we at present very much want.

The Substance next mentioned is evidently  
 of the Class of solid Bitumens, and a Species  
 of the *Lapis Thracius* before described. The  
 Residuum after burning, or *Caput mortuum* of  
 all the Bitumens, is a calcined Earth ; and  
 Rocks and Promontories are the most common  
 Places out of which they are found exfudating.

† The Substance here described, whatever  
 Mistakes there have been among Authors since  
 about it, appears to me to be evidently no  
 other than the common Pit Coal ; and I have  
 made it appear as clearly so in the Translation,  
 only by having properly rendered the Word  
*άνθρακες*, the carelessly misunderstanding which  
 Word alone has been the Occasion of all the  
 erroneous Guesses about the Substance here  
 described. The Authors of these seem all to  
 have understood the Word *άνθραξ*, as signifying  
 Fossile or Pit Coal ; and therefore, as the Au-  
 thor compares the burning of this Substance  
 to that, they were necessitated to think of some  
 other Substance that he might here mean ; as  
 it was impossible he should intend to compare  
 a Thing to itself.



Amber, and in *Elis*, in the Way to *Olympias* over the Mountains. These are used by the Smiths<sup>t</sup>.

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*Wormius*, on this Foundation, imagined, that he meant the Cannel Coal: *Quod Galenus vocat Ampelitidem, &c. Theophrastus Carbones vocat, quod eorum colorem habeat, & vices gerat.* Thus is *Theophrastus*, according to Custom, accused of saying Things he never meant; because the People who quote him have not been at the Pains to understand him: *ἐκκαίονται δὲ καὶ πυρᾶνται καθάπερ οἱ ἄνθρακες*, is evidently, they kindle and burn like Wood Coals, or, as we call it, Charcoal; for that is the genuine and determinate Sense of the Word *ἄνθραξ* in *Greek*, and *Carbo* in *Latin*; as is evident from the other Works of this Author, *Pliny*, and all the other old Naturalists. Even the more correct of the Moderns, when they would express what we call Pit Coal, the Substance here described by the Author, never use the Words *ἄνθραξ* or *Carbo* alone, but always *Carbo fossilis*, and *λιθάναθραξ*. See *Woodward, Charlton, Merret, &c.* The similar Use of this Bitumen got it the Name of Coal, but always with an Addition that distinguished it from what was more commonly and properly so called; and expressed its not being of vegetable, but fossile Origin.



κθ'. Εὐρέθη δὲ ποτε<sup>v</sup> ἐν (τοῖς) Σκαπ-  
τησύλης μετάλλοις λίθος, ὃς τῇ μὲν  
ὄψει παρόμοιος ὦν ξύλῳ σαπρῷ· ὅτε δ'  
ἐπιχέοιτό τις ἔλαιον, καίεται· καὶ ὅτ' ἐκ-  
καυθείη, τότε παύεται καὶ αὐτὸς, ὥσπερ  
ἀπαθῆς ὢν.

λ'. Τῶν μὲν ἔν καιομένων αὐται δια-  
φοραί.

λα'. Ἄλλο δὲ τι γένος ἐστὶ λίθων, ὥσ-  
περ ἐξ ἐναντίων πεφυκὸς, ἄκαυσον<sup>w</sup> ὅλως,

<sup>v</sup> It is much to be questioned, whether this was the true original Reading, and genuine Sense of the Author; in all probability some Errors in the old Editions have made this Passage express what he never meant to say. The Substance, and indeed the only Substance described by the other antient Naturalists as resembling black Wood, is the Gagates or Jet, before mentioned among the Bitumens: but that has no such Quality as the Author has here ascribed to this Stone of *Scaptesylos*.

The Antients had a common Opinion of the Bitumens, that the Fire of them was en-



XXIX. There<sup>v</sup> is also found in the Mines of *Scaptesyliæ* a Stone, in its external Appearance something resembling rotten Wood; on which, if Oil be poured, it burns; but when the Oil is burnt away, the burning of the Stone ceases, as if it were in itself not liable to such Accidents.

XXX. These then are the Differences of the Stones which are subject to the Force of Fire.

XXXI. But there is another Kind of Stone, formed, as it were, of contrary Principles, and entirely incombustible<sup>w</sup>:

creased by Water; and extinguished by Oil; and very probably this was the Sentiment originally delivered here by the Author; however Errors upon Errors in different Copies of his Works may since have altered the Sense of them. The Stone itself was probably a Bitumen of the *Lapis Thracius* Kind, as the Place from whence it has its Name was a Town of that Country.

<sup>w</sup> The Author having now gone through the different Effects of Fire on the various Kinds of Stones which are subject to be acted upon by it, comes here to the Consideration of



ἄνθραξ καλόμενος. ἐξ ἧ καὶ τὰ σφαγίδια

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certain others, which either from the different Matter of their constituent Particles, or the different Manner of their Combinations, he esteems of a Texture not to be injured by it; but altogether safe against its Efforts; and, as his own Words express it, incombustible.

None of these indeed are of Power to resist the solar Fire collected by a great reflecting Burning-glass; but, in general, are first calcined as it were, and split and shattered in Pieces by it, and afterwards melted into Glass. This, however, was probably a Kind of Fire, unknown in these extreme Degrees of Power, till very long after the Time of this Author. The culinary Fire, or that used in those Times for fluxing Ores, the strongest they then knew, tho' much less intense than those we now use on that Occasion (of which there are many unquestionable Proofs; nay, that even those of the Workers in Metals, but a few Ages ago were so) had no Power of making any Change in these Stones; therefore the Author is not to be censured for esteeming them incombustible; or not knowing what it was impossible he should have seen. He is to be understood with regard to the Action of the Fires used in his Time; and he must then be allowed to have been well acquainted with the Subjects he treats of in this Division of his Work.

\* The Antients expressed by this Word all



This is called the \* Carbuncle, on which

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the red transparent Gems, which have been since distinguished under the Names of the different Kinds of Ruby, Granate, Hyacynth, &c. all which they esteemed only different Species of the Carbuncle: And in Justification of them it must be acknowledged, that fossile Bodies not being organized, in general want those fixt and determinate Characteristics, by which those of the vegetable and animal Kingdoms are unalterably distinguished from each other. Those of the Gems in particular have fewer fixed and unvariable Differences by which their Genera and Species may be determinately fixed than any other.

The Reason of the Difficulty in regularly methodizing and distinguishing the Genera and subordinate Species in the various Classes of the fossile Kingdom, is, that in the Time of their original Concretions their Particles scarce ever coalesced in perfect Purity; but took up among them, from amidst the Mass of fluid Matter in which they were at that Time sustained, Particles of extraneous Matter, of various Kinds in various Places; so that not only the external Face, but even the interior Constitution of the same Species is found in different Regions very different; and in many Specimens not to be known at first sight even to the most accurate Observer.



γλύφουσιν. ἐρυθρὸν μὲν τῷ χρώματι,

But if this be the Case in fossile Substances in general, it is much more particularly so in this Class of them, the Gems; the Differences of which are owing to the Distribution of a certain kind of Particles in their Masses; which are so very uncertain, both in Quantity and Manner of placing, and in their various Effects upon the Mass, that scarce any thing absolute is to be determined from them.

The Gems are naturally angular, as are the Crystals: but like them, from various Accidents in their Formation, they are found sometimes in rude or shapeless Masses; and when angular, they have still all that Variation of Figure which we see take place in Crystal and Spar; from the different Disturbances of their Crystalization. In all these Cases a various Number of Angles may be occasioned, as we see in Salts, from the Accidents of their Concretion. In these, as well as in those, we have the same Kind in different Figures; and as we can crystalize them under the Eye, we can determine the Causes of those Alterations. The round, or pebble Gems, seem not to have been original in that Form, but worn to it by rolling about in a Fluid.

The Hardness and the Lustre of the Gems, must distinguish them from all other Stones; for if we considered their Form, as their essential Character, many Crystals would assume the



they engrave Seals. Its colour is red,

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Name: and *Cronstedt* has well determined, that a certain Spar he had seen in Figure of the most regular Diamond, must then be called, a Diamond.

No peculiar Construction, no Form of constituent Parts is visible in the Gems: they appear as Masses of uniform Nature; and they break irregularly and indeterminately; yet there is in all a really plated Structure. The Lapidaries find this in some, and can split them; the Burning Glass discovers it in the rest; and when turned to it in a right Direction, tears them to pieces: they split into the thinnest Plates that can be conceived, and seem to have been composed in the Manner of the Talcs, only more compact. 'Tis pity this Character is not more obvious: for it affords a real distinctive Mark between the Gems, and all other Stones: Crystals, which seem to come nearest to them, have it not.

Their Colours are less essential, for they can in most be driven away by Fire; and Nature sometimes gives the Gem without them; they are evidently owing to the Metals; for we can by means of Metals, give the same to Glass; our artificial Gem.

The Salt System of *Linnaeus* appears here almost ludicrous. To a truly philosophic Eye, the Difference of Estimation and Price are nothing; but the common Reader will hardly



keep his Countenance when he sees the Diamond reduced to a Species of Allum; and the Emerald of Borax. *Fossils Arrang'd*, p.137, 138.

What can be ascertained in general is this:

The Mass of constituent Matter in them all, is a pellucid crystalline Substance, which is in different Kinds of different Degrees of Hardness, from that of the Diamond to that of the merest shattery Crystal. This crystalline Matter, had it concreted in perfect Purity, had been colourless alike in all: and the various Species had been distinguishable only by their different Degrees of Hardness: but as this Matter, in the time of its Coalescence, assumed into it any Particles of a proper degree of Gravity and Fineness, which happened to float in its Way, it became by that Means different not only in Colour, nay, and in Degree of Colour, according to the Nature and Quantity of the Particles it took up into itself; but from their different Nature was also altered in what alone could have been its determinate Characteristics, its Hardness and specific Gravity. Many Reasons may be alledged why the Particles thus assumed into the crystalline Nodules at the Time of their Formation, must have been principally of the metalline Kind; and we find, in effect, that they were so. The various Colours of the Gems have their Rise from these Admixtures; and, according to what I have before observed as to the colouring of Spars by the same Means, when the metalline Matter thus mixed with the crystalline



was Lead, the Stone became a Topaz, or, as the Antients called it, a Chrysolite: for it is very evident, that what they called the Topaz; we now call the Chrysolite; and what they called the Chrysolite, we now, on the contrary, call the Topaz.

Our Topaz is a very elegant and very beautiful Gem, of which the Jewellers have two Kinds, the Oriental and Occidental; the Oriental are of a fine pale yellow like the Jonquil Flower. They are of very great Splendour, and equal the Ruby in Hardness. These are brought from *Arabia*, and many Parts of the *East Indies*. The Occidental are often very beautiful; but are distinguished from the Oriental by their Softness, for they are no harder than common Crystal: and by a foxy redness with the yellow. We have them from *Silesia* and *Bohemia*.

The Topaz of the Antients, now called the Chrysolite, differs from these in Colour, for it has always an Admixture of green with the yellow; probably from Particles of Copper dissolved in an Acid, and taken up with those of the Lead into the Matter of the Gem, at the Time of its original Concretion.

As these Gems have their Colours from this accidental Admixture of extraneous Particles, they may also be divested of them by Fire; without any Injury to their Texture: and the Oriental Topaz thus rendered colourless, is, like some other Gems to be hereafter described, sometimes made to counterfeit a Diamond,



πρὸς δὲ τὸν ἥλιον τιθέμενον, ἄνθρακος  
 καιομένην ποιεῖ χρῶαν. Τιμιώτατον δ'  
 ὡς εἰπεῖν. μικρὸν γὰρ σφόδρα, τετταρα-  
 κοντα χρυσῶν. ἄγεται δ' ἔτος ἐκ Καρ-  
 χηδόνοσ κὶ Μασσαλίας.

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When Lead and Iron together entered the Composition, the Stone became a Hyacynth; when Iron alone, the Granate, and other red Gems, or, as the Antients in one Word express it, the Carbuncles were produced: the Ruby is particular, and owes its dye to Gold. When Copper, dissolved by Acids got in, the Emerald appeared; by Alcalies, the Sapphire; and so of the rest. No Wonder is it, therefore, that the Gems in particular have never been perfectly reduced to Method; since there is so little Room for determining any thing fixed and stable in regard to them; and when the Operations by which Nature gave them their Existence, have been so uncertain, and liable to such numberless accidental Variations.

It was from this Property of resembling a burning Coal when held against the Sun, that this Stone obtained the Names *Carbunculus* and ἀνθραξ; which afterwards being misunderstood, there grew an Opinion of its having the Qualities of a burning Coal, and shining in the dark; and as no Gem ever was, or ever will be found



and of such a Kind, that when held against the <sup>y</sup> Sun, it resembles that of a burning Coal. This Stone is extremely valuable, one of a very small Size being valued at forty Aurei. It is brought from *Carthage* and *Massilia*.

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endued with that Quality, it was supposed that the true Carbuncle of the Antients was lost: but it was long generally believed, that there had some time been such a Stone. The Words of this Author, however, set it very clear, that this Appearance in the Sun only was the Occasion of the Name. That Species of Carbuncle of the Antients which possessed this Quality in the greatest Degree, was the *Garamantine* or *Carthaginian*; and as the Author gives also *Carthage* for the Place whence this which he here describes was brought, there is no doubt but the particular Species here meant, is the *Garamantine* Carbuncle of the Antients, and that is the true Garnet of the Moderns. Experience shews, that this Stone has more the Appearance of a fire Coal in the Sun than the Ruby or any other of the red Gems; and it is famous for sustaining the Force of Fire unhurt; which is the other great Characteristic of that Stone mentioned by the Author. This Stone is often very beautiful and valuable: I saw one sold this Winter, 1774, at an Auction



λβ' Οὐ καίεται δ' ὁ περὶ <sup>z</sup> Μίλητον  
γωνιειδῆς ὄν. ἐν ὧπερ καὶ τὰ ἐξάγωνα.

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of Mr. *Christie's*, under the Name of a *Jacinth*, for a very considerable Sum of Money; and very well it was worth it.

<sup>z</sup> The *Miletian* Kind is generally supposed to be that called by other Authors the *Alabandine*, as the Places from whence they have their Names are in the same Kingdom. *Theophrastus*, who describes the *Miletian*, has not mentioned the *Alabandine*; and *Pliny*, who describes that, has not named the *Miletian*.

The other Gems, by the Antients included in the general Name *Carbuncle*, are distinguished by later Writers into various Species of the *Ruby*, *Garnet*, *Almandine*, and *Hyacinth*; and are,

1. The *Rubinus verus*, the *True Ruby*. This is of a fine blood Colour, and of extreme Hardness, and, when large, is by some still called a *Carbuncle*. This is from *Cambaja*, *Calicut*, *Coria*, and the Island of *Ceylon*.

2. The *Balass Ruby*, *Rubinus Balassius* or *Pallacius*. This is of a paler red than the former, and tinged with a mixture of blue; its common Shape is oblong and pointed. And either this or the *Rock Ruby*, as it is called,



XXXII. There is also an incombustible Stone found about *Miletum*<sup>s</sup>, which is of an angular Shape, and sometimes regularly hexangular; they call this also

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which is a Species of the Garnet hereafter to be mentioned, is probably the *Carbunculus Amethystizontes* of *Pliny*. The Balas Ruby comes principally from the Island of *Ceylon*.

3. The *Rubinus Spinellus*, the Spinell Ruby. This is of a clearer red than the Balas, but is not so bright nor hard as the true Ruby.

4. The *Rubacus*, the *Rubacelle*. This is red, with a cast of yellow, and is the least valuable of all the Kind.

5. The *Granatus verus*, the true Garnet. This is a very beautiful Gem, and was, as before observed, the Carbuncle of *Theophrastus*, and *Carbunculus Garamanticus* of the Antients in general: Its Colour is a deep red, approaching to that of a ripe Mulberry, but held to the Sun, or set on a light Foil, a true Fire Colour. This is sometimes found of a considerable Size.

6. The *Granatus Sorranus*, the Sorane Garnet. This is of an intense red, but with some mixture of yellowish, or of the Colour of the Hyacinth of the Moderns.

7. That Species of the Garnet called the Rock Ruby, the *Rubinus rupium*, and by the *Italians Rubino de la Rocca*. This is a very



καλῆσι δ' ἄνθρακα ἢ τέτον· ὁ ἢ θαύμα-  
 σὸν ἔσιν. ὅμοιον γὰρ τρόπον τινα ἢ τὸ  
 τῆ<sup>a</sup> ἀδάμαντος.

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hard Gem, and is of a fine red, mixed with a violet Colour.

8. The Almandine; a Stone of a middle Nature, between the Ruby and Garnet. This is the *Alabandicus* of *Pliny*, and probably the Milesian Carbuncle of our Author already described.

9. The Amandine. This was the *Træzenius* of the Antients, and was variegated with red and white; but is at present scarce known.

10. The *Sandastrum* of *Pliny*, a Gem now wholly lost.

11. The Hyacynth of the Antients; truly and properly a violet-coloured Gem, and which, if it be now at all known, is ranked by the Moderns among the Amethysts. The Stones we know by the Name of Hyacynths, being Gems of a yellowish red in three or four Degrees, which will be more particularly spoken of hereafter.

<sup>a</sup> The Diamond has been thought to come nearest of all Gems to deserving the Character of incombustible. It will bear extreme Degrees of common Fire, and that for a long Time together, and come out unhurt. But it



a Carbuncle from its not being injured by the Fire; but that is strange, for the Diamond<sup>a</sup> might as properly be for that Reason called by the same Name, as it also possesses that Quality.

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suffers some Damage, if suddenly brought into the Cold after these severe Trials; and much more by the Burning Glafs. But there is yet a Quality which the Diamond shews in the Fire different from all other Gems, and by which it is distinguished from them all; for there is a certain degree of Fire in which it is volatile. I shewed this, very many Years ago, to the late Excellent Lord *Granard* and Mr. *Charles Stanhope*, at my House in *Bloomsbury*; by placing a small Diamond in a wind Furnace. We saw the Progress of the Operation: the Diamond was first penetrated by the Fire throughout its whole Substance; and appeared a burning Coal: it then shivered and cracked in many places, and afterwards became smaller and smaller till it entirely vanished: no Part nor Remnant of it was to be found.

The Diamond is the hardest and most resplendent of all Gems, and has in all Ages been esteemed much more valuable than all others: its Colour, when pure, as it generally is, is that of perfectly clear Water; but it is sometimes found tinged with metalline Par-



λγ. Οὐ γὰρ εἶδ' ὡσπερ ἡ κίττησις  
ἢ τέφρα, δόξειεν ἂν, διὰ τὸ μηδὲν

ticles, assumed into it at the Time of its original Formation, as in the other Gems ; and is thence yellowish, reddish, or bluish, and sometimes, but very rarely, greenish. As the Diamond thus is sometimes of the Colour of other Gems, but greatly superior in Hardness to them ; so the common Crystal, sometimes, from the same Accidents, resembles them, and is much softer, and of little Value. Crystals thus tinged are what the Jewellers call Bastard Emeralds, Sapphires, &c.

The Diamond is composed of various Laminæ laid close one on another ; and Jewellers of Skill will sometimes find the Joinings, and with the Edge of a fine Instrument split a Diamond into two of equal apparent Surfaces.

If the plain Surfaces of the Plates of a Diamond be turned to the Focus of the strongest Burning-glass, it receives no Hurt, even by that powerful Fire ; but if the Edges and Joinings of the Laminæ are turned to it, the Stone separates at them, is reduced into a number of Scales or thin Flakes ; and lost.

The Form of the *Brazil* Diamond differs from the Oriental, as well as do its Qualities. There are Shirly, or Basaltine, resemblances of all the Oriental Gems ; and this is



XXXIII. The Power these Stones have of resisting the Force of Fire ; is not from the same Cause with that of

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such of the Diamond ; and no other. *De Laet* was acquainted with it, and with its qualities. *Agricola* knew its Dodecahædral form. *Wallerius* accurately describes its Faces by their cubic Shape. The *Brazil* Diamond has the same Electric, and the same Phosphoric Properties, with the Oriental : After it has been held in the Sun, it has a silvery Brightness in the dark ; and the same Quality, in some Degree, when rubbed : and it takes the Foil, as the Oriental Diamond. But they all want the perfect Hardness of the Oriental Diamond ; and they have somewhat less specific gravity ; and they can be melted by the extream force of Fire, which the Oriental Diamond cannot.

We are not to expect all Diamonds in their perfect crystalized form ; we see them rounded in the Manner of the pebble Crystals, and like all other crystalized Stones, they vary in the Number of the Angles, even in the same Species.

Like all the other crystalline Stones, this is also liable to be tinged to all Colours ; but these Tinges it receives in so small a Quantity, and in a Degree so delicate, that it is a Doubt



ἔχειν ὑγρόν. <sup>b</sup> Ταῦτα γὰρ ἀκαυσα ἢ ἀπύ-  
ρωτα, διὰ τὸ ἐξηρηῆσθαι τὸ ὑγρόν.

λδ'. Ἐπεὶ ἢ τὸ ὅλον ἢ κίσσηρις ἐκ  
κατακαύσεως δοκεῖ τισι γίνεσθαι. πλὴν

whether a coloured Diamond be not more beau-  
tiful even than a perfect clear one.

We talk of our vast Diamonds, the *Tuscan*,  
the *Sancy*, and *Pitt's*; but what are these to  
that of the *Mogul*, which before cutting weigh-  
ed very near eight hundred Carats? *Fossils*  
*arrang'd*, p. 139, 140.

<sup>b</sup> The Author here explains upon the Man-  
ner in which these Stones resist the Action of  
the Fire, which he declares to be by their con-  
taining naturally no Moisture, which he has  
before declared to be essential to Fusibility;  
not by their having already suffered all the  
Change they were liable to, from their having  
been before exposed to that Element. He  
gives the very rational Opinion of some People  
in his Time, and which we shall easily per-  
ceive hereafter was also his own, that some  
Substances, commonly supposed in their na-  
tive State, had certainly been wrought upon by  
Fire; and had by that means been divested of  
whatever that Element could drive out of them:



the Pumices, or of Ashes <sup>b</sup>. They seem not to burn, because they absolutely and originally contain no Moisture; whereas those Substances do not kindle nor burn in the Fire, because their Humidity has been already evaporated.

XXXIV. Some are of opinion, that the <sup>c</sup> Pumices have been entirely made

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and brought into a Condition of not suffering any farther Changes by the same Means.

<sup>c</sup> The Author mentioning it but as the Opinion of some, that the Pumice had already passed the Fire, and by it been reduced into its present State; is a Proof that the general Opinion in his Time was, that it was in its native Condition. This seems to have been an Error of the later as well as the antient Writers of Fossils, who have almost all given it a Place among the native fossil Stones, as if Nature had formed it as we see it: Whereas there is all the Evidence that our Senses can give, that it is no more than a Cinder; the Remainder of some other fossile Body calcined by a violent Fire either subterranean unseen, and perhaps since extinguished, or that of the burning Mountains, on and about all which it is constantly found; and that in vast Quantities. The more violent Explosions of these may have tossed immense Quantities of it to Places so dis-



τῆς ἐκ τῆ ἀφρῆ τῆς θαλάσσης συνισα-  
 μένης· λαμβάνουσί δὲ τὴν πίσιν διὰ  
 τῆς αἰσθήσεως.

λέ. Ἐκ τε τῶν περὶ τῆς <sup>d</sup> Κρατῆρας

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tant, as to make People forget its coming thence; or into Seas, whose Tides and Storms may have carried them to other Shores, near which no such Repositories of it are situated; and this might yet more puzzle and mislead People about its Origin. The great Quantities of Pumices found in this Manner, far from any Fires by which they might have been formed; floating on the Surface of the Sea, thus thrown on it, or perhaps raised by the bursting of Vulcanos from its Bottom; and something altered from their original Figure and Colour, by being washed and rounded by the Motion of the Waves, gave Rise to an Opinion in some, that such were another Kind, different from those of the burning Mountains; and that they were formed by a Concretion of the Froth of the Sea: in this, as the Author observes, they had the apparent Testimony of their Senses. Many have erroneously imagined, that by this Kind, supposed by some to



what they are by burning; that Kind excepted which they esteem formed by the Concretion of the Froth of the Sea: This Opinion, as to the Sea kind, they take from the apparent Testimony of their Senses.

XXXV. As also the other, in regard to those formed in the <sup>d</sup> Mouths, and

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be formed of the Froth of the Sea, this Author meant the *Alcyonium*; and have fallen foul upon him for ranking that Substance among the Pumices: But no one has done him more Injustice in this point than his Editor *De Laet*, who, though in his Edition of this Author he does Honour to *Furlanus*, for having justified him in that point, and observed that this was not his Meaning; yet afterwards, in his own History of Gems, &c. charges him with it, *L. 2. p. 131. Theophrastus etiam alcyonium, quod ex maris spuma concrefcit, Pumicem vocat.*

<sup>d</sup> For these there is, indeed, the apparent and unquestionable Testimony of our Senses, that they owe their present Mode of Existence to the Action of Fire, scarce any fossile Substance being of Strength and Solidity enough to bear the excessive Degree of it in these Places, without being affected and altered in its Form; and reduced to a Slag or Cinder of such Kind



γενομένων, ἢ ἐκ τῆς Ἀραβικῆ λίθου τῆς  
 φλογεμένης, ἢ ἢ κισσηῶται. μαρτυρεῖν δὲ  
 ἢ οἱ τόποι δοκῶσιν ἐν οἷς ἡ γένεσις. ἢ γὰρ

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and Texture as its constituent Parts disposed it most readily to fall into. As to those found floating on the Sea, I have observed how hardly the Author has fared about them in *De Laet's* Hands; but *Boetius* has yet infinitely more puzzled this Cause in regard to him, and seems even to have misunderstood the Misunderstandings of others concerning him; for he tells us, *L. 2. p. 400*, speaking of the Pumice in general, Ἀλκυόνιον a *Theophrasto* vocari putant, quod e marina spuma coactus sit: And this is one of the many Instances in which this good old Writer is so strangely misrepresented, that it is impossible, from the Accounts of others, to make the least Guess at what he has left us. The very Word Ἀλκυόνιον is no where to be found in this whole Book; and what he is generally charged with is, not the calling the Pumice *Alcyonium*, as this Author imagines; but the *Alcyonium a Pumice*: And even that Accusation, we see, from a careful Review of his own Words, is wholly groundless and erroneous.



different Openings of the burning Mountains, through which the Flames have made their way : and those made by burning the *Lapis ° Arabicus*, a Stone, which when it has passed the Fire assumes the Form of the Pumice. The

° In the other Editions of this Author there is the Word *Διαλάρη*, where I have given 'Αρα-*Λιτῆ* ; the former is the Name of no Stone in the World, and the latter of one very aptly placed in this Class of Fossils ; and which all the Antients have described, but this Author no where else has the Name of : There is therefore no question but that this was the original Reading, and the common Text, *Διαλάρη*, no more than an Error which got early into the Copies, and has been ever since (as Errors usually are) carefully and exactly preserved. This is also the Opinion of *De Laet*, who, however careless of this Author in his *Liber de Gemmis*, yet is a thoughtful and good Critic on him in many Places in his Edition of this Treatise.

This *Arabicus*, or, as it is sometimes called, *Arabus Lapis*, is described also by *Dioscorides*, *Pliny*, *Isidorus*, &c. as a white Stone, resembling the purest Ivory, which when burnt became spongy, porous, and friable ; in short, assumed the Form of the Pumice ; and was used, like it, as a Dentrifice. *Dioscorides*,



ἐν τοῖς μάλιςα ἢ ἡ κίσσηρις. Τάχα

δ' ἢ μὲν ἕτως, οἱ δ' ἄλλως. ἢ πλείους

τρόποι τῆς γένεσεως<sup>f</sup>.

λς'. Ἡ γὰρ ἐν<sup>b</sup> Νισύρω καθάπερ ἐξ

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speaking of it, says, Ὀδόντων δὲ σμῆγμα γίνεται καυθεῖς κάλλιρον. and Ὁ δὲ Ἀραβικὸς λεγόμενος λίθος ἔοικεν ἐλέφαντος ἀσπέλα. *Pliny, Arabicus Lapis Ebori similis dentifriciis accommodatur crematus.* And this was so early as in those Times, and even continues yet to be one principal Use of all the Pumice Kind.

<sup>f</sup> That all true genuine Pumices are formed by the Action of Fire, I believe, is an unquestionable Certainty; but as the antient as well as modern Naturalists have often confusedly placed among them, and under their Names, other Stones of different Kinds, and absolutely different Origin, though something resembling them in external Figure, the Author does very judiciously here in allotting a different Process of Nature for the Formation of such.



Places, indeed, in which Pumices are produced, seem to testify the Manner of their Formation; for they are principally found about the Craters of the burning Mountains. On the whole, some Kinds of them, perhaps, may be formed by the Action of Fire on Stones of a proper Texture, and others in some other Manner: for there are in Nature many different Ways of Production<sup>f</sup>.

XXXVI. The Pumices in the Island of <sup>e</sup> *Nisuros* seem an Instance of this,

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<sup>e</sup> These Pumices, as they are called, of *Nisuros*, seem not only an Instance of the different Operations of Nature used in the Formation of the different Pumices; but of there having been Stones of wholly different Kinds and Origin ranked among them. The Description the Author gives of them, proves them to be no genuine Pumices, but Tophi; natural and original Nodules, or loose Masses of Matter; covered with a Crust, as most of the natural Nodules are, but none of the Pumices ever are seen to be; nor, indeed, is it easy to be conceived, from their manner of Formation, how they should: These were fossile Substances, therefore, of some other Class, which, as they in a superficial Manner resembled the Pumice, the indeterminate Man-



ἄμμος τινὸς ἔοικε συγκεῖσθαι. σημεῖον  
 δὲ λαμβάνουσιν, ὅτι τῶν εὐρίσκομένων ἔνιαι  
 διαθρύπτονται ἐν ταῖς χερσὶν ὡσπερ εἰς ἄμ-  
 μον, διὰ τὸ μῆπω συνισᾶναι μηδὲ συμ-  
 πηπεγέναι.

λζ'. Εὐρίσκεισι δ' ἀθρόας κατὰ μι-

---

ner of writing in those early Times, had given  
 Occasion to be ranked among them. What  
 they really were is not easy, at this distance of  
 Time, to determine; but the most probable  
 Conjecture is, that they were Pyritæ; Speci-  
 mens of which I have at this Time, that bear  
 some rude external Resemblance of the Pumice  
 Kind; and we shall presently see this Author  
 describing a Pumice, which he says is some-  
 thing like one Species of the *Pyritæ*, called  
*Molaris*; it may give some Light into this Case  
 to observe, that *Strabo*, mentioning this Island,  
 says, *Saxosa est & molaris lapidis copia prædita.*  
*De Laet* imagines the Stone described by our  
 Author must have been very different from that  
 of *Strabo's*, because it was liable to crumble to  
 pieces in the Fingers; but as I have already  
 observed, that the *Molaris* of the Antients was  
 a Species of the *Pyrites*, and as no Stone is so  
 liable to crumble in pieces as the *Pyrites*,



for they appear to have been formed by a slight Coalescence only of an arenaceous Matter: What is esteemed a Proof of this is, that some of the Pumices found there crumble in the handling into a kind of Sand, as if they never had been thoroughly concreted or bound into a Mass.

XXXVII. These are found in Heaps,

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when it has lain some time exposed to the Air, and the Salts have shot and got loose, I am so far from being of his Opinion, that I look upon it as a Certainty, that the Nifura Pumice of our Author, and Molaris of *Strabo*, are the very same Substance; and that *Strabo's* Words are a great Confirmation of my Conjecture; as is also the Size our Author allots the Stone, and its Property of crumbling in pieces, which he also observes was not universal, but only happened to some of them, those, I imagine, which had lain most exposed, and the Salts of which had been let loose by the Humidity of the Air, while the others continued firm and solid, as those in *England* and other Places do, while lodged in the Strata they were originally deposited amongst. This I take to have been the Occasion of the different Degrees of Hardness of this Substance which our Author has described, though the Philosophy of his Times



κρὰ χειροπληθεῖς ὅσον πολλὰς, ἢ μικρῶ μείζους, ὅταν ἀπαμείβωνται τ' ἄνω.

λή. Ἐλαφρὰ δὲ σφόδρα καὶ <sup>h</sup> ἀμμώδης ἐν Μήλῳ πᾶσα μὲν, ἐνία δ' αὖ ἐν λιθῷ τινὶ ἐτέρῳ γινεται, καθάπερ ἐλέχθη πρότερον.

had not looked far enough into Nature to see the Cause.

<sup>h</sup> The beginning of this Sentence appears to have been always hitherto faultily printed in the Editions which have come to our Knowledge; the Honour of setting it right, by the Emendation according to which I have given it, belongs to *De Laet*; whom it is much more Pleasure to me to name thus with Respect than Censure; though an earnest Desire of doing the Author Justice, and finding his true Meaning, the only End I have in view in these Annotations on him, sometimes obliges me to speak in that manner. What is here καὶ ἀμμώδης, is in the other Editions ἢ καὶ ἄμμος; which, as Sand was not the Substance here treated of, could never have been the original Reading.

The Island of *Melos*, sometime called also *Mimalis*, has been always known to abound



many of them at least as big as can be grasped in a Man's Hand, and sometimes larger than that, when the superficial Part is taken off.

XXXVIII. All the Pumices of the Island of *Melos* are also light and sandy; and some Kinds there are which are produced, as was before observed, in other Stones.

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with Pumices, and those of the very finest Kind; which it did also in this Author's Time, as appears by his Description of their being light and sandy, or easily rubbed to Powder; from which last Quality, possessed in some Circumstances in a much greater degree, it was principally, I suppose, that the *Pyritæ* of *Nisuros* obtained the Name of Pumice: As from some like Similitude of Substances did the Stones next mentioned here under the Pumice Name, and said to be produced in other Stones; and which, whatever they were, as it is not easy at this distance of Time, and with the little Light we have from the Writings of the Antients, to ascertain, I am perfectly convinced, however, from the Account of their being found in other Stone, and that as we cannot but conclude from the Detail, unaltered in its own Texture, were no genuine Pumices.

The Differences afterwards assigned to the



λθ'. Διαφορὰς δ' ἔχουσιν πρὸς ἀλλήλας, ἢ χρώματι, ἢ πυκνότητι, ἢ βάρει.

μ'. Χρώματι μὲν ὅτε μέλαινα, ἐκ τῆς ῥύακος, τῆς ἐν Σικελίᾳ. πυκνός τε ἢ βαρεῖα, αὐτὴ τε ἢ μυλώδης. γίνεται γὰρ τις ἢ τοιαύτη κίσσηρις, ἢ βάρος ἔχει, ἢ πυκνότητα, ἢ ἐν τῇ χρήσει πολυτιμότερον τῆς ἐτέρας. σμηκτικὴ δὲ ἢ ἢ ἐκ τῆς ῥύακος μᾶλλον τῆς κερφῆς ἢ λευκῆς. σμηκτικωτάτη δ' ἐκ τῆς θαλάσσης αὐτῆς.

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different Species of the Pumice, are what may be observed in a greater or lesser degree in the various Kinds we now have brought from *Germany*, the *East Indies*, and the burning Mountains; and the Author appears to have been very well acquainted with them: His assigning a greater Degree of the abstergent Quality to that from the Shores than that from the burning Mountains; and a greater than even in that, to those of the Sea, is probably very just, though not now regarded, as the Sea Salt in-



XXXIX. The different Sorts also vary from one another in Colour, Compactness, and Gravity.

XL. As to their Colour, there is a black Kind found on the *Sicilian* Shores, which is compact and weighty, and something resembles that kind of the Pyrites called the *Molaris*: for there is a natural Pumice of this Texture, heavy and compact; and this is of more Value and more useful than many of the others; this Kind from the Shores is a better Abstergent than the light white Kind: But the most abstergent of all others, is that from the Sea itself.

corporated in the Mass of those, must add much to this Quality.

The Author having now gone through the Nature of the Pumices, returns to the Consideration of those Stones he was before describing, and from the History of which he had looked on this as a Digression. The Stones here treated of, are what he has before named among the Gem Kind, as I have already observed in regard to the Sense of the Word *σφραγίδιον*; some of the Species of which he



μά. Καὶ περὶ μὲν τῆς κισσήριδος ἐπι-  
 τοσῆτον εἰρήσθω. περὶ δὲ τῶν πυρραμένων  
 ἢ τῶν ἀπυρῶτων λίθων, ἀφ' ὧν ἢ εἰς τῆ-  
 το ἐξέβημεν, ἐν ἄλλοις θεωρητέον τὰς  
 αἰτίας.

λβ'. Τῶν δὲ λίθων ἢ ἄλλαι κατὰ τὰς  
 ιδιότητας διαφοραὶ τυγχάνουσιν, ἐξ ὧν ἢ  
 τὰ σφραγίδια γλύφουσιν.

μγ'. Αἱ μὲν τῇ ὄψει μόνον ; οἷον τὸ

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observes differ only in their external Figures  
 and Colours, and others in more peculiar Qua-  
 lities.

<sup>i</sup> The Carnelian is one of the semipellucid  
 Gems, and has its Name *Carneolus*, *Carniolus*,  
 or, as it is sometimes improperly written, *Cor-  
 niolus*, from its Colour, which, in the differ-  
 ent Degrees in various Kinds, resembles Flesh  
 with more or less of the Blood in it ; and *Sardus*  
 or *Sarda*, from *Sardinia*, the Place where it  
 was originally found. The several Kinds of this  
 Stone are found in different Places, and our



XLI. Hitherto has the Pumice been treated of: Hereafter are to be considered the Natures and Causes of the Diversity of the other several Kinds of combustibile and incombustibile Stones; from the History of which this Digression has been made.

XLII. There are, beside what has been already named, among the Stones which are cut as Gems, other Differences, in regard to their several peculiar Qualities.

XLIII. Some of which are in the external Appearance only. Of this Kind are those of the <sup>i</sup> Carnelian, the

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Lapidaries make a great Distinction between the Oriental and Occidental, which differ extremely in Hardness. The Antients divided this, as they did also other Gems, into Male and Female (as will be seen hereafter in this Author) in regard to their deeper or paler Colour; both which Colours, however, are sometimes found in different Parts of the same Stone. The Jewellers of our time reckon four Species of Carnelian; the common or red, the white, the yellow, and the Beryll Carnelian; the first of these is again divided into Male and Female,



Σάργδιον, καὶ ἡ Ἰασπις<sup>k</sup>, καὶ ἡ Σάπφει-

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and is much in esteem for Seals; we have it from the *East Indies*, as also from *Bobemia*, *Silesia*, *Sardinia*, and many other Places; nor is our own Kingdom without it, though I have never yet found any here perfectly fine. The white is a very beautiful Stone, of a fine Grain, and equal Hardness, with many Kinds of the red: it is not perfectly white, but rather what we call a Pearl Colour, white with a slight Admixture of blue. The yellow is a very beautiful Stone, often of a fine Flame Colour, and more transparent than either of the former; this is found in the *East Indies* and *Bobemia* only. The last, or Beryll Carnelian, is properly the Male Oriental Kind; it is of a deeper Colour than any of the others, as also much harder, and more transparent: Some of our Jewellers, knowing of no other Beryll but this, name it simply the Beryll; but it ought never to be so called but with the Addition of its own proper Name Carnelian. The Beryll of the Antients was a Stone of quite another Kind, transparent, and of a bluish green; and evidently the very Gem which we now call the *Aqua Marina*. Besides those above named, we have three less perfect Carnelians, yet beautiful enough; the brown, which is the *Carneolus Fuscus* of *Cronstedt*; the dotted, the *Carneolus Stigmatas* of *Wallerius*; and the



<sup>k</sup> Jasper, and the Sapphire; which last

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veiny *Carneolus Lineatus* of the same Author. This last I have lately seen very beautiful from *Scotland*, scarce inferior to the *East Indian*.

See *Fossils Arrang'd*, p. 209.

<sup>k</sup> The Jasper is another of the semipellucid Stones; it is much of the same Grain and Texture with the Agates, but not so hard, or capable of so elegant a Polish, nor does it approach so near Transparency; its general Colour is green, but it is spotted or clouded with several others, as yellow, blue, brown, red, and white. It is found both in the *East* and *West Indies*, in *Bohemia*, in many Parts of *Germany*, and in *England*: I have a Specimen of it found here, little inferior to the Oriental, and better than any I ever saw from *Germany*. Our Lapidaries distinguish it into the Oriental and Common; and subdivide those Differences according to the Colour of the Spots or Veins. The Oriental is much harder, and capable of a much better Polish than any of the others; it is of a bluish green, and the Veins are generally red.

The *European* or common Jaspers are of all Degrees of green, and variegated with several Colours; the *English*, in particular, are hard, commonly of a deep green, often not veined or spotted at all, and when they are, it is commonly with red or flesh Colour, sometimes with



ρος<sup>1</sup>. αὕτη δ' ἐστὶν ὡσπερ χρυσόπαρος.

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white, and sometimes with both those Colours.

The Heliotrope, or common Blood-stone, is of this Kind also, and very little, if really at all, different from the Oriental Jasper; the Colour is, like that, of a bluish green, and the Variegation red, but in Spots rather than Veins, and of a deeper Colour.

<sup>1</sup> The Sapphire of the Antients, here described, was a Stone very different from the Gem we now know by that Name, and was of the *Cyanus*, or *Lapis Lazuli* Kind; but not as some have too hastily judged, the *Lapis Lazuli* itself\*.

We shall find by what this Author says hereafter, that these were evidently two different Stones; and indeed *Pliny*, and the rest of the antient Naturalists, if carefully read, will be found to have clearly distinguished them; and described them to be what they really were, different Species of the same Genus. They were both mixed Masses, both blue, variegated with white, and yellow; but they differed in this, that the *Cyanus* had the yellow Matter,

\* Quam Gemmam Plinius Sapphirum vocat, Cyanus est seu Lapis Lazuli. *Boet.* 183.

The Sapphirus of *Pliny* is much different from our Sapphire; and his Description answers to the *Lapis Lazuli*. *Woodw. Meth. Foss.* 29.



is spotted, as it were with Gold.

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in form of Dust, irregularly and confusedly mixed among the other Matter of the Mass; whereas the Sapphire was beautifully spangled with it, in regular, distinct, and separate Spots. These were its greatest Characteristic, and obtained the Stone its constant Epithets of χρυσόπατος and χρυσοσιγής. *Inest* (says *Pliny*, speaking of the *Cyanus*) *ei aliquando et aureus pulvis, non qualis in Sapphirinis, Sapphirus enim et aureis punctis collucet*; or, according to *Salmasius*, *in Sapphiris enim aurum punctis collucet*; and others of the Ancients describing it, have Σάπφειρος λίθος ἔχων σπιλάδας χρυσίε ὡς ἐν σίγμασι; and λίθος ὠραῖος ἔχων σπιλάδας χρυσίε ὡς ἐν σίγμασι.

Upon the Whole, what can be collected from a careful Perusal of the Antients on this Subject is, that the Stone they knew by the Name of the Sapphire, was an opaque, or at best but imperfectly transparent, Gem, of a fine blue, deeper than that of the *Lapis Lazuli*, and variegated with Veins of a white sparry Substance, and distinct separate Spots of a gold Colour.

The Sapphire of the Antients was therefore not only not the same with the Gem we now know by that Name; but had not even the least Resemblance of it: I see no Reason, however, to conclude from hence, as *Woodward*



and some others have done, that our Sapphire was unknown to them : it was unquestionably of the Number of their transparent Gems, though not distinguished by a particular generical Name. *De Laet* imagines it was one of the many Kinds they reckoned of the Amethyst or Hyacinth ; but I think it appears much more probably to have been the Gem they called the *Beryllus Aëroides* ; as they did, for the same Reason, their blue Jasper *ἰασπις ἀερόεσσα*. *Pliny* describes the Beryll in general to be (except in Colour) of the Nature of the Emerald, and says it was brought from the *Indies*. Their Beryll was what we now call the *Aqua Marina*, a beautiful transparent Gem of a bluish green ; and there is absolutely no Stone which our Sapphire more nearly resembles than this ; and to which, if it were not allowed a particular generical Name of its own, it could more properly be referred : nor could there, I think, be otherwise conceived a better Name for it than such a one as would express, as this did, a transparent Stone of a \* sky blue, and (except in Colour) of the Nature of the Emerald.

Our Sapphire is a very elegant, transparent Gem, in most Species of a beautiful blue, and nearly approaching to the Ruby in Hardness. It owes its Colour to Particles of Copper dissolved in some Menstruum of an alkaline Nature, and, as more or less of this cupreous

\* *Sereni enim cœli et lucidissimi habet colorem. Boet.*



Matter has entered its original Composition, is of a deeper or paler blue, and in the entire Absence of it, perfectly colourless, and resembling a Diamond.

We have now among the Jewellers, four Species of this Gem: 1. The blue Oriental Sapphire. 2. The white Sapphire. 3. The Water Sapphire. 4. The Milk Sapphire; and beside these there is a fifth, of a bastard Kind, having a Tinge of green, the *Sapphirus Subviridis* of *Wallerius*.

The first, or fine blue Oriental Sapphires, are greatly superior to the Occidental, and are called, in regard to their deeper or paler Colour, Male and Female. We have them from the Island of *Ceylon*, and from *Pegu*, *Bishnagar*, *Conanor*, *Calecut*, and some other Parts of the *East Indies*.

The second is brought principally from the same Places, and is a true Sapphire, though wholly colourless, being of the same Hardness with the former, and equalling it in Splendor and Transparency.

The third is the Occidental Sapphire; these we have principally from *Silesia* and *Bobemia*. They are of different degrees of blue, but never are so well coloured as the Oriental, or nearly so hard; their constituent Matter coming nearer the Texture of common Crystal than the gemmeous Substance of the true Sapphire.

The fourth, or Milk Sapphire, is the softest and least valuable of all; this is the *Leuco-Sapphirus* of Authors; it is brought from *Silesia*,



μθ'. Ἡ δὲ <sup>m</sup> Σμάραγδος, ἢ δυνάμεις  
 τινὰς ἔχει. τῷ τε γὰρ ὕδατος, ὡσπερ  
 εἶπωμεν, ἐξομοῖται τὴν χροῖαν ἑαυτῆ,  
 μετρία μὲν ἔσα ἐλάττονος, ἢ δὲ μεγίστη,  
 πάντος ἢ δὲ χειρίστη, τῷ καθ' αὐτὴν μό-

*Bohemia*, and some other Places: It is transparent, and its Colour is that of Milk, with a slight Tinge of blue.

The greenish Sapphire is from *Bohemia*.

The Oriental Sapphire will lose its Colour in the Fire, without any Loss of its Splendor or Transparency; and is sometimes made by this means to counterfeit the Diamond; as the natural colourless Sapphire is also often made to do: but tho' these are both very beautiful Stones, they want much of the Hardness and Brilliancy of that Gem, and may always be easily discovered by a skilful Eye.

<sup>m</sup> The Emerald is a most beautiful Gem, transparent, and of a lively grass green, without the least Admixture of any other Colour. The *Romans* called this the *Neronian* or *Domitianian* Gem; the *Persians* and *Indians* call it *Pachæ*, and the *Arabians*, *Zamarrut*; from whence it is generally supposed the Word *Smaragdus* is derived; though, in my Opinion,



XLIV. <sup>m</sup> The Emerald has also its peculiar Properties; for it assimilates Water, as was before observed, to its own Colour. A Stone of a middling Size will do this to a small Quantity only of the Water into which it is put, a large one to the Whole; but a bad one to no more than a little of it, which lies

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there is much more Probability that that Word was from the *Greek* Verb *σπαράσσω*, *luceo*, or *splendeo*, as this Gem was ever in great Esteem for its particularly vivid Lustre. It has its Colour from some Particles of Copper dissolved in an acid Menstruum, mixed with it at its original Concretion; and it will lose it, and become colourless in the Fire like the Sapphire.

The Antients distinguished twelve Kinds of the Emerald, some of which seem, however, to have been rather Stones of the Prasius or Jasper Kind, as they talk of Emeralds which were not transparent, and of enormous Size; and others no more than coloured Crystals and Spars from Copper Mines; so that a more scientific Way of Writing would probably have much curtailed the List.

The present great Distinction is into Oriental and Occidental; the former are excessively hard, of a lively Colour, and equally beautiful in all Lights. These are of no determinate



νον. ἢ πρὸς τὰ ὄμματα ἀγαθή. διὸ ἢ  
 τὰ σφραγίδια. φορεῖσιν ἐξ αὐτῆς, ὡς  
 βλέπειν. ἔσι δὲ σπανία ἢ τὸ μέγεθος

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Figure, but generally approaching to a round or oval, the largest of them seldom coming up to the Size of a Hazel Nut. These are now become very scarce, and what we have among the Jewellers may much better be distinguished into the *American* and *European*. Of these the *American* are greatly superior to the others both in Hardness and Lustre, and are indeed to the *European*, what in most other Gems the Oriental are to the Occidental. They are found in many Parts of *South America*, principally in *Peru*. They are often very elegant and beautiful Stones, and sometimes not inferior to the Oriental in Colour. They exceed all other Emeralds in Size, some of them having been found of two Inches Diameter. Nay, there are Accounts of much larger.

The *European* are found in *Germany*, *Italy*, *England*, *Ireland*\*, and some other Places. They are the least valuable Kind, and are not only inferior to the others in Hardness, Colour, and Transparency, but also in Size.

\* See Dr. Rutt's Natural History of the County of Dublin.



just about it. It is also good for the Eyes; for which Reason People carry about them Seals engraved on it, that they may have them to look on. It is, however, a scarce Stone; and but small:

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The true Oriental Emerald is of the same Hardness with the Sapphire: the *American* Emeralds are very different in this respect, and really are of different Kinds; some of them coming very near the Hardness of the Oriental, and others little exceeding that of common Crystal; the *European* in general are of this last Texture also, and, determinately speaking, are rather coloured Crystals than real Emeralds.

The Property of the Emerald, of assimilating Water to its Colour, here commemorated by this Author, has much puzzled those who have written on these Subjects since; they have none of them been able to find it in the Emerald, and that for this plain Reason, that they have all looked for what the Author never meant: They expected to find, that the Emerald would impart a Tincture or lasting Colour to Water, by being infused in it, as vegetable Substances, &c. do; whereas *Theophrastus* means no more, than that its Radiations will tinge Water, if it be made the Medium through which they pass, with their own Colour. This had



ἔ μεγάλη. Πλὴν εἰ πεισέυειν ταῖς ἀνα-  
 γραφαῖς δεῖ ὑπὲρ τῶν βασιλέων τῶν Αἴ-  
 γυπτίων, φασὶ γὰρ κομιδῆναί ποτ' ἐν  
 δώροις παρὰ τῷ Βαβυλωνίων βασιλέως·  
 μῆκος μὲν <sup>n</sup> τετράπηχυν, πλάτος δὲ τρί-  
 πηχυν. ἀνακείσθαι δὲ καὶ ἐν τῷ τῷ Διὸς

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before been observed of it in regard to the Air, and it has been said, \* *Inficere circa se repercussum aërem*. Our Author observes, that it will do the same in Water; and, according to its Size and Goodness, diffuse a Greenness through that also, if laid in it.

<sup>n</sup> There are, beside what is here related, many other Accounts of Emeralds of an enormous Size, though none so astonishingly incredible as this: All these I imagine to be either absolutely false; Descriptions of Things which never had Being: Or erroneous; Accounts of Things which really have been, but have been misrepresented through Ignorance or otherwise in the relating. Of this last Kind I imagine the *Ægyptian* Account to be, and believe that there really were Stones of these Shapes and Sizes among them; but that they were not Emeralds, but of some other beautiful green Stone, of the Jasper or some like Kind.

\* *Pliny*, L. 37. c. 8.



unless we are to give Credit to the Commentaries of the *Egyptian* Kings, in which it is recorded, that there was once sent as a Present from a King of *Babylon* an Emerald "four Cubits in length, and three in breadth: And that there was in their Temple of *Jupiter*,

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The Antients, in their Accounts of the Emerald, we find, have distinguished three Kinds of their twelve, as much superior to the others; these were,

1. The *Scythian*, which greatly excelled all the other Kinds, and of which *Pliny* observes, that *quantum Smaragdi a gemmis distant, tantum Scythici a cæteris Smaragdis*. The Emerald in general was sometimes, from the particular Excellence of those of this Country, called the *Scythian Gem*, ἡ Σκυθικὴ by the *Greeks*, and *Scythis* by the *Latins*.

2. The *Bactrian*, which nearly approached to the *Scythian* in Colour and Hardness, but was always small. And

3. The *Ægyptian*, which was dug in the Mountains about *Coptos*. These were sometimes of considerable Size, but of a muddy Colour, and wanted the vivid Lustre of the two former Kinds.

These were the Characters of the three finest



ὄβελίσκον ἐκ Σμαράγδων τετάρων, μή-  
κος μὲν τετραράκοντα πηκῶν. εὖρος δὲ,  
τῇ μὲν τέτρως, τῇ δὲ δύο. Ταῦτα μὲν  
ἔν ὅτι κατὰ τὴν ἐκείνων γραφήν.

μέ. Τῶν δὲ ὁ Τανῶν καλεσμένων ὑπὸ  
πολλῶν, ἢ ἐν Τύρῳ μεγίστη. σήλη γὰρ

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Species of the Emerald of the Antients ; the other nine were, the *Cyprian*, the *Æthiopian*, the *Herminian*, the *Persian*, the *Attic*, the *Median*, the *Carthaginian*, or, according to some of the Critics, *Calchedonian*, for they imagine the Word is mis-spelt *Carchedonii* for *Chalcedonii*; the *Arabian*, called *Cholus*, and the *Laconic*. These were all Emeralds of a lower Class than the three first named ; they were in general found in and about Copper Mines, and were many of them very little deserving the Name of the Emeralds : They differed in their Degrees of Colour, Hardness, Lustre, and Transparency, and the *Persian*, in particular, was not pellucid. To these Species of the Emerald, *Pliny* observes, they added the *Tanos*, a Gem brought from *Persia*, of an unpleasing Green, and foul within. From his Manner of mentioning this not among, but after the Species of the Emerald, and saying that others gave it a Place among them,



an Obelisk composed of four Emeralds, which was forty Cubits long, and in some Places four, and in others two Cubits wide. These Accounts we have from their Writings.

XLV. But of those which are commonly called the ° Tani, the largest any where known is in *Tyre*; for there

it is evident that he did not allow it to be a genuine Emerald.

° In the old Editions of this Author there was a small Lacuna after τῶν δὲ, at the End of which was ἀνῶν, the End of the Word wanting. This Defect had been in some of the more modern Editions, filled up only with the Letter T, and the Word made Τανῶν; but after Editors, dissatisfied with this, and observing that the Author afterwards mentions the *Bactrian* Emeralds, refined upon the former way of filling the Lacuna with a single Letter, and made it Βακτριανῶν, in which Manner it is now generally received by the Critics, and stands in almost all Editions: I have, however, brought it back to the old Τανῶν again: And this, from what I have to offer in defence of it, I believe cannot but be owned to have been evidently the original Reading. In this I am sensible I dissent from the generality of Critics; and, as in some other Places, even



ἐστὶν εὐμεγέθης ἐν τῷ τῷ Ἡρακλέους ἱερῷ.  
εἰ μὴ ἄρα ψευδὴς Σμάραγδος. ἢ γὰρ  
τοιαύτη γίνεται τις φύσις.

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from *Salmasius*, the best, most diligent, and accurate of them all, and to whom I am much indebted in many Parts of this Work. But I had rather dissent from a thousand Critics than from Reason.

That *Bactrianων* cannot have been the original Reading here is evident, from the Characteristics of that Species before named, the principal of which was its Smallness. Many of the other Emeralds were at Times found small, but the *Bactrian* always: its general Character was, that it was too small for engraving Seals on, and therefore only used for ornamenting Vessels and other Utensils of Gold. And it is certain, that if *Theophrastus* had known this Exception to its common Character, he would have named it hereafter, when describing it, and mentioning still its constant Smallness. But beside the Improbability of a large Pillar of a Gem usually too small for a Seal; why do those Gentlemen imagine *Theophrastus*, who we shall find hereafter was well acquainted with the Stones of this Class, should suspect the *Bactrian* Emerald to be a



is at that Place a very large Pillar of this Stone in the Temple of *Hercules*. But perhaps this is no true Emerald, but of the *Pseudo-Smaragdus*, or bastard Kind; for there is such a Stone of this Class.

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bastard Kind: It was well known to him to be a genuine Emerald, and was generally esteemed the second in Value: the best in the World except the *Scythian*.

That he could never, therefore, mean the *Bactrian* Emerald here, where he is describing a large, and, as he suspects, bastard Stone, is certain; and that he did mean the Tanus, I think, is, from his Account, almost equally clear. He is talking of the excessive Size of Emeralds; and after having mentioned two Accounts, neither of which, he tacitly declares, he can believe, he here adds a third, the Truth of which he seems not to doubt, but suspects the Genuineness of the Stone. *Pliny*, we see, is just of the same Opinion in regard to the Tanus; ranking it, according to the common Opinion, in the same Chapter with the Emeralds, but not allowing it a Place among them, according to his own Sentiments. That Author has generally copied closely from *Theophrastus* in Things of this Kind, and almost every where adopted his Opinions; 'tis highly probable, therefore, that he had read this Pas-



μς. <sup>p</sup> Γίνεται δὲ ἐν τοῖς ἐν ἐφικτῶ κῆ  
γνωρίμοις τόποις, διττακῆ μάλις, περὶ

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sage with *Tanōn*, and thence formed his Suspicions of its not deserving a Place among the genuine Emeralds. And to this it may be added, that *Theophrastus*, though very particular in his Accounts of the Emerald, and all its Kinds, has no where else mentioned this.

<sup>p</sup> After this mention of the Tanus, which the Author suspects to be a bastard Kind of Emerald, and which was brought from remote Places, he now gives the History of the Bastard Emerald in general; which he observes was common, and produced in Places more frequented. What the Antients knew by the Names of Bastard Gems, were Crystals from Mines, tinged with the Colours of the various precious Stones: and that by the same means, the Admixture of metalline Particles, at the Time of their original Concretion: These had therefore the Colour, and in some degree the Beauty of the Gems, but wanted their vivid Lustre and their Hardness. And thus the Bastard Emeralds here mentioned were many of them no more than common Crystal tinged by Particles of Copper dissolved in an Acid. But though this was the general and more determinate Sense of the Words *Pseudo-Smaragdus*, &c. yet they were often used in a



XLVI. <sup>P</sup> The common bastard Emeralds are produced in Places known and well frequented ; especially in two ;

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laxer Sense, and applied to Substances of different kinds more essentially distinct from the Gem Class than these, only from their having some Resemblance, (perhaps in some Cases in little more than Colour) to the Gems from which they had the Credit to be named. And of this Kind, if I may be indulged in a random Guess, I should imagine this *Tanus* to have been ; which it is evident some had placed among the Emeralds, and of which this Author knew not whether he might not refer it to the Bastard Emerald ; though most probably it was no more than a fine Jasper, ranked among these Gems by less intelligent People, from its having a good green Colour, and some degree of Diaphaneity ; for I have seen Oriental Jaspers, which, though opaque in the Mass, have been tolerably pellucid, and of a beautiful green, when cut into thin Plates.

The Places where these Bastard Emeralds were found, favour very much the general Account I have given of them. The Copper Mines of *Cyprus* could not but abound in Crystals tinged with the Matter of the Mine, and resembling Emeralds. And *Pliny* observes of the *Carthaginian*, that they were always bad, and that the Store of them failed when the



δὲ α Κύπρον ἐν τοῖς χαλκωρυχείοις, ἢ ἐν τῇ νήσῳ τῇ ἐπικειμένῃ Καρχηδόνι. ἢ ἰδιωτέρως εὐρίσκουσιν ἐν ταύτῃ. μεταλλεύεται γὰρ ὡσπερ τᾶλλα ἢ ἡ φύσις. ἢ ῥάβδος ποιῶσιν ἐν Κύπρῳ αὐτὴν καθ' αὐτὴν πολλὰς· εὐρίσκονται δὲ σπανίαι μέγεθος

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Copper Mines there were exhausted. Copper seems, therefore, to have been essential to their Formation; and their want of Lustre and Hardness shews them not to have been truly Gems, but, what I have before called them, coloured Crystals.

*Salmasius* is of opinion, that Καρχηδόνι here is an Error, and that the Word should be Χαλχηδόνι; and that the Island, the Name of which the Author has not mentioned, was *Demonesus*, in which there were antiently Copper Mines.

Others are for preserving the Word as it stands, and suppose the Island to be *Cothon* or *Coton*, mentioned by *Strabo*, and placed over against *Carthage*. I have every where paid great Deference to that excellent Critic's Opinions; but in this cannot agree with him, because if this be an Error in the Copies of this Author, it is also to be amended in *Aristotle*, *Pliny*, and the rest of the Antients, who all have it *Carchedonius*, not *Chalcedonius*: and I see no Reason why we should doubt but that



the Copper Mines of <sup>9</sup> *Cyprus*, and an Island over against *Carthage*. In this Island the true Emerald is also sometimes found. These are dug out of the Earth as the other; and in *Cyprus* there are many Veins of them together;

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there may have been Copper Mines in *Cothon*, though exhausted or lost many Ages since. There are so many Passages in the Antients, where these Alterations are absolutely necessary, that a Commentator who wishes the World to have any Opinion of the Certainty of what they have left us, ought to be very careful how he adds to the Number without apparent Necessity.

<sup>9</sup> These were the Emeralds which in after Times were distinguished into two Kinds, and made two of the twelve Species they reckoned of this Gem, the *Cyprian* and *Carthaginian*; but it is evident from this Author's Account, that they were really no genuine Emeralds, but are two of the Kinds which a more scientific way of writing would have struck off from that List. *Pliny* accounting them Emeralds, we see, says they were always bad; and *Theophrastus* tells us, they served as Chryfocolla, for the soldering of Gold: and that some were of an Opinion, which it is easy to see he him-



ἔχουσαι σφραγίδος, ἀλλ' ἐλάττους αἰ  
 πολλαί. διὸ καὶ πρὸς τὴν κόλλησιν αὐτῆ  
 χρῶνται τῷ χρυσίῳ. κολλᾶ γὰρ ὡσπερ ἡ  
 χρυσοκόλλα. καὶ ἐνιοὶ γε δὴ καὶ ὑπολαμ-  
 βάνουσι τὴν αὐτὴν φύσιν εἶναι. καὶ γὰρ τὴν  
 χροῖαν παρόμοια τυγχάνουσιν.

μζ. Ἀλλὰ ἡ μὲν<sup>†</sup> χρυσοκόλλα δα-

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self also favours, that they were of the Chryso-  
 colla Kind; for he adds, they were evidently  
 of the same Colour. This Opinion was un-  
 questionably very just, and these Emeralds, as  
 they were called, were no other than a larger,  
 clearer, and purer Kind of Chryso-colla, differ-  
 ing from the common Chryso-colla of those  
 Times in nothing but that they were of a  
 brighter Colour and purer Texture, from there  
 having been less of terrestrial or other hetero-  
 gene Matter, assumed into them at their origi-  
 nal Formation. Their answering the Purposes  
 of Chryso-colla in soldering Gold, is alone a  
 sufficient Proof of the Truth of this, for had  
 they been real Emeralds, or any thing else  
 truly of the Gem Kind, they never could have  
 served for such a Use.

<sup>†</sup> The preceding Account of the *Cyprian E-*  
*meralds* must appear very strange to any one who



few, however, are found there big enough for Seals to be engraved on: the small ones are very numerous, insomuch that they use them for soldering of Gold; which Purpose they serve in the manner of Chryfocolla. Some have imagined them, indeed, to be of the Chryfocolla Kind, and in Colour they certainly are very like.

XLVII. The Chryfocolla is found

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imagines the Chryfocolla of the Moderns to be the Substance with which I here class those supposed Gems: but it is to be observed, that the Chryfocolla of the Antients here mentioned, and meant in that Account, was a Substance very different from, and indeed not at all resembling what is at present known by that Name.

Our Borax, which we call Chryfocolla for the same Reason which obtained the original Chryfocolla its Name; its Use in soldering Gold; is a Substance which resembles that of the Antients in no one thing but that Property; and is a Salt, made by the Evaporation of an ill-tasted and foul Water, of which there are Springs in *Persia*, *Muscovy*, and *Tartary*.

The Chryfocolla of this Author, and of the Antients, was a sparry Matter, of a beautiful green Colour, found in Copper Mines; or if



Ψιλῆς ἢ ἐν τοῖς χρυσείοις, ἢ ἔτι μᾶλλον ἐν τοῖς χαλκωρυκείοις, ὡσπερ ἐν τοῖς περὶ τὰς τόπυς.

μή. Ἡ δὲ Σμάραγδος σπανία, καθάπερ εἴρηται. δοκεῖ γὰρ ἐκ τῆς Ἰάσπιδος

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in those of other Metals, no where but where there was an Admixture of Copper with the Metal of the Mine. It owed its Colour, as the green Crystals and Emeralds do, to that Metal, and was generally found in form of Sand; but if embodied in Masses of other Matter, was always separable by washing or other Means; and when separated, appeared loose and in the same Form. It was in different Places of different degrees of Colour, but the deeper coloured, and such as resembled the Emerald, was the most esteemed. It is described by *Dioscorides* and *Pliny* to be *coloris herbae segetis late virentis*, and *porracei coloris*; which is exactly what the *Greeks* called πράσινος. And *Dioscorides*, in another Place, says, the best Chrysololla was that which was κατακόρως πρασιζουσαν, *satiatè porraceum*. The Chrysololla of the Antients was therefore very different from that of the Moderns: and was what, in a purer State, and larger Size, might in those Times very naturally be, and really was, accounted a Species of the Emerald.

Ἡ Ἰάσπιδος ἔστιν ὡς ἔχειται ἐν τῇ Πρα-



in great Quantity in Gold Mines; and even much more plentifully in those of Copper, and the Places near them.

XLVIII. The true Emerald is, as before observed, a scarce Stone; it seems to be <sup>f</sup> produced from the Jasper, for it

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sius, and that of the Emerald: this latter is often called the Root or Mother of the Emerald, as that Gem is sometimes found adhering to it: And, indeed, there are often Parts of the Prasius, which, when cut, are not distinguishable from genuine Emeralds. The Jasper itself also often emulates the Colour and Appearance of the Prasius and Emerald. Indeed when we consider what has already been observed, in regard to the original Formation of Gems, we cannot wonder if they are often found degenerating in Appearance, or improving into, and much oftener affixed upon, or in some measure blended with the Substance of one another. What the particular Stone here mentioned by the Author was, it is not easy to ascertain; perhaps some Stone, which they improperly reckoned among the Emeralds; perhaps a Prasius, clearer than ordinary, affixed to a Jasper, as it frequently is, as well as to Crystals and other Substances; perhaps no more than a Jasper, finer than ordinary at one End; for it was often found in those Times green and pellucid; *viret & sæpe translucet*



γίνεσθαι. φασὶ γὰρ ἐυρεθῆναι ποτὶ ἐν  
Κύπρῳ λίθον, ἧς τὸ μὲν ἥμισυ Σμάραγ-  
δος ἦν, τὸ ἥμισυ δὲ Ἰάσπιδος ὡς ἔπω με-  
ταβεβληκυίας ἀπὸ τῆς ὕδατος.

μθ'. Ἔστι δὲ τις αὐτῆς ἐργασία πρὸς  
τὸ λαμπρόν. ἀρχὴ γὰρ ἔσα ἔλαμ-  
πρά.

ν'. Αὕτη τε δὴ περιττὴ τῇ δυνάμει,

*Jaspis*, says *Pliny*, l. 38. c. 9. and possibly a true genuine Emerald affixed to it, as often to the *Prasius*, and affixed to, or immerfed in others: But, whatever it was, it is certain, from the present more rational System of the Origin of the Gem Class, that it had been in this mixed State from the Time of its original Concretion; and would assuredly have for ever continued so: there being no Agent in nature of Power to have changed the *Jasper* Part into the Nature of the other.

The medicinal Virtues of the Emerald, according to the Antients, were so many, that, to look over their Accounts of them, one would imagine it deserved even more Esteem as a Medicine than as a Gem: They accounted it a certain Remedy, taken internally in Powder, for Poisons, and the Bites of venomous Beasts, for Fluxes of the Belly, the Plague, and pesti-



is said there has been found in *Cyprus* a Stone, the one half of which was Emerald and the other Jasper, as not yet changed.

XLIX. There is some Workmanship required to bring the Emerald to its Lustre, for originally it is not so bright.

L. It is, however, excellent in its

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lential Fevers, Hæmorrhages, and Dysenteries; the Dose was from four to ten Grains. Externally worn as an Amulet, they esteemed it a certain Remedy for Epilepsies, and imagined it had the Power of easing Terrors, and driving away evil Spirits; tied to the Belly or Thigh of Women with child, they attributed to it the Virtues of the Eagle-stone, of staying or forwarding Delivery: and thought it an infallible Preservative of Chastity; to the Violations of which it had that innate Abhorrence, that if but worn on the Finger in a Ring, it flew to pieces on the committing them.

It may not be amiss to have thus once given an Account of the Virtues the Antients attributed to Gems: for they had almost as large a List for every Kind as this. The greatest part of these cannot but be seen at first view to be altogether imaginary; and as to the Virtues of



ἢ τὸ λυγκύριον. ἢ γὰρ ἐκ τέττα γλύφεται τὰ σφραγίδια. ἢ ἔσι σερευτάτη, καθάπερ λίθος. ἔλκει γὰρ ὡσπερ τὸ ἤλεκτρον· οἱ δὲ φασιν εἰ μόνον κάρφη ἢ ξύλον, ἀλλὰ ἢ χαλκὸν ἢ σίδηρον, εἰάν ἢ λεπτός. ὡσπερ ἢ Διοκλῆς ἔλεγεν.

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the Gems in general, it is now the reigning Opinion, that they are nearly all so, their greatest Friends allowing them no other than those of the common Crystal. However, whether the metalline Particles, to which they owe their Colours, are, in either Quantity or Quality, in Condition to have any Effect in the Body, is a Matter worthy a strict and regular Trial; and that would at once decide the Question between us and the Antients, and shew whether we have been too rash, or they too superstitious.

t There has been more Confusion and Error about the *Lapis Lyncurius* of the Antients, than about any other Substance in the whole fossile Kingdom. What I have to offer in regard to it, is very different from the generally received Opinions: these are, however, first to be examined; for if they are right, this has no Title to be heard.



Virtues, as is also the *Lapis* <sup>t</sup> *Lyncu-rius*, which is likewise used for engraving Seals on, and is of a very solid Texture, as Stones are; it has also an attractive Power, like that of Amber, and is said to attract not only Straws and small pieces of Sticks, but even Copper and Iron, if they are beaten into thin Pieces. This *Diocles* affirms.

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The first and most generally received is, that it was what we now call the *Belemnites*: This is the Opinion of *Woodward*, &c. &c. &c. how true it may be is to be examined from their Accounts; and as they are, most of them, only Copies, and those often erroneous ones, of this Author, he is, where his Descriptions are long enough, always first to be consulted, and most relied on; and from his Words I venture to pronounce it evident, that the *Lapis Lyncu-rius* was not the *Belemnites*. He first says, it was fit for engraving Seals on; which every one who ever saw a *Belemnites* must pronounce impossible to have been meant of it; its Structure rendering it the most improper Substance imaginable for such Uses. And next, that it was of a very solid Texture, like that of the Stones or Gems: the first Sight of a *Belemnites* must also prove, that this was not meant of it; for it is not of a solid Texture, nor of



νά. Ἔτι δὲ διαφανή τε σφόδρα καὶ πυρρῶν.  
 Βελτίω δὲ τὰ τῶν ἀγρίων, ἢ τὰ τῶν ἡμέ-  
 ρων. καὶ τὰ τῶν ἀρρένων, ἢ τὰ τῶν θηλείων.  
 ὡς καὶ τῆς τροφῆς διαφερέσης, καὶ τῆς πονεῖν,  
 ἢ μὴ πονεῖν. καὶ τῆς τῆς σώματος ὅλως φύ-  
 σεως, ἢ τὸ μὲν ξηρότερον, τὸ δὲ ὑγρότε-  
 ρον.

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a Grain, as we call it, any way resembling that of a Stone, but composed of a number of transverse Striæ; and of the Texture, specific Gravity, and Hardness of Talk, which could never give it a Title to what our Author says of the *Lyncurius*; that it was not only hard and solid, but *σερεωτάτη*, extremely so. Hence, I presume, I may first venture to pronounce this, which is the common Opinion, evidently erroneous, and that the *Lapis Lyncurius* of the Antients was not the *Belemnites*.

The few who dissent from this Opinion, of the Number of whom are *Geoffray*, *Gejner*\*,

\* Ego Lyncurium a succino differre non video: et id quoque pro Gemma habitum olim, præsertim quòd aureo colore pellucet et splendet, minimè dubito.



LI. The *Lapis Lyncurius* is pellucid, and of a fire Colour: And those Stones which are produced from the Animal in its native Wildness, are better than those from the tame; as also those from the Male, than those from the Female: As the different nourishment the Creature eats, and the different Exercise it uses, as well as the Difference of its whole Habit of Body, in being either dryer or moister, make great Differences in the Stones.

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&c. hold, that the *Lapis Lyncurius* of the Antients was no other than Amber. This is the second and only other Opinion worth naming; and the Favourers of it bring many Passages from the Copiers of the Antients, to confirm it: All which serve to prove what I have before observed, that many quote the Antients who have never read them; and shew how useful, and, indeed, absolutely necessary, a correct Edition of this Work of our Author is, in Researches of this kind. This Opinion is even more easily than the other proved erroneous from the Words of *Theophrastus*; who not only compares the *Lyncurius*, in some of its Properties, to Amber, which, as I have before observed in a parallel Case in the Note on the



νβ'. Εὐρίσκησι δ' ἀνορέττοντες οἱ ἔμ-  
πειροι. Κατακρύπτεται γὰρ ἢ ἐπαμάται

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Sapphire, is sufficient Proof, that they cannot be the same : as no body would ever think of comparing a Thing to itself : But after having gone through a compleat Description of the *Lyncurius*, according to the received, though erroneous, Opinion of those Times, of its being produced from the Urine of the Lynx ; he begins a separate Account of Amber under its own proper Name ; and shews he was well acquainted with its Nature and Properties, and knew it to be a native Fossile. Hence it is therefore also evident, that the *Lapis Lyncurius* was not Amber, and that the generally received Opinions of it are both evidently erroneous. That such as had not read the Antients themselves should fall into Errors of this kind, from the Obscurity and Confusion of those who copied from them, we cannot wonder. But here it may not be amiss to observe, that it is not the Antients themselves, but these Copiers and Quoters of them, who are generally obscure. *Epiphanius*, who was better acquainted with them, has made a different Guess, and is, indeed, the first Author who has had the least Thought of what I shall attempt to prove to be evidently the Truth in regard to this Stone.



LII. They are found, in digging, by People who are skilful; though the Creature, when it has voided its Urine, hides it, and heaps the Earth together

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What it is not, has been sufficiently proved. It remains to enquire, what it really is. The Way to judge of this is, to consider what the Antients have left us about it: What *Theophrastus* says we have before us. That it was of a stony Texture is plain from his Account, and may be confirmed from all those who wrote more determinately; they have always called it, λίθος λαγγάριος. *Eriphanius* has, εὔρομεν δὲ λαγγάριον ἔτω καλλέμενον λίθον. And *Pliny*, l. 8. c. 38. *Lyncum humor ita redditus, ubi gignuntur, glaciatur arefcitque in Gemmas Carbunculis fimiles, & igneo colore fulgentes Lyncurium vocatas.* Can any one imagine this a Description of a Belemnites? All that we find in the Antients about it, in short, is of this Kind, and determines the *Lapis Lyncurius* to have been a transparent Gem, of no determinate Shape, and of a yellowish red or flame Colour, sometimes paler, and sometimes deeper; which distinguished it into Male and Female; as we shall see hereafter in this Author; and of a Texture fit for engraving on. Had the Antients meant to have described our Belemnites, they would not only not have named any one



γῆν ὅταν ἐξήση. γίνεται δὲ ἢ κατεργασία τις αὐτῆ πλείων.

of these Characters, but would certainly have described its Shape, which is the most striking, obvious, and remarkable thing about it. We are therefore to seek for some Stone better answering this Description; and this we find, even to the utmost Exactness, in the Gem which we now call the Hyacinth, which it is also evident they have never described under any other Name but this, (for what they called the Hyacinth, was a Stone of a very different Sort, and reckoned by us either among the Garnets or Amethysts) and which it is not easy to conceive how they could better or more exactly have described, than they have in their Accounts of the *Lyncurius*. I have before observed, that *Theophrastus* mentions more than one Species of it, and we at present know three. *Pliny* seems, in the Passage I have quoted from him, to have meant that beautiful Species of it which we call the *Hyacintha la bella*, a Gem in great Esteem, of a flame Colour with an Admixture of a deep Red, but without any Tendency to Blackness. These we have from *Cambaia*, and other Parts of the *East Indies*, and sometimes from *Bobemia*, but not so hard or beautiful as the Oriental. Our second Kind are the saffron-coloured; these are next in Esteem after the *La Bella*, and are



about it. The polishing these Stones is also a Work of great Trouble.

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from the same Places. The third are the amber-coloured; these have no mixture of red; these were the female *Lyncuria* of the Antients, and are the least esteemed of all: They are found in *Silesia*, *Bohemia*, *Spain*, and *Italy*.

The candid and excellent Dr. *Watson* has given many Reasons for supposing the Antients to have been acquainted with our Tourmaline, and to have known that Stone by the Name of *Lapis Lyncurius*. These are Fields of Conjecture, open to all who rouse the learned Quarry; and it is with a great deal of Pleasure I have read those Observations of my learned Friend: perhaps a great deal may be said to shew they do not disagree with my own. For thus much is certain, that the Hyacinth, which I understand here to be alluded to, has an electric Power.

As to the Stone *Æpinus*, and others, used in their Experiments, and called the Tourmaline; and which their Authority has fixed as the Tourmaline to this Day; that is a peculiar Species of Garnet, differing in every essential Character from the other Garnets. It is a prism of nine Sides, with two trihaedral Pyramids. Its Colour is purple, not fiery red, as the *πυρρα* of *Theophrastus* must compel us to believe the *Lyncurius* to be; nor have we yet



νύ. Ἐπεὶ δὲ καὶ τὸ ὕψηλεκτρον λίθος.  
καὶ γὰρ ὄρυκτὸν τὸ περὶ Λιγυσικίην. καὶ τέ-

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seen of it with those particular degrees of fainter and fuller Colour, which would best answer the antique *Lyncurius*. I therefore fear the *Lapis Electricus* of the *Berlin* Memoir, &c. is not the *Lyncurius*: but I am very confident that the Hyacinth has all the same Qualities.

ὕ This is much to the Honour of *Theophrastus*. I have before had Occasion to observe, that in departing from the Opinions of this Author, After-ages became more and more ignorant, their Systems erroneous, and their Accounts full of Confusion and Obscurity; till in some late Ages we have been at the pains of unlearning what our Forefathers had been taught by them, and now have brought ourselves to Systems of real Knowledge, by closer Observations of Nature. In many Cases, we find all that we have been studying for is to know just what we might have learnt from the Works of this Author alone. Of this I have before given some Instances; and the Sentence before us, is another very remarkable one: That Amber is a Stone, or native Fossil, the best of the modern Writers seem as certain, as that Gems, Rocks, or Minerals are so. It has, however, for many Ages, been judged by some, to be of a vegetable, and by



LIII. v Amber also is a Stone: It is dug out of the Earth in *Liguria*, and has, as the before mentioned, a Power

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others an animal, nature. And a thousand idle and incoherent Systems have been received as to its Formation: *Dioscorides* thought it an Exsudation of the black Poplar; and *Pliny*, of the Pine; and others, the Fat or Semen of Whales. And it is but of late, that the World has been again brought into the Opinion, that it is, as this Author esteemed it, a mere native Fossile. It is of various Colours, white, brown, and yellow, and is found in Masses of different Shapes and Sizes, on the Shores, in many Parts of the World, particularly in *Prussia*; but where-ever it is found on the Shores, it is also to be found, if carefully sought for, in the neighbouring Cliffs, the Sea having had no Share in bringing it to light; but that it has, in Storms and high Tides, wash'd it out of the Strata of those Cliffs, and cleaned and rounded it at the Edges, by constantly tossing it about; and rubbing it against harder Substances. Amber is naturally invested with a Crust, as the Flints and other natural fossile Nodules are; it is found in this State, in digging, in *Prussia*, *Pomerania*, and other Places, and is called Rock Amber. When it has been washed out of its native Place by the Sea, and divested of this Crust, it is called Wash'd Am-



των ἂν ἢ τῆ ἔλκειν δύναμις ἀκολουθείη.  
 μάλις δ' ὅτι δῆλος ἢ φανερωτάτη τὸν  
 σίδηρον <sup>w</sup> ἄγασα. γίνεται δὲ ἢ αὕτη σπα-

---

ber, or Smooth Amber. We have of both these Kinds in *England*; the rough is found in digging to considerable Depths in Clay, but is commonly of an ill Colour, and impregnated with the vitriolic Salts, with which almost all our Clay-pits abound; and this in such a degree, as often to crumble and fall to pieces, when it has been some time exposed to the Air: The other, or Wash'd Amber, we have on many of our Shores, particularly the Northern; and that sometimes not inferior to the finest of the *Prussian*. Beside the Variety of natural Colours in Amber, of which, beside the common pale-yellow, we see white, orange, brown, and grey; there are certain Cabinets which now boast, red, purple, and green Amber; but I think I am warranted to say, that these, as well as the fine pale striated Amber, are made such by art: there are some Polish *Jews* who have this secret, and who keep it carefully to themselves.

<sup>w</sup> The Author takes occasion here, among the Stones endued with an attractive Quality, to mention the Loadstone, the most known and most powerful of them all. The antient *Greeks* called this, Ἡράκλεια λίθος, and the later, Μαγνήτις λίθος. It has since been by some im-



of Attraction: But the greatest and most evident attractive Quality is in that Stone which attracts <sup>w</sup> Iron. But

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properly called, instead of *Heraclea*, *Herculea*, as if it had obtained its Name from *Hercules*; whereas it had it from *Heraclea*, a City of *Lydia*, near which it was found in great abundance. Κέκληται δὲ ἕτος ἀπὸ τῆς Ἡρακλείας τῆς ἐν Λυδία πόλεως, says *Hesychius*. This, therefore, was its original Name among the antient *Greeks*, and indeed its only Name; for the Word *Magnetis*, which was also in common Use among them, signified a quite different Substance: Their Μαγνήτις λίθος was a white silvery-looking Stone, with no Power of Attraction, and in frequent Use for turning into Vessels of many kinds, as this Author observes in another Place. It was a talcy Stone, of the Ollaris kind; (*see Fossils Arrang'd, p. 27,*) but not exactly the same with any we know at present. The later *Greeks* calling the Loadstone by the same Name, which both had from *Magnesia* in *Lydia*, the Place where they were found, has occasioned almost endless Errors in the less cautious Writers since. The Loadstone is a ferrugineous Substance, found in many Parts of the World, and in Masses of different Size: It is commonly met with in or about Iron Mines, and among ferrugineous Matter. We have them from most Parts of



νία, ἢ ὀλιγαχῆ. ἢ αὕτη μὲν δὴ συναριθ-  
μείδω τὴν δύναμιν ὁμοίαν ἔχειν.

νθ'. Ἐξ ὧν δὲ τὰ σφραγίδια ποιῆ-  
ται, καὶ ἄλλα πλείους εἰσίν. οἷον ἢθ'  
\* Γαλοειδῆς, ἢ ἢ ἔμφασιν ποιῆ καὶ διά-  
φασιν. καὶ τὸ Ἐνθράκιον, καὶ ἢ ὕ ὄμ-  
φαξ. ἔτι δὲ καὶ ἢ <sup>z</sup> Κρύσαλλος, καὶ τὸ

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the World, and there are very good ones found in *England*: Many have been picked up in *Devonshire* and the neighbouring Counties, as well as other Parts of the Kingdom; and I not long since found a Fragment of one, which will take up a small Needle, within two Miles of *London*.

\* The Hyaloides has been by different Authors supposed to be the *Asteria*, the *Iris*, the *Lapis Specularis*, and the Diamond; all which seem very random Guesses, and liable to Objections not to be surmounted. The Stone, I think, appears rather to be the *Astrios* of *Pliny*, which he describes to be a fine white or colourless Gem, approaching to the Nature of Crystal, and brought from the *Indies*: His Words are, having been speaking of the *Asteria*, *Similiter candida est, quæ vocatur Astrios*,



that is a scarce stone, and found in but few Places: It ought, however, to be ranked with these Stones, as it possesses a like Quality.

LIV. There are, beside these, many other Gems used for the engraving Seals: As the <sup>x</sup> Hyaloides, which reflects the Images of Things, and is pellucid; the Carbuncle, and the <sup>y</sup> Omphax; as also <sup>z</sup> Crystal, and the

*crystallo propinquans, in India nascens, & in Pal-  
lenes Littoribus. Intus a centro ceu stella lucet  
fulgore Lunæ Plenæ. Quidam causam nominis  
reddunt quòd Astris opposita fulgorem rapiat, &  
regerat; optimam in Carimania gigni nullamque  
minus obnoxiam vitio, l. 37. c. 9.* And Stones  
of this Kind have of later Years been found  
near the River of the *Amazons* in *America*, and  
taken for Diamonds.

<sup>y</sup> The Omphax was most probably the *Beryllus Oleaginus* of *Pliny*; which, from what is left us about it, appears to have but little deserved to be ranked among the Beryls, and seems much more properly distinguished by a particular Name, as this Author has allowed it.

▪ Crystal is the most known and most common of all this Class of Stones. Our Lapi-



<sup>a</sup> Ἀμέθυσον. ἄμφω δὲ διαφανῆ.

νέ. Εὐρίσκονται δὲ ἢ αὐται, ἢ τὸ  
Σάρδιον, διακοπτομένων τινῶν πετρῶν.

daries distinguish it into two Kinds, the Spring Crystal; and Pebble Crystal. The first is found in the perpendicular Fissures of Strata, commonly in Form of an hexangular Column, adhering to the Matter of the Stratum at its Base, and terminating at its other End in a Point. The other is found lodged at random in the stony or earthy Strata, or loose among Gravel, and is of no certain or determinate Shape or Size, but resembles the common Flints or Pebbles in Form.

There are, beside these, regular and hexangular Crystals, found also lodged in the Strata, sometimes pointed at both Ends, sometimes covering the external Surface of small roundish Nodules, and sometimes shot all over the Inside of hollow ones of various Sizes: These last are called the echinated and concave crystalline Balls; and the former the double-pointed Crystal, *Crystallus in acumen utrinque desinens*. The Pebble Crystals of *England* are often of very considerable Hardness; and some have been found here which the Lapidaries have said approached to the white Sapphire. The pointed



<sup>a</sup> Amethyft; both which are, in like manner, pellucid.

LV. Thefe, as alfo the Carnelian, are fometimes found in the dividing other Stones.

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and hexangular are what Authors have called *Iris's* and *Pseudo-adamantes*. The Antients were of opinion, that Cryftal was only Water congealed in long tract of Time, into an Ice, more durable than the common. And *Pliny* thought it was no where to be found but in exceffively cold Regions; but we are now very certain, that it is even in the hotteft. As to the various Forms of Cryftal, they will be no where fo well known, as from the Cryftallographie of the great and incomparable *De L'ifle*.

<sup>a</sup> The Amethyft of the Antients was the fame with the Gem known yet by that Name: It is a very elegant Stone, of a purple or violet Colour, in different Degrees of Deepnefs. It is found both in the Fiffures, and lodged among the Matter of the Strata; and fometimes, like common Cryftal, in concave Balls, refembling the *Ætitæ*. It owes its Colour to Iron: And common Cryftal and Spar are often found in and about Mines of that Metal, tinged in different Degrees to a Refemblance of it. The Antients reckoned five Species of the Amethyft, differing in Degrees of Colour; and we have at leaft as



νς'. Καὶ ἄλλαι δ', ὡς προείρηται,  
 πρότερον διαφορὰς ἔχουσαι, ἢ συνώνυμοι  
 πρὸς ἀλλήλας. Τῆ γὰρ Σαρδίη, τὸ  
 μὲν διαφανὲς, ἐρυθρότερον δὲ, καλεῖται  
<sup>b</sup> θῆλυ· τὸ δὲ διαφανὲς μὲν, μελάντερον  
 δὲ, ἢ ἄρσεν. ἢ τὰ λυγκίρια δ' ὡσαύτως.

many among the Jewellers at present, though they are not at the pains to distinguish them by particular Names; they divide them in general into Oriental and Occidental: The former are very scarce, but of great Hardness, Lustre, and Beauty; the latter are had from many Places, particularly *Saxony*, *Germany*, and *Bohemia*: They are often as finely coloured as the Oriental, but are soft. In *England* we also sometimes find them very beautiful, and of tolerable Hardness.

The Amethyst loses its Colour in the Fire, like the Sapphire and Emerald: The Oriental Kind, divested of its Colour by this Means, comes out with the true Lustre and Water of the Diamond; and is so nice a Counterfeit of it, that even a very expert Jeweller may be deceived by it.

<sup>b</sup> The Division of the Gems into Male and Female, from their deeper or paler Colour, I



LVI. Other Differences there also are, as was before observed, in Gems of the same Name: As in Carnelians, that Species which is pellucid and of a brighter red, is called the <sup>b</sup>Female; and that which is pellucid and of a deeper red, with some Tendency to Blackness, the Male. The *Lapis Lyncurius* is distin-

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have before observed, is in a Manner general, and runs through almost the whole Class: The Male is always the deeper, the Female the paler; tho' both Kinds, as they are called, are often found in the same Stone. This Difference in the Degree of Colour, happens from the different Quantity of the metalline Particles, to which they all owe their Colours, as mixed with them at their original Formation: And I make no doubt, but that there are some of all the Kinds perfectly colourless, if we were enough acquainted with their exact Texture and Degree of Hardness to be able to distinguish them by it. If we were, we should as surely find white Emeralds, and white Amethysts, as white Sapphires; there being scarce any of the coloured Gems of which we do not see the Male and Female, as they are called; and of which some Specimens of the Female are not found nearly as colourless as Crystal.



ὦν τὸ θῆλυ διαφανέστερον, καὶ ξανθότερον.

καλεῖται δὲ καὶ <sup>c</sup> κυανὸς, ὁ μὲν ἄρρην, ὁ δὲ

θῆλυς. μελάντερος δὲ ὁ ἄρρην.

νζ. Τὸ δ' <sup>d</sup> ὀνύχιον, μικτὴ λευκῶ καὶ

<sup>c</sup> The Carnelian and *Lapis Lyncurius* have been spoken of already. The Gem which the Antients called *Cyanus*, is what we now know by the Name of *Lapis Lazuli*; a Stone common among us in the Tops of Snuff-boxes and other Toys; and of which the glorious blue Colour, called Ultramarine by the Painters, is made. This has also been already treated of occasionally in the Notes on the Sapphire. To what is there said, it may be not improper to add, that it is a true Copper Ore, generally yielding about  $\frac{1}{3}$  of that Metal, and commonly a little Silver: It is of two Kinds, the Oriental, and *German*; the former is from *Asia*, *Africa*, and the *East Indies*; the Colour produced from this is not subject to Injuries, from Time or any other Accidents: The *German* is found not only in the Kingdom whose Name it bears, but in *Spain*, *Italy*, and *Saxony* also; in Mines of different Metals, particularly of Copper. The Colour made from this is subject to Injuries from many Accidents, and in



guished in like manner, the Female of which is more transparent, and of a paler yellow ; and the <sup>c</sup> *Lapis Cyanus* is in the same manner divided into Male and Female ; the Male is in this also of the deeper Colour.

LVII. There is also the <sup>d</sup> Onyx, variegated with white and brown placed

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Time usually turns green. The Stone, wherever found, is generally of the same Figure and Complexion, excepting, that the Oriental is harder than the other Kinds. It is composed always of three Substances, with which there is sometimes mixed a fourth, a Kind of Marchasite, of a shining yellow Colour, and flying off in the Calcination with a sulphureous Smell, like that of the common Pyritæ ; the other three Substances, of which it is constantly composed, are hard, fine crystalline Matter, saturated with Particles of Copper, and by them stained to a beautiful deep blue : This is what may be called the Basis, and is variegated with a white crystalline Matter, and a yellow Talc of the foliaceous Kind ; but the Flakes of it are so small, that the Whole appears in the Form of a Powder.

<sup>d</sup> The Onyx is a semi-pellucid Stone, of a fine flinty Texture, taking an excellent Polish, and is strictly of the Flint Class.



φαιῶ παρ' ἄλληλα. τὸ δ' ἀμέθυσον οἰ-  
νωπὸν τῆ χροῶ.

νή. Καλὸς δὲ λίθος καὶ ὁ<sup>a</sup> Ἀχάτης, ὁ

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I have before observed, in the Note on the Alabaſter, that that Stone had, from its ſimilar Uſe among the Antients, alſo the Name of this Gem; and that great Errors had been occaſioned, by later Authors not underſtanding always which of the two they meant. But this is not all the Confuſion there has been in regard to this Stone; for the Antients have, many of them, deſcribed it ſo looſely and indeterminately, that it is ſcarce poſſible, from their Writings, to fix any Characteriſtic, or ſay determinately what their Onyx was: And we find, in conſequence of this, many different Stones deſcribed as Onyxes by the Writers ſince. It is to the Honour of *Theophraſtus*, however, to be obſerved, that he has ſtrictly and exactly determined what this Stone was; and that if the late Writers had conſulted him, inſtead of being led into a thouſand Mazes by the leſs ſcientific Authors ſince, they would never have deſcribed Carnelians, and a multitude of other different Stones, under this Name; but have known, that the Onyx was as much a diſtinct Stone with him, as the Emerald or the Amethyſt, and as different from many of thoſe they have deſcribed under its Name, as they from one another.



alternately; and the Amethyst, which resembles Red-wine in Colour.

LVIII. The <sup>a</sup> Agate also is an elegant

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From his Account we are to determine, then, that the Onyx is a Stone of a whitish Ground, variegated with Zones of brown: And such are the true and genuine Onyxes we see at present. What may farther be added to its Description is, that its Ground is often of the Colour of the human Nail, bright and shining; the Zones are laid in perfect Regularity, and do not, according to the Judgment of the nicest Distinguishers of the present Times, exclude it from the Onyx Class, of whatsoever Colour they are, except red, in which case it takes the Name of Sardonyx: The Colour of the Ground, and Regularity of the Zones, are therefore the distinguishing Characteristics of this Stone: And in the last, particularly, it differs from the Agate, which often has the same Colours, but placed in irregular Clouds, Veins, or Spots.

We have our Onyxes both from the *East* and *West Indies*; as also from *Spain*, *Italy*, and *Germany*; and there have been tolerably fine ones found in *England*.

<sup>a</sup> The Agate is another of the semi-pellucid Stones of the Flint Class; it is nearly of the same Degree of Hardness with the Onyx; and differs from it, as was before observed, in the



ἀπὸ τῆ Ἀχάτῃ ποταμῷ τῆ ἐν Σικελίᾳ.  
ἢ πωλεῖται τίμιος.

---

irregular and uncertain Manner of its Spots, Clouds, and Variegations, being placed. It has commonly a grey horny Ground; its Variegations are of different Colours, and often most beautifully disposed; representing sometimes, very exactly and elegantly, Trees, Shrubs, and Plants, Clouds, Rivers, and Forests, and sometimes Animals: There are Stories of very strange Representations on some of them; and, indeed, the beautiful Images we often now see upon some, may incline one to believe many of the strange Things we hear of them.

The Antients have distinguished Agates into many Species, to each of which they have given a Name, importing its Difference from the common Agate; whether it were in Colour, Figure, or Texture: From their Colours, they called the red *Hæmachates*, the white *Leucachates*, and the plain yellowish, or wax-coloured, *Cerachates*. Those which approached to, or partook of the Nature of other Stones, they distinguished by Names compounded of their own generical Name, and that of the Stone they resembled or partook of: Thus that Species which seemed allied to the Jaspers they called *Jasp-Achates*; and that which partook of the Nature of the Carnelian, *Sard-*



Stone; it has its Name from the River *Achate* in *Sicily*; and is sold at a great Price.

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*Achates*; and those which had the Resemblance of Trees and Shrubs on them, they called, for that Reason, *Dendrachates*: These are what our Jewellers at this Time call *Mocha-Stones*, but improperly; for they are not the Product of that Kingdom, but are only used to be brought from other Countries, and shipped there for the Use of our Merchants.

Others they have named idly from their imaginary Virtues; as that Kind which they supposed had the Power of conquering the Rage of Lions, and other wild Beasts, they called therefore *Λεοντοσέρες*, which some have imperfectly translated *Leonina* only, and suppose the Stone to have been so named, from its being of the Colour of a Lion's Skin: How much they were mistaken, we may know from this remarkable Description of it in so old an Author as *Orpheus*:

Ἄλλ' ἔτος πάντων προφερέσατος, εἴκ' ἐμιν εὖροις  
 Εἶδος ἔχοντα δαφροῖν ἄμ' αἰμακέτοιο δράκοντος,  
 Τῷ καὶ μιν προτέροισι λεοντοσέρην ὀνομῆναι  
 Ἦνδανεν ἡμιθέοισι, κατὰ σικτον σπιλάδεσσι  
 Πυρσαῖσι λευκαῖς τε, μελαινομέναις χλοεραῖς τε.

*Pliny* seems not to have perfectly understood



νθ'. Ἐν<sup>b</sup> Λαμπψάκῳ δὲ ποτ' ἐν τοῖς  
 χρυσίοις εὗρέθη θαυμαστὴ λίθος, ἐξ ἧς ἀνε-  
 νεχθείσης πρὸς Τίραν, σφραγίδιον γλυ-  
 φερὸν ἀνεπέμφθη Βασιλεῖ, διὰ τὸ πε-  
 ριτλόν.

ξ'. Καὶ αὗται μὲν ἅμα τῷ καλῷ ἢ  
 τὸ σπάνιον ἔχουσιν. αἱ δὲ δὴ ἐκ τῆς Ἑλ-  
 λάδος, εὐτελέσονται.

ξά. Οἷον τὸ ἀνθράκιον τὸ ἐξ Ὀρχομενῆ

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the History of this Species ; as he is too often  
 also in other Places guilty of Errors, in regard  
 to the *Greek* Authors from whom he takes his  
 Accounts of Things. Indeed it seems much to  
 be questioned, whether the Stone itself be not  
 as much the Product of Imagination, as the  
 Virtues ascribed to it: However, as there was  
 so evident a Proof as this, of its having ob-  
 tained its Name from its supposed Virtues, be-  
 cause it was πάντων προφερέστατος; not its Co-  
 lour; I could not omit giving it a Place, to  
 ascertain the original Meaning of a Name so  
 much misunderstood.

The Agate was first discovered in the River  
*Achate*, from which, as our Author observes,  
 it had its Name, but has since been found to



LIX. There was also once found in the Gold Mines of <sup>b</sup> *Lampsacus*, an admirably beautiful Gem, on which, after it had been sent to *Tyre*, a Seal was engraved, which for its Excellence was presented to the King.

LX. These are very beautiful, and very scarce: But those produced in *Greece*, are of the meanest and worst Kind.

LXI. Such are also the Carbuncles

---

be the Product of almost every Nation upon Earth. The finest in the World are those of the *East Indies*: It is found also in great Plenty in *Italy*, *Spain*, and *Germany*, where there are sometimes also very elegant ones; *England* is not without them: In general, the *English* are not good; but some few of them have been found little inferior to the finest.

<sup>b</sup> *Lampsacus* was a City of *Asia*, near the *Hellepont*, in the Neighbourhood of which there were Mines worked for Gold, Silver, and Copper. What the Gem was, here mentioned by the Author, there is no determining; but in all Probability, from its having a Place so near the *Agates*, it was a more than ordinarily beautiful Stone of that Kind.



τῆς Ἀρκαδίας °. ἔσι δ' ἕτος μελάντερος  
 τῆ Χίε. κάτοπτρα δὲ ἐξ αὐτῆ ποιῆσι.  
 ἢ ὁ Τροιζήνιος <sup>d</sup>, ἕτος δὲ ποικίλος, τὰ  
 μὲν φοινικοῖς, τὰ δὲ λευκοῖς χρώμασι.  
 ποικίλος δὲ ἢ ὁ Κορίνθιος, τοῖς αὐτοῖς  
 χρώμασι. πλὴν τὸ λευκότερον ἢ χλορο-  
 εἰδέσερον τὸ δ' ὅλον πολλοὶ τυγχάνουσιν  
 οἱ τοιῆτοι.

ξβ'. Ἀλλ' οἱ περὶ τοὶ σπάνιοι, ἢ ἐξ  
 ὀλίγων τόπων °. οἷον ἐκ τε Καρχηδόνας,

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° The *Arcadian* Carbuncles of the Antients, were of the Garnet kind, but so deep coloured, that they were little esteemed; and those of other Countries, which were of the same kind, but little regarded among them. It appears to me, that our Tourmaline was known to them by the Name of an *Arcadian* Carbuncle.

<sup>d</sup> The *Troaxenian* I have before observed, in the Notes on the Anthrax, was what we call the *Amandine*, a Stone now little known or regarded. And the *Corinthian* seems to have been only a meaner and worse Kind of it: Toward the end of the Description of this Species, after the Word πλὴν, there was a Lacuna, affording room for a Word of about three or



of *Orchomenus* in <sup>c</sup> *Arcadia*, which are darker coloured than the *Chian*; but are, however, used for making Mirrors; and the *Træzenian*<sup>d</sup>, which are variegated with purple and white: The *Corinthian* is also of this Kind; it is variegated with the same Colours, but is whiter and paler. And finally, there are many others of this Sort.

LXII. But the most perfect and valuable Carbuncles are scarce, and had only from a few Places<sup>e</sup>, as *Carthage*

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four Syllables; it is here filled up from *Salmasius*, whose Motive for giving the Word λευκότερον was, that *Pliny*, who has copied this Passage from *Theophrastus*, shews, that he had read or understood it so; by giving *pallidiores* & *candidiores* for it. And it may be observed in general, that there is no better way of judging of the obscurer Passages of the Antients at this time, than by observing how they have understood one another.

<sup>e</sup> The Antients we find made great Distinction between the different Species of the Carbuncle; on some of which they set almost no Value; and others they esteemed at a very high Rate. This Author has very carefully and ex-



ἢ τῶν περὶ Μασσαλίαν, ἢ ἐξ Αἰγύπτου,  
 ἢ ἐκ τῶν καταδύπων, ἢ Συήνης πρὸς Ἐλε-  
 φαντίνῃ πόλει. ἢ ἐκ τῆς Ψηδῶ καλεμένης  
 χώρας.

ξγ. Καὶ ἐν Κύπρῳ ἢ τε Σμάραγδος,  
 ἢ ἢ Ἰασπιδίς<sup>f</sup>, οἷς δὲ εἰς τὰ λιθόκολλα

actly distinguished and ascertained the Places of  
 the one as well as the other.

The *Carthaginian* or *Garamantine* Carbuncle  
 was, as I have observed in another Place,  
 what we now call the Garnet, &c. This Place  
 was so famous for it, that it was called by  
 many the *Carchedonius Lapis*, Καρχηδόνιος λίθος.

*Quo Carchedonios optas ignes lapideos*  
*Nisi ut scintillent?* Publ. Syr.

That the *Carthaginian* and *Garamantine* Car-  
 buncle were really the same Stone, is ascer-  
 tained by *Strabo*, ἢ δὲ ὑπὲρ τῶν Γαιτέλων ἐστὶν ἢ τῶν  
 Γαραμάντων γῆ παράλληλος ἐκεῖνη, ὅθεν οἱ Καρχηδό-  
 νιοι κομίζονται λίθοι. And *Eriphanius* adds his  
 Confirmation of this Place being famous for the  
 Carbuncle, γίνεται δὲ ἐν Καρχηδόνι τῆς Λιβύης.  
*Pliny*, and other of the Antients, confirm also  
 their being found in *Egypt* and *Massilia*; and  
*Salmasius* has very judiciously rendered the last



and *Massilia*, from *Ægypt*, about the Cataracts of the *Nile*, and the Neighbourhood of *Syene*, a City of the *Elephantines*, and from the Country called *Psebos*.

LXIII. In *Cyprus* also are found the Emerald and the Jasper<sup>f</sup>; but what are

mentioned Place intelligible, by altering it from  $\Psi\eta\Phi\omega$ , as it always before was written, to  $\Psi\eta\text{C}\omega$ , the Name of a Kingdom in the inland part of *Æthiopia*. It is to be observed, however, that the following Ages grew nicer in regard to their Gems; for two of the Kinds we find here placed among the more perfect and valuable, the *Egyptian*, and (according to the just mentioned Emendation of  $\Psi\eta\text{C}\omega$ ) *Æthiopian*, were even before the Days of *Pliny*, ranked among the meaner Kinds; *Archelaus* & in *Ægypto circa Thebas nasci tradidit fragiles, venosas, morienti Carboni similes*. And, *Satyrus* *Æthiopicos dicit esse pingues lucemque non emittentes, aut fundentes, sed convoluto igne flagrantes*. Lib. 37. c. 7.

<sup>f</sup> The Jasper and the Emerald in general have already been spoken of. The *Bactrian* Emeralds were allowed, as has been observed, the second place in Value: Our Author's Account of them, and the Place and Manner in



χρῶνται, ἐκ τῆς Βακτριανῆς εἰσὶ πρὸς τῆ  
 ἐρήμῳ. συλλέγουσι δ' αὐτὰς ὑπὸ (τὰς)  
 Ἐτησίας, ἰππεῖς ἐξιόντες· τότε γὰρ ἐμ-  
 φανεῖς γίνονται, κινεμένης τῆς ἄμμου,  
 διὰ τὸ μέγεθος τῶν πνευμάτων. εἰσὶ δὲ  
 μικροὶ καὶ ἔ μεγάλοι.

ξδ'. Τῶν σπινδαζομένων δὲ λίθων ἐστὶ  
 καὶ ὁ Μαργαρίτης καλούμενος, ἔ διαφανῆς

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which they were found, has been copied by most of the Writers after him, though all of them have not been careful enough to do him justice, by doing it correctly. It is evident, that *Pliny* rendered his κινεμένης τῆς ἄμμου, *tellure aperta*, (though it is not exactly so printed in any of the Copies, but, *tunc enim terta, tersa*, or *tellure internitent*,) because *Solinus* and *Isidorus* have it, *tunc enim detecto solo facillime internitent*, and *tunc etiam tellure deoperta intermicant*; which shews that they had read it *tellure aperta* in him; however our later Copies may have deviated from the old ones. But the same *Isidorus* condemns *Pliny* in another part of this Sentence, by transcribing from him his noted Error, of rendering the τὰ λιθόκολλα of *Theophrastus* by *colliguntur enim in commissuris saxo-*



used for setting in Cups and other Vessels of Gold, they have from *Bactriana*, toward the Desert: They go thither on Horseback to search for them, at the Time of the blowing of the Etesian or annual Easterly Winds; for they are seen at that Time, as the Sands are violently tossed about by the Winds: What they find there, however, are but small.

LXIV. Of the Number of the Precious Stones is that also which is called

*rum*: The Meaning of *Theophrastus* evidently is, that these *Bactrian* Emeralds were used for ornamenting Vessels of Gold, by being fixed in them in various Figures. That this was a common piece of Luxury among the Antients, and that Emeralds and Berylls, the only other green Gem, were mostly employed in it, as making the best Figure in Gold, is to be seen in many Passages of the Antients.

*Gemmatum Scythicis ut luceat ignibus aurum  
Adspice quot digitos exiit iste calyx.*

Martial.

——— *Et inæquales Beryllo  
Virro tenet Phialas.*

Juvenal.

What the Author here means by *εις τὰ λιθόκολλα*,



μὲν τῆ<sup>s</sup> φύσει. ποιῶσι δ' ἐξ αὐτῆ τὰς  
 πολυτελεῖς ὄρμας· γίνεται δὲ ἐν ὄσρεϊῳ  
 τινὶ, παραπλησίως ταῖς πίνναις· φέρει δ'  
 ἢ τε Ἰνδικὴ χώρα, ἢ νῆσοι τινὲς τῶν ἐν τῇ  
 Ἐρυθρᾷ.

is evidently, that these *Bactrian* Emeralds, though very fine, were but small; and therefore principally used to stud and ornament Vessels of Gold. And this *Pliny* has so far misunderstood, that he has translated it, that they were found in the *Commissuræ Saxorum*. And as Errors never fail to be faithfully copied and handed down to Posterity, this has been carefully delivered to us by every Author since; while *Theophrastus*, who never meant any such thing, or imagined there were any such things as Stones to be found in those Desarts, was either forgot, or accused of the Error.

\* The Pearl was in great esteem among the Antients. It was by the *Romans* allowed the second Place among Jewels: and seems ever to have been a particular Favourite with the Ladies.

Pearls are produced in many kinds of Shell-fish; but the finest, and what are properly the genuine Pearl, are bred in the *concha margaritifera plerisque, Berberis antiquis Indis dicta*. List, Hist. Conch. Our Author seems



the Pearl. It is not of a pellucid Nature, but Bracelets, and other Ornaments of great Value are made of it. It is produced in a kind of Oyster, and, in like manner, in the *Pinna marina*; and is found in the *Indies*, and on the Shores of certain Islands in the *Red Sea*.

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to have been very well acquainted with the History of the Pearl; and, doubtless, means this very Shell by his ὄσρειω τινί. *Androsthene*s also confirms its being this very Shell that the fine Oriental Pearls are found in, ἐν δὲ ἴδιον καλῶσιν ἐκεῖνοι Βέρβερι, ἐξ ᾧ ἡ μαργαρίτις λίθος. I have ventured to add an *ς* to the Word παραπλησίω in the *Greek* Text, because the Sense and original Meaning of the Author seem to have been so. The Shell which produces the Pearl is not at all like the *Pinna*, and some have censured this Author for saying it was; which he seems never really to have done, but to have known the History of the Substance he is treating of much better; and to have said, as I have made it by the Addition of that single Letter, probably lost in some of the Copies, that the Pearl is produced in the *Berberi*, and in like manner in the *Pinna marina*; which it also was, and which the Antients knew it was.

The Pearl is no more than a morbid Excref-



Ξέ. Τὸ μὲν ἔν περὶ τὸν σχεδὸν ἐν αὐταῖς.  
εἰσὶ δὲ καὶ ἄλλαι τινές. οἷον ὁ, τε ἑλέφας  
ὄρυκτὸς <sup>h</sup>, ποικίλος μέλανι (καὶ λευκῶ) καὶ

---

cence from the Animal in which it is found : it consists of several Laminæ laid closely round one another, as the Bezoar, the Calculi in human Bladders, and other animal Stones. When small, such are called Seed-pearls, and when larger than ordinary, *Uniones*. Our Jewellers distinguish them into Oriental and Occidental. They are found in many Places, as well as in different Shells. The finest in the World are those of the *Persian Gulph* : There are a great number found about *Cape Comorin* and the Island of *Ceylon*, but they are greatly inferior to the *Persian*. Very large ones have been found about *Borneo*, *Sumatra*, and the neighbouring Islands, but not of the fine Shape and Water of the *Persian*.

The Occidental have a milky Cast, and want the polished Gloss of the Oriental. They are very plentiful in many Parts of *America* ; as also in *France*, *Italy*, and *Scotland* ; and we meet with them every Day in our Oysters and Muscles here, but seldom of any great Beauty.

Some have been of Opinion, that they were bred singly, one only in a Shell ; and that they thence had their Name *Uniones* ; but this is an Error, many being very frequently found toge-



LXV. These are of peculiar Excellence and Value. And there are yet also some others to be mentioned; as the fossile<sup>n</sup> Ivory, which is variegated with

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ther; nay, there are Accounts of one Shell producing 120.

<sup>n</sup> Fossile Ivory and Bones of Animals lodged long before in the Earth, are frequently dug up in all Parts of the World. These Substances have preserved their Texture, Solidity, and Colour, in different Degrees, according to the Nature of the Matter among which they have lain: Sometimes they are dug up firm, solid, and scarce altered; sometimes so rotten, as to crumble to pieces in handling; and sometimes stained to various Colours, from the dissolved Particles of metalline or mineral Matter among which they have been lodged.

Of this Kind is the Turquoise, generally esteemed and called a Stone, but, in reality, no other than the Bones and Teeth of Animals, accidentally lodged near Copper Mines, or Places where there is cupreous Matter in the Earth. This Metal, if dissolved by a proper acid Menstruum, makes the Bone a green Turquoise, of which there are some found in *Germany* and elsewhere: And if the cupreous Particles have been dissolved in a proper alkaline Menstruum, they convert the Bones or Teeth, into the Substance of which they penetrate, into the com-



ἢν καλῶσι<sup>i</sup> Σάπφειρον. αὕτη γὰρ μέλαι-

mon blue Turquoise. This Colour it is sometimes found beautifully and equally tinged with all through; and sometimes only in Spots and Lines of a very deep Blue, but which the Assistance of Heat will diffuse through the whole Mass, and make it as beautifully palely, and uniformly blue, as that found naturally so.

The Word μέλανι in this Place has been always translated black; and *Pliny* copies it in that Sense from this Author; for he says, *Theophrastus auctor est & ebur fossile candido & nigro colore inveniri*. If we may be allowed to understand it as I have done, only in the very Sense in which he uses it in the next Line; and judge that he means by it no more than a deep Blue; as 'tis certain he there does, where he applies it to the Sapphire; for Nobody can imagine he intended to call that black; if we receive the Word, in this Sense, and determine that the Author means to say, that fossile Ivory was white variegated with blue; and remember what is just before observed of the Turquoises only spotted and veined with a very deep Blue, as those of *France* all are; and many of many other Places, till brought to the Fire; we shall understand this Passage, the Meaning of which has never yet been guess'd at, in a



white and a dark Colour ; and the <sup>i</sup> Sapphire, which is of a dark Dye, and not

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very clear and very particular Light : and find, that the Substance here described is the genuine rough Turquoise, which our Author has very properly called no other than fossile Ivory, as perhaps all he had seen was of Elephants Teeth ; and seems very well acquainted with it in its rough State. Whether the manner of diffusing its Colour by Fire was known at that Time, is more than can now be positively determined : Most probably it was not, and they looked upon the native blue Turquoise, which they called *Callais*, as a different Substance.

That the System of the Turquoises owing their Colour to Copper dissolved in a proper Alkali, is just, I have this to prove ; that by a similar Operation I have myself made Turquoises, many of which I have now by me, and which have been acknowledged true ones by our best Lapidaries.

<sup>i</sup> The Sapphire has been spoken of at large already ; I shall only add here, that the Word *μέλαινα* in this Place evidently signifies not black, but deep blue, as I have understood it in the former Line. And that this Passage is a strong Confirmation, that the Sapphire and Cyanus are not the same Stone, since he here compares one of them to the other. And, as I have often had Occasion before to observe, we



να, ἐκ ἄγαν πόρρω τῆ κυανῆ τῆ ἄρρενος  
 καὶ κ Πρασίτης· αὕτη δὲ ἰώδης τῆ χροῶ.

Ξς'. Πυκνὴ δὲ καὶ λ' Αἱματίτις. αὕτη δ'

cannot suppose he would compare a Thing to itself.

\* The Prasius is the Stone known by our Jewellers under the Name of the Root of the Emerald; and before mentioned in the Notes on that Gem.

It is a Gem of the lower Class, of an impure green, in which there is commonly some Tinge of yellow. The Antients distinguished it into three Kinds; the one of a plain yellowish green, the others variegated with white, and with red. We often see it now coloured from the other Gems or coloured Stones on which it is produced, but make no Distinctions from those Accidents.

We have, however, as the Antients had, three Kinds of it distinguished by Colour, though none of them variegated; they are, the deep green, the yellowish green, and the whitish yellow; the last has very little green in it, and more properly belongs to the *Lapis Nephriticus* Class, as being but semi-pellucid.

It is found in the *East* and *West Indies*, and in *Germany*, *Silesia*, *Bobemia*, and *England*; but is little valued any where.

*Woodward* errs in thinking our Jewellers call



very different from the Male Cyanus ; as also the <sup>k</sup> Prasus, which is of an æruginous Colour.

LXVI. And the <sup>1</sup> Hæmatites, or

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this the Smaragdo-Prasus : that and the Chryso-prasus are both, indeed, called Species of it, but are much superior to it in Beauty and Value. The Chryso-prasus is a Stone of greater Lustre and Hardness than the Prasus, and is in Colour of an equal Mixture of green and yellow. And the Smaragdo-Prasus, a beautiful Gem, of a grass green, with the slightest Cast imaginable of yellow.

The Distinctions between the Emerald, Prasus, Chryso-prasus, and Smaragdo-Prasus, are, indeed, very nice, but they are very just. The Antients, we find, were well acquainted with them ; and some of our Lapidaries are very clear in them at this Time. As the History of Gems is at best a thing too full of Confusion and Uncertainty, we ought, of all things, to avoid adding to it, by losing more of the old Distinctions.

<sup>1</sup> The Hæmatites is an Iron Ore, and a very rich one, perhaps the richest of all ; for there is some of it which contains more than half Iron. It is generally of a ferruginous reddish Colour, very heavy, and in Texture resembling the fibrous Talcs. The Antients had five Kinds of it, some of which are now lost : The



αὐχμώδης, ἢ, κατὰ τῆνομα, ὡς αἵματος  
 ξηρῆ πεπηγότης. ἄλλη δὲ καλεμένη Ξαν-  
 θῆ, ἔ μὲν τὴν χροῖαν, ἔκλευκος δ', ὃ μᾶλ-  
 λον καλεῖσι χροῖμα οἱ Δωρεῖς ξανθόν.

ξζ'. Τὸ γὰρ <sup>11</sup> Κεράλλιον, (ἢ γὰρ

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*Ethiopian*, which was the most esteemed, and probably meant by the first Kind mentioned here, was of the same Nature with ours. The *Xanthus* or *Xuthus*, ξηθός, here mentioned afterwards, was that which was afterwards called *Elatites*: It was naturally of a pale, yellowish Colour, but became red, as all ferrugineous Bodies do by burning.

Our *Hæmatites* is sometimes of a plain striated Texture, and sometimes has its Surface rising very beautifully into globular Tubera, or Inequalities, resembling Clusters of large Grapes. It is found in *Spain, Italy, Germany, England*, and elsewhere: That of our own Kingdom is very rich in Iron, some of it yielding  $\frac{1}{2}$  of that Metal, and running into a malleable Iron on the first Fusion.

<sup>11</sup> The Nature and Origin of Coral has been as much contested as any one Point in natural Knowledge; the Moderns can neither agree



Blood-stone, which is of a dense, solid Texture, dry, or, according to its Name, seeming as if form'd of concreted Blood: There is also another Kind of it, called *Xanthus*, which is not of the Colour of the former, but of a yellowish White, which Colour the *Dorians* call *Xanthus*.

LXVII. To these may be added <sup>11</sup>

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with the Antients about it, nor with one another: And there are at this Time, among the Men of Eminence in these Studies, some who will have it to be of the vegetable, others of the mineral, and others of the animal Kingdom. It were easy to overthrow all that has been advanced, as to its belonging to the mineral Kingdom, but that there is not Room here for all one could wish to say. As no one, however, has been at more Pains to prove it of mineral Origin than our own Dr. *Woodward*, it may not be amiss here, in few Words, to defend *Theophrastus's* *Φύεται ἐν τῇ θαλάττῃ*, against that Gentleman's Hypothesis: and shew, as it evidently is so, that *Theophrastus* was in the right, in determining that it was an organized Body; and consequently the Doctor mistaken, in imagining it to have been formed in the manner of Fossils. And this I promise myself may be done even from his own Account. It



τῆ δ' ὡσπερ λίθος) τῇ χροῇ μὲν ἐρυθρὸν,  
 περιφερὲς δὲ, ὡς ἂν ρίζα. φύεται δὲ ἐν τῇ  
 θαλάττῃ.

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may be proper to premise here, that it was of absolute necessity to the supporting that Gentleman's System of the Solution of Fossils at the Deluge, that this should be proved to be one, because he gives it as a Certainty, that all the fossile Corals have been in a State of Solution; which, had they ever been of another Nature, they could not, according to his own System, have been. If his System be just in this Point, I have Proofs, that, whatever he might conclude from it, it really makes for the antient Opinion; for, whatever may have been the Case in regard to the fossile Corals in the Doctor's Cabinet, I have one which I very lately took up from 25 Feet deep in a Clay-pit in the Neighbourhood of *London*: Which shews evidently, that it never has been in a State of Solution, and must have been therefore, according to his own System, an organized Body; for there are Numbers of small Balani affixed on it, and that not immersed in, or laid on it in irregular and uncertain Postures (as must have been the Case, if they had accidentally been lodged in and on it at the Time of its concreting in the Waters of the Deluge) but fixed in the very Manner in which they are found



Coral, for its Substance is like that of Stones: Its Colour is red, and its Shape cylindrical, in some sort resembling a Root. It grows in the Sea.

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when living and in their natural Posture: This it is impossible they should be, if ever they had been dislodged from it; as they must have been, if ever it had been in a State of Solution. Nor are we to imagine, that the fossile Corals have been in a State of Solution, because they have often very different Matter from the Coralline in their Constitution; nay, sometimes seem almost wholly composed of such: For we frequently find fossile Wood, which, according to that Gentleman's own System, never has been in a State of Solution, saturated in like manner with the Matter of the common Pyrites, and sometimes seeming wholly composed of it. And this very Specimen of Coral of mine, which, it is evident, never has been in a State of Solution, is yet almost wholly converted into an Agate.

To this it may be added, that after all the Pains that Gentleman has taken to prove that Corals are Fossils, and formed by mere Apposition of Corpuscles, not by Organization; his chemical Analysis of red Coral, has brought him to a Necessity of allowing, that there is something of another Nature in them: And how can he imagine this came there? When I



Ξή. Τρόπον δέ τινα εἰ πόρρω τέτρα τῆ φύσει ἢ ὁ <sup>m</sup> Ἰνδικὸς κάλαμος ἀπολελιθωμένος. Ταῦτα μὲν εἰν ἄλλης σκέψεως.

Ξθ. Τῶν δὲ λίθων πολλαί τινες αἱ φύσεις, ἢ τῶν μεταλλευομένων. ἔναι γὰρ

can be informed how something of a vegetable or animal Nature can be produced otherwise than from Seed or Egg, I may come over to the Doctor's Opinion ; that Corals have been formed by mere Apposition of Particles wash'd out of the neighbouring Rocks : But till then must believe, that no animal or vegetable Matter can be produced otherwise than by organized Growth : nor is there now the least Doubt that they are to be ranged in the animal Kingdom. *Peyssonell, Jussieu*, and our own acute and excellent *Ellis*, have put this beyond question.

It is matter of great concern to me, that I am obliged in this, and some other parts of this Work, to dissent from the Opinions of the Author above-mentioned, to whom the World owes more real and everlastingly true Discoveries in the History of Fossils, than to any one Man beside who ever wrote ; and to whom I am myself so much indebted in this very Work : But Truth is to be sought for at the Expence of the Opinions of all the Writers in the World ; and as *Dr. Woodward* is an Au-



LXVIII. The <sup>m</sup> petrified *Calamus Indicus* also, is not very different from this. But these are more properly the Subjects of a different set of Observations.

LXIX. Beside these there are also many Kinds of metalline Stones, some

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thor so much and so deservedly esteemed, wherever he is in Errors, few would venture to believe him so, unless convinced of it, either by ocular Demonstration, or the apparent Testimony of the Antients. Where these have made against him, there, and there alone, I have ventured to dissent from him: and I cannot but observe, that he has, in this Case of the Corals, been guilty of that Precipitancy of which he so angrily accuses some other excellent Authors: And when he so severely censured in this matter, in which himself was in the wrong, a Gentleman to whom the World is very much indebted in things of this Kind, he should have considered that it might be his own Fate to be afterwards treated in the same manner; and remembered the excellent *Spanish* Proverb, which advises a Man who has Glass Windows never to throw Stones.

<sup>m</sup> The petrified *Calamus Indicus* of the Antients, was one of the starry-surfaced fossile Coralloids; and, indeed, was not named without some appearance of Reason: The Speci-



ἅμα <sup>n</sup> χρυσὸν ἔχουσι καὶ ἀργυρον, ὡροφα-  
νὲς δὲ μόνον ἀργυρον· βαρύτεραι δ' αὐταὶ  
πολὺ καὶ τῆ ῥοπῆ καὶ τῆ ὀσμῆ.

ό. Καὶ ° Κυανὸς αὐτοφυῆς, ἔχων ἐν

men I have of it, very prettily and exactly re-  
sembles that Body.

<sup>n</sup> The Gold and Silver Ores are of so many  
Kinds, and such various Appearances, that it  
is an almost endless Scene of Variety that may  
be found in visiting the various Mines, or exa-  
mining the Specimens from them. Gold,  
*Woodward* observes, is, more or less of it, in-  
corporated with almost all kinds of terrestrial  
Bodies: And Silver I have seen in almost an  
infinite variety of Forms. That of *Saxony* is  
incorporated generally with Sulphur and Ar-  
senick, and has from them an external Shew of  
Gold, for which Reason it is called there *Rot-  
gulden Ertz*, that is, Red-golden-looking Ore:  
This is very heavy, and when broken is of a  
strong Smell.

Beside these, the common Marchasites and  
Pyritæ many of them hold Gold and Silver in  
small Quantities; and are of various Colours,  
and contain sulphureous, arsenical, and other  
different Matter, enough to give them both  
Smell and Weight, and sometimes both, to a  
very great Degree,



of which contain both <sup>n</sup> Gold and Silver, though the Silver alone is visible; and these are very remarkable, both for their Weight and Smell.

LXX. As also the native Blue, or <sup>o</sup> *La-*

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• The *Kυανός* or Cyanus here mentioned, is not the blue Gem before described under that Name, but the blue Colour used by Painters, and since called *Lapis Armenus*, by which Name alone it is now known. The *Greeks* called this and the Gem both by the common Name *Kυανός*, Cyanus: They had no other Name for this, but generally took care to distinguish which they meant, by the Context. It is here evident by its Epithet *αίτοφύης*, by way of distinction from the artificial *Cæruleum* used in Paintings; (for the Cyanus Gem, or *Lapis Lazuli*, cannot be supposed to have been so subject to be counterfeited) and its containing their Chryfocolla, which the *Lapis Armenus* always does, that the Paint, and not the Gem, was the Cyanus meant here. The Antients calling these two different Substances by the same Name, has, however, been the Occasion of innumerable Confusions and Misunderstandings of their Works; and that not only among the less careful of the Moderns, but even among some of their earliest Copiers: And we are not to wonder if many are at present misled,



ἑαυτῷ χρυσοκόλλαν. ἄλλη δὲ λίθος,  
ὁμοία τὴν χροίαν τοῖς <sup>P</sup> ἄνθραξι. βάρος  
δ' ἔχεισι.

οἶα. Τὸ ὅλον δὲ ἐν τοῖς μετάλλοις  
πλεῖσαι ἢ ἰδιώταται φύσεις εὐρίσκονται  
τῶν τοιούτων. ὧν τὰ μὲν εἰσι γῆς, καθά-  
περ <sup>Q</sup> Ωῖχρα, καὶ Μίλτος. τὰ δ' οἶον

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as it is now generally thought going very far back if we turn to *Pliny*; when we find that even *Pliny*, who has taken the greater Part of his History of Fossils from this Author, has in many Places evidently and notoriously misunderstood him. Of this we have an evident Instance in the present Case; for he has confounded the two Substances called by this Name, and said of the Gem Cyanus, what *Theophrastus*, from whom he translated it, says of the Paint; as I shall have Occasion to observe at large, when I come hereafter to the Passage from which *Pliny* translated it.

The Cyanus here meant, therefore, is the *Lapis Armenus*, called by the *Germans*, *Bergblau*, and by the *French*, *Verd azur*. It is a mixt earthy Substance, of a beautiful greenish Blue; and seems composed of arenaceous and ochreous Matter, tinged to that Colour by Particles of Copper. It was first found in *Armenia*,



*pis Armenus*, which has in it Chryso-colla; and another Stone, in Colour resembling the <sup>p</sup> Carbuncle, but much heavier.

LXXI. Upon the whole, there are many and very remarkable, different Kinds of fossile Substances dug in Pits; some of which consist of an argillaceous Matter, as <sup>q</sup> *Ochre*, and *Reddle*; others

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from whence it has its present Name, and used to be brought from thence; but has since been discovered in *Germany*, *Bobemia*, *Saxony*, and many other Places: Our own Kingdom produces it, and that as good as any in the World, but in what Quantity I cannot say. I remember to have seen it in the Fissures of Stone, among some of the Talcs, not far from *Mountsorrel* in *Leicestershire*, and have now some of it, which I brought thence.

<sup>p</sup> The Stone next mentioned, and said to resemble the Carbuncle, but to be heavier, was probably of the Cinnabar Kind, of which hereafter: Many Specimens of this Fossil I have seen of a very fine Texture, and beautiful Colour; and all of it has the other Quality here mentioned, Weight.

<sup>q</sup> Ochre and Reddle are Earths of the same Nature and Texture, and only differ in Colour;



ἄμμος, καθάπερ χρυσοκόλλα, ἢ κυανός.  
τὰ δὲ κόνιας, οἷον ἰ Σανδαράκη, καὶ Ἄρ-  
ρηνικόν, ἢ ὅσα ὅμοια τέτοις.

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there are many Kinds of each, several of which will be spoken of hereafter: They are all of a fine argillaceous Texture, most of them easily crumbling to pieces, and staining the Fingers in handling. They are used in Medicine and by the Painters. The common yellow Ochre is a cheap and very useful Colour: And the common Reddle is often sold in the Druggists Shops either in its native State, if pale enough, as it sometimes is; or mixed with Whiting, under the Name of Bole Armeniac.

The Ochres all contain more or less Iron; for the yellow ones become red by burning.

ἰ Sandarach and Orpiment are also two Substances of the same Nature and Texture, differing in Colour, like the Ochre and Reddle; and, in like manner, the yellow will become red by burning.

Orpiment is the Ἄρρηνικόν of the antient, and Ἄρσενικόν of the later *Greeks*. The *Arabians* call it *Zarnich Asfar*: It is a very beautiful Substance, composed of large Flakes, resembling those of the *Lapis Specularis*, but of a glorious Yellow; very weighty, and sometimes holding a small Quantity of Gold.



of a sandy, as *Chryfocolla* and the *Lapis Armenus*; and others as it were of Ashes, as <sup>r</sup> *Sandarach*, *Orpiment*, and others of that Kind.

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There are, beside this fine Orpiment, two other less beautiful Kinds; the one composed of an impurer Substance, resembling common Sulphur, spangled all over with small Flakes of the fine foliaceous Kind; the other more impure than the last, and tinged of a paler or deeper Green in many Places, from Particles of Copper. These are what may be called the three different Kinds of this Fossil; but there are, beside these, almost endless Varieties of it, in regard to its deeper or paler Colour, and the extraneous Matters contained in it.

Yellow Orpiment burns to a Redness in the Fire, emitting a nauseous Smell; and this red Mass is sometimes called red Orpiment: But the genuine and natural red Orpiment is the *Sandarach* here mentioned; this the *Arabians* call *Zarnich-Abmer*; it is of the same Nature with the former, but generally in larger Masses, and not of that foliaceous Texture, but in more compact Glebes.

All the Kinds of Orpiment and *Sandarach* are found in the Mines of Gold, Silver, and Copper; and sometimes two or more of them



οβ'. Καὶ τῶν μὲν τοιούτων πλείους ἄν  
 τις λάβοι τὰς ιδιότητας. ἔναι δὲ λίθοι  
 ἢ τὰς τοιαύτας ἔχουσι δυνάμεις, εἰς τὸ μὴ  
 πᾶσαι, ὡς περ εἶπομεν. οἷον τὸ μὴ  
 γλύφεται σιδήροις, ἀλλὰ λίθοις ἑτέροις<sup>f</sup>.

ογ'. Ὅπως μὲν, ἢ κατὰ τὰς ἐρ-  
 γασίας ἢ τῶν μειζόνων λίθων πολλὴ δια-  
 φορά. ἄλλοι πρῖνοι γάρ· οἱ δὲ γλυπτοί,  
 καθάπερ ἐλέχθη, ἢ τορνευτοὶ τυγχάνουσι,  
 καθάπερ ἢ ἡ<sup>f</sup> Μαγνήτις αὐτὴ λίθος, ἢ ἢ

---

mixed in the same Glebe. I have, from the Mines of *Goffelear* in *Saxony*, a most elegant Piece of the foliaceous Orpiment, which has two fine Veins of native Sandarach running across it: It was brought to me under the Name of a Gold Ore; and I believe really does contain a small Quantity of that Metal.

<sup>f</sup> This is a Doctrine well known to our Lapidaries, and without the Knowledge of which the Diamond, the first and finest of all Gems, never could have been worked into Form at



LXXII. Many other Properties there also are in these Substances which are easily observed. As that some of the Stones before named are of so firm a Texture, that they are not subject to Injuries, and are not to be cut by Instruments of Iron, but only by other Stones <sup>f</sup>.

LXXIII. On the whole, there is a great Difference in the Texture of the larger Stones; as may be learnt from the different Manners in which they may be worked; some may be cut, others engraved on, and shaped, as before observed, by the Turner's Instruments, as the <sup>t</sup> Magnet Gem, a Stone of very ele-

all; for nothing will cut it but itself. Other Gems and Stones are either work'd with Diamond-powder, or with that of Emery, one of the hardest Substances in Nature, except the Diamond; and afterwards with Tripoly, and other softer Powders.

<sup>t</sup> The Magnet Gem, or *Μαγνήτις λίθος* of the antient *Greeks*, I have before observed, was a Stone of an entirely different Nature from the Loadstone, which we now call the Magnet. The Stone here meant, was a very bright white



ὄψει περιττὸν ἔχουσα· καὶ, ὡς γε δὴ τινες  
θαυμάζουσι, τὴν ὁμοίωσιν τῷ ἀργύρῳ μη-  
δαμῶς ἔσαν συγγενῆ.

οδ'. Πλείεις δ' εἰσὶν οἱ δεχόμενοι πά-  
σας τὰς ἐργασίας. ἐπεὶ καὶ ἐν Σίφνῳ  
τοιγᾶτός τις ἐστὶν ὄρυκτός. ὅς τρία σάδια  
ἀπὸ θαλάττης, στρογγύλος καὶ βολώδης, καὶ  
τορνεύεται, καὶ γλύφεται διὰ τὸ μαλακόν.

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Substance, so nearly resembling Silver in Ap-  
pearance, that it was scarce, at first Sight, to  
be distinguished from it: It was found in large  
Masses, and was of a Texture easily to be  
wrought into any Shape or Figure. This  
made it in great Esteem among the Antients,  
and in constant Use, turned into Vessels of  
different Kinds. What Stone it was, is at  
present not to be certainly determined, farther  
than that it was of the Ollaris Kind; pro-  
bably it may be now lost; at least among the  
Nations we have Commerce with.

What I have before observed of the Antients  
calling this silvery Stone the Magnet, and our  
Loadstone the *Heraclius Lapis*, is confirmed,  
in very plain Words, by *Hesychius*, Μαγνητις



gant Appearance, and much admired by many: This carries a fine Resemblance of Silver, though it is in Reality a Stone of an entirely different Kind.

LXXIV. Many also there are, which admit all Kinds of working; as in *Siphnius* there is a fossile Substance of this Kind, which is dug in Lumps, and roundish Masses, at about three Furlongs Distance from the Sea: This may at first be either engraved on, or worked by the Turner into any Form, by reason of

λίθος, αὐτὴ πλανᾷ τὴν ὄψιν ἀργύρῳ ἐμφερῆς ἔσα, ἢ δὲ Ἡρακλεῶτις τὸν σίδηρον ἐπισπᾷται.

*v* This Stone was afterwards called *Lapis Siphnius*, from the Place where our Author observes it was found, which was an Island in the *Ægean Sea*, called by some *Merope*. What the Antients in general have left us about it beside, is, that it was of Strength to bear the Fire. And Vessels made of it, served, as those of Earthen-ware, for the common Offices of Boiling, &c. *Pliny* sums up their Accounts of it in these Words: *In Siphno Lapis est qui cavatur, tornaturque in vasa coquendis cibis utilia, vel ad esculentorum usus: and a little afterwards, Sed in Siphnio singulare quod, excofactus, oleo nigrescit durescitque, natura mollissi-*



ὅταν δὲ πυρωθῆ (ἢ ἀποβαφῆ) τῷ ἐλαίῳ,  
μέλας τε σφόδρα γίνεται, καὶ σκλη-  
ρός. ποιῶσι δ' ἐξ αὐτῆ σκεύη τὰ ἐπι-  
τράπεζα.

οέ. Οἱ μὲν τοιῶτοι πάντες ὑποδέχον-  
ται τὴν τῆ σιδήρου δύναμιν. ἔνιοι δὲ λίθοις  
ἄλλοις γλύφονται, σιδήρου δ' ἔδυναται.  
καθάπερ εἶπομεν. οἱ δὲ σιδήροις μὲν ἀμ-  
βλέσι δὲ ἢ εἰσιν, ὡς<sup>w</sup> παραπλησίως δὲ  
κατὰ τὸ μὴ τέμνεσθαι σιδήρῳ.

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*mus.* I have, among the Ollares, one of the  
coarse grey and black Kind; the *Pierre Ollaire*  
*a gros Graines* of *Bomare*; which becomes of a  
perfect black after it has been two or three  
Times in the Fire. Perhaps this is the very  
Stone which *Pliny* speaks of here. I had mine  
from *Minorca*.

<sup>w</sup> The Marbles, Alabasters, and most other  
Stone of *Strata*, are of the Number of those  
which we cut with blunt Iron Instruments.  
But if we consider our Manner of performing  
this, which probably is the same that was  
used in this Author's Time, and is not with-



its Softness; but when it is afterwards burnt and wetted with Oil, it becomes black and solid. Vessels of different Kinds, for the Service of the Table, are made of this. "

LXXV. All Substances of this Kind are to be worked on by Iron Instruments; but others there are, which, as before observed, will not be touched by them, but must be cut by other Stones; and others yet, which may be cut with Iron, but the Instruments must be dull and blunt<sup>w</sup>: Which is much as if they were not cut by Iron.

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out the Assistance of Water and Sand, we shall find, that these are not properly to be divided from the Class of those usually cut with other Stones; for, in reality, the Sand in this Case does more than the Iron, and is a similar Substance to the Powder of hard Stones used to Gems; tho' coarser. The Art of cutting and polishing the harder Gems with other Stones was known very early in the World: We have Accounts from some of the earliest Authors, of Fragments of Diamonds being set in a convenient Manner for handling, and made into Tools for the working on other Gems. Dia-



ος'. Καί τοι ἢ σφραεώτερα ἢ ἰσχυρό-  
 τερα τέμνει ἢ σίδηρος, λίθου σκληρότερος  
 ὢν.

ος'. Ἐτοπον δὲ κακείνω φαίνεται  
 διότι ἢ μὲν ἀκόνη κατεδίει τὸν σίδηρον.  
 ὁ δὲ σίδηρος ταύτην μὲν δύναται διαίρειν

mond-powder is the 'great Thing in Use with us on these Occasions, and next to it Emery; and Emery was also known to the Antients, and used by them on the same Occasions. Σμίρις λίθος ἐστὶν ἢ τὰς ψήφους οἱ δακτυλιογλίφοι σμήχουσι. Dioscorides. Σμίρις ἄμμος εἶδος, ἢ σμήχονται σκληροὶ τῶν λίθων. Hesychius.

*Cardanus* imagines, but erroneously, that the Porus of the Antients was our Emery; or else, that our Emery was unknown to them; which is no less an Error: For it is evident, they were well acquainted with its Uses. And as to what he adds, of their working on Gems with the Porus, and Fragments of the *Lapis Obsidianus*, *Salmasius*, who had certainly read more than most Men, affirms, he never could find any Account of it among them. *Pliny*



LXXVI. Iron, however, being harder in its Texture than Stone, will cut such as are both harder and more solid than these.

LXXVII. There seems, however, yet an Absurdity in this, since the Whetstone has Power upon, and takes off a Part of the Iron Instruments which are sharpened on it, and the Instrument may be made to cut and work upon the Whetstone; but notwithstanding,

relates, indeed, that Fragments of the harder Kind of the *Ostracites* were used for this Purpose; *lib. 37. c. 10. Ostracia seu Ostracites est testacea durior: altera Achatae similis nisi quod Achates politura pinguescit; duriori tanta inest vis ut alicæ gemmæ scalpantur fragmentis ejus.* And that a Sand prepared from the Porus, was used for polishing Marble, but not Gems; *Crassior enim harena laxioribus segmentis terit, & plus erodit marmoris, majusque opus scabritie polituræ relinquit. Rursus Thebeicia polituris accommodatur, & quæ fit e poro lapide aut e pumice.* For *poro lapide*, many of the Copies have *toro lapide*, and *duro lapide*; but the concurrent Accounts of other of the Antients determine it to be this particular Stone that is meant. And the same Author expressly says,



ἢ ῥυθμίζειν, ἐξ ἧς δ' αἱ σφραγίδες, ἔ. ἢ  
 πάλιν, ὁ λίθος, ᾧ γλύφουσι τὰς σφραγι-  
 δας, ἐκ τέττα ἐσὶν ἐξ ἑπερ αἱ ἀκόνας, ἢ  
 ἐξ ὁμοίᾳ τέττω. ἄγεται δ' ἢ ἐξ Ἀρμενίας<sup>x</sup>.  
 οἴ. Θαυμασὴ δὲ φύσις καὶ τῆς βα-

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that the *Obsidianus* could not cut the true  
 Gems, *Obsidianæ fragmenta veras gemmas non  
 scarifant.*

<sup>x</sup> The *Armenian Whetstones*, *Coticulæ* of the  
*Latins*, and Ἀκόνας of the *Greeks*, were of a  
 Stone of extreme Hardness; and, as we may  
 learn from this Passage, of the same Nature  
 with that, which they used for the working  
 some of those Stones which Iron could not  
 touch.

This Stone used for working on others they  
 first had from *Cyprus*; and some of the an-  
 tient *Greeks* called it *Adamas*, from its extreme  
 Hardness; as they also did sometimes Iron, for  
 the same Reason. This Manner of Writing  
 has much misled their Copiers; and even *Pliny*,  
 who, after having in one Place given the right  
 Account of this Stone, and called it *Cos*, in  
 another mistakes it for a Diamond, and calls  
 it such. This was the Effect of his copying  
 from various Authors in different Parts of his



will not cut those Gems which are work'd into Seals; tho' the Stone with which they are worked is composed of the same Kind of Matter with the Whetstone, or something not very unlike it. These Stones are from *Armenia*\*.

LXXVIII. The Nature of the Stone

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Work; and not seeing, in many Places, that they were describing only the same Substance under two different Names. This *Cyprian* Stone was long in Esteem, and served not only for polishing, but boring Holes through such Gems as they strung on Threads, to wear for Bracelets, and other the like Ornaments. But After-ages found out the *Armenian*, which proving much harder than it, became more generally used, and at length entirely banished the other. That this *Armenian* was of the same Kind with their *Ἀκόνας*, is evident from this Passage of *Theophrastus*; and that it had the Properties of the *Cyprian*, and was used as it, is plain from *Stephanus's* Account of it, παρέχονται δὲ λίθου τὴν γλύφουσαν καὶ τρυπῶσαν τὰς σφραγίδας. *Pliny's* Account of other Gems being bored by *Cyprian* Diamonds, means no more, than that they were wrought by a Stone of the Nature of the *Ἀκόνη*, brought from *Cyprus*.



σανιζέσης τὸν ὕ χρυσόν. δοκεῖ γὰρ δὲ  
 τὴν τοιαύτην ἔχειν τῷ πυρὶ δύναμιν, καὶ  
 γὰρ ἐκείνο δοκιμάζει. διὸ καὶ ἀπορῶσι τι-  
 νες, ἐκ ἄγαν οἰκείως ἀπορῶντες. εἰ γὰρ  
 τὸν αὐτὸν τρόπον δοκιμάζει. ἄλλα τὸ  
 μὲν πῦρ τῷ τὰ χρώματα μεταβάλλει,  
 καὶ ἀξιῶν. ὁ δὲ λίθος, τῇ παρατρέψει.  
 δύνασθαι γὰρ, ὡς ἔοικεν, ἐκλαμβάνειν τὴν  
 ἑκάστη φύσιν.

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ὕ The Stone here described is the *Lapis Lydius* of the Author, commonly called the Touch-stone, from its Office of trying Metals by the Touch. The excellent *Salmasius*, generally so happy in understanding the Antients, and to whom I am obliged, in the Course of this Work, much oftener than to any other Author, is yet guilty of a Mistake in regard to this Stone; and erroneously accuses *Pliny* of a great Error, in a Thing in which that Author, however often faulty, is perfectly right. Mistakes in the Works of Men of such Emi-



which tries <sup>y</sup> Gold, is also very wonderful, as it seems to have the same Power with Fire ; which is also a Test of that Metal. Some People have, for this Reason, questioned the Truth of this Power in the Stone ; but their Doubts are ill founded, for this Trial is not of the same Nature, or made in the same Manner with the other. The Trial by Fire is by the Colour, and Quantity lost by it ; but that by the Stone, is made only by rubbing the Metal on it ; the Stone seeming to have a Power of receiving separately the distinct Particles of different Metals.

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nence as this excellent Critic, ought, above all Things, to be set right ; as they otherwise pass with the Generality of Readers as certain and unquestionable Truths. And this, in particular, being in the Name of a Stone, ought to be cleared rather than any other ; as Errors about Names are what alone have given more than half the Confusion we have, in regard to the Works of the Antients. *Pliny* has said of this Stone, *Auri argentique mentionem comitatur lapis, quem coticulam appellant, quondam non solitus inveniri nisi in flumine Imolo, ut auctor est*



οθ'. Εὐρῆσθαι δέ φασιν νῦν ἀμείνω  
πολυὲν τῆς πρότερον. ὥστε μὴ μόνον τὸν  
ἐκ τῆς καθάρσεως, ἀλλὰ καὶ τὸν χαλκὸν  
κατάχρυσον, καὶ ἄργυρον γνωρίζειν, καὶ  
πόσον εἰς τὸν σατῆρα μέμικται. σημεῖα  
δ' ἐστὶν αὐτοῖς ἀπὸ τῆς ἐλαχίστης. ἐλά-  
χιστον δὲ γίνεται κριθῆ, εἶτα κόλυβον.  
εἶτα τεταρτημόριον, ἢ ἡμιόβολος. ἐξ ὧν  
γνωρίζουσι τὸ καθῆκον.

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*Theophrastus: nunc vero passim, quem alii He-  
raclium, alii Lydium vocant. On which Sal-  
masius's Remark is this, Fallitur Plinius pec-  
catque non mediocriter. Lapis hic Lydius quo  
aurum & argentum probatur, nunquam dictus est  
Heraclius, sed ille alter Lydius qui ferrum rapit.*  
I am sorry to say it, but it is *fallitur Salmasius,*  
not *Plinius*; for we need look no farther than  
this Author to know, that *Heraclius* was as  
common a Name for the Touchstone among  
the Antients, as for the Loadstone: See p. 24,  
where he expressly says, that the Touchstone



LXXIX. It is said also, that there is a much better Kind of this Stone now found out, than that which was formerly used; insomuch, that it now serves not only for the Trial of the refined Gold, but also of Copper or Silver coloured with Gold; and shews how much of the adulterating Matter by Weight is mixed with Gold: This has Signs which it yields from the smallest Weight of the adulterating Matter, which is a Grain, from thence a Colybus, and thence a Quadrans or Semi-Obolus; by which it is easy to distinguish if, and in what Degree, that Metal is adulterated.

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was so called, *οἱ δὲ βασανίζουσι τὸν ἀργυρον ὡσπερ ἤτε καλεσμένη λίθος Ἡράκλεια καὶ ἡ Λυδῆ.* The Loadstone and Touchstone were therefore both called among the Antients, from their common Country, *Lapis Lydius*, and *Lapis Heraclius*. And for that Reason there have been great Errors in regard to them, in many of the less careful Writers since: As about the two Cyanus's, and, in short, all the Substances which they had thus confused, in not allowing them particular Names. It has since been called *Lapis Basanites*, from its Use in trying



π'. Εύρίσκονται δὲ τοιαῦται πᾶσαι ἐν τῷ ποταμῷ Ἐτμολῷ. λεία δ' ἡ φύσις αὐτῶν ἢ ψηφοειδῆς, πλατεῖα, ἔστρογγύλη. μέγεθος δὲ ὅσον διπλασία τῆς μεγίστης ψήφου. διαφέρει δ' αὐτῆς πρὸς τὴν δοκιμασίαν τὰ ἄνω πρὸς τὸν ἥλιον, ἢ τὰ κάτω. καὶ βέλτιον δοκιμάζει τὰ ἄνω. τῆτο δέον, ὅτι ξηρότερα τὰ ἄνω. κωλύει γὰρ ἡ ὑγρότης εἰς τὸ ἐκλαμβάνειν. ἐπειδὴ ἢ ἐν τοῖς καύμασι τὸ δοκιμάζειν χεῖρον.

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Metals; *Chrysites*, from its particular Efficacy in Trial of Gold; and *Coticula*, because it was generally formed, for Conveniency, into the Shape of a small Whetstone. We are not to suppose, however, that this Stone alone serves for that Purpose; in *Italy* a green Marble, called there *Verdello*, is now generally used in its stead; and in most other Places the *Ba-*



LXXX. All these Stones are found in the River <sup>2</sup> *Timolus*; their Texture is smooth, and like that of Pebbles; their Figure broad, not round; and their Bigness twice that of the common larger Sort of Pebbles. In their Use in the Trial of Metals, there is a Difference in Power between their upper Surface, which has lain toward the Sun, and their under, which has been to the Earth, the upper performing its Office the more nicely; and this is consonant to Reason, as the upper Part is the dryer; for the Humidity of the other Surface hinders its receiving so well the Particles of the Metals: For the same Reason also it does not perform its Office so well in hot Weather

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*saltes*, a black Marble, found in regularly shaped Columns, many placed together, as in *Ireland*, where a Quantity of it is called the Giants Causeway.

\* The true *Lydius* was originally found only in this River, afterwards in many other Places; and at present is very plentiful in many of the larger Rivers of *Germany*. This Author gives



ἀνίησι γάρ τινα νοτίδα ἐξ αὐτῆς. δι' ἣν ἀπολιθαίνει. συμβαίνει δὲ τῆτο καὶ ἄλλοις τῶν λίθων. καὶ ἐξ ὧν τὰ ἀγάλματα ποιεῖσιν. ὃ καὶ σημεῖον ὑπολαμβάνει ὡς ἴδιον τὸ τῆ ἔδρα.

πά. Αἱ μὲν ἔν τῶν λίθων διαφοραὶ, καὶ δυνάμεις σχεδὸν εἰσιν ἐν τέτοις.

πβ'. Αἱ δὲ τῆς γῆς ἐλάττονας μὲν, ἰδιώτεραι δέ.

πγ'. Τὸ μὲν <sup>α</sup> τήκεσθαι, καὶ ἀλλοιοῦσθαι,

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a very circumstantial Account of the Property of this Stone; and they had in his Time very good ones, and knew very well how to use them, if they could do what he says with them. The true *Lydius*, tho' perfectly black, is a real Kind of Serpentine. Its Structure is the very same with the common green and white Serpentine; and there is a green and black one, the black Parts of which are perfectly like it.



as in colder, for in the hot it emits a Kind of Humidity out of its Substance, which runs all over it: This hinders the metalline Particles from adhering perfectly, and makes Mistakes in the Trials. This Exfudation of a humid Matter is also common to many other Stones; among others, to those of which Statues are made; and this has been looked on as peculiar to the Statue.

LXXXI. These then, in general, are the Differences, and particular Qualities of Stones.

LXXXII. Those of Earths are fewer, indeed, but they are also more peculiar.

LXXXIII. <sup>a</sup> Earth is subject to be

<sup>a</sup> The Author now enters on an Account of the various Earths. The Differences of which are, indeed, very essential. It is to be observed, that he sets out in his usual Manner, justly, and philosophically. The two great Characteristics of Earths, are their easy Diffusibility in Water, and Concretion and Induration on being separated from it; and their being fusible by Fire. The first of these Qualities essentially distinguishes them from most



ἢ πάλιν ἀποσκληρύνεσθαι, ἢ ταύτη συμ-  
βαίνει· τήκεται μὲν γὰρ τοῖς χυτοῖς ἢ  
ὄρυκτοῖς, ὡσπερ ἢ ὁ λίθος. μαλάττεται  
δὲ, πλίνθους τε ποιῶσιν, ὧν τὰς τε ποι-  
κίλας, ἢ τὰς ἄλλας τὰς συντιθεμένας.  
ἀπάσας γὰρ πυρῶντες ἢ μαλάττοντες,  
ποιῶσιν.

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other Fossils: The other they have in com-  
mon with Stones; and, indeed, with almost  
all other fossile Bodies whatever. It was im-  
possible for our Author to have known this,  
unless he had had our Assistances. But we  
find by Experiments with powerful Burning-  
glasses, that in a manner all fossile Substances,  
as well as Earths, are fusible and vitrifiable.

Earths; determinately speaking, are opaque  
Bodies, diffusible by Water, and vitrifiable by  
extreme Heat; friable when dry, not inflam-  
mable, and generally insipid to the Taste:  
Not that these are certain, universal Characte-  
ristics, and liable to no Exceptions. What-  
ever may be the Case in the Vegetable and Ani-  
mal Kingdoms, it is the Misfortune in the  
Study of fossile Bodies, that such has been the  
Confusion and Intermixture of their constitu-  
ent Particles at the general Deluge, that there  
are none such to be established in them; for



liquated, altered from its original State and Consistence, and afterwards indurated again. It will melt, as Stones, with fusible and fossile Substances; and is softened, and made into Bricks: These are of various Kinds, and composed in various Manners, but are all made by moistening and burning.

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there are so many heterogene Particles, of a thousand different Kinds, mixed even with the same Fossil in different Places, that there is no determining to any Certainty, even its Manner of Variation from its pure State. What I have given may pass, however, for a general Character of what, in Treatises of Fossils, we mean by the Word *Earths*; which may be afterwards distinguished into *Clays*, *Ochres*, *Boles*, *Marles*, *Chalks*, and *Loams*. Sand, and the common vegetable Mould, which some give a Place in the Catalogues of *Earths*, have of right no Business among them; for the first is only either a smaller kind of Gravel, consisting of an infinite Number of small Pebbles of different Shapes and Colours; or the constituent Particles of the Stone of Strata or other Bodies accidentally loose: and the latter owes its present Mode of Existence, in a great measure, to putrified animal and vegetable Substances of a



πδ'. <sup>b</sup> Εἰ δὲ καὶ ὁ ὕδατος ἐκ τῆς ὑελίτι-

thousand Kinds; and is, distinctly speaking, no genuine Fossil.

In order to the rightly understanding what is meant by the calling any Substance by either of the other Names, it may not be improper briefly to give their several Distinctions, so far as the general Uncertainty of the Fossile Kingdom will permit.

1. *Clays* are Earths composed of very fine Parts, smooth, heavy, not easily mixing with Water; and when mixed, not readily subsiding in it; compact, viscid, and leaving a fatty Impression on the Tongue: soft while in the Stratum, and hardening by Fire into a kind of stony Texture.

2. *Ocbres* are ponderous earthy Substances, more fat than Chalk, and less so than Clay, readily diffusible in Water, and friable when dry, staining the Fingers in handling, and principally differing from the Boles, in that they are of a looser Texture.

3. *Boles* are ponderous earthy Substances, more fat than Chalk or Marle, but less so than Clay; ponderous, of an astringent Taste, melting in the Mouth, staining the Fingers; and generally partaking more or less of the Nature of Iron; as indeed, in some Degree, do most, if not all, the other Earths, but the Boles generally more than any.



LXXXIV. <sup>b</sup> But if Glass be made, as

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4. *Marles* are light friable Substances, of a middle Nature between Clay and Chalk, not so fatty as the former, nor so dense as the latter, easily diffusible in Water, and, when tasted, dry, insipid, and adhering to the Tongue.

5. *Chalks* are earthy Substances, dense, brittle, readily diffusible in Water, and quickly separating themselves from it by Subsidence, staining the Fingers in handling, and, in tasting, sticking to the Tongue.

6. And *Loams* are earthy Bodies, of a dense, rough Texture, consisting of clayey or ochreous Matter, with arenaceous Particles of various Figures, Sizes, and Colours, immersed in and intimately mixed with it.

Much more might be said on this Occasion, were this a proper Place for it; but a general and succinct Account of what is meant by the general Names of Clays, &c. may be sufficient for what is intended in this Place; which is only to give something of a determinate Idea of what is meant by the Words Chalk, Bole, &c. when there shall be Occasion hereafter to say any of the Bodies described by this Author is of the Nature of one or other of these Substances.

<sup>b</sup> All Earths are vitrifiable by extreme Degrees of Heat. Nothing is more certain, than that the Vitrification, or converting the Substances of which Glass is made, into that Form,



δος, ὡς τινές φασι, καὶ αὕτη πυρῶσει γίνε-  
 ται. ἰδιωτάτη δ' ἡ τῷ χάλικι μιγνυμένη.  
 πρὸς γὰρ τὸ τήκεσθαι καὶ μίγνυσθαι, καὶ  
 δύναμιν ἔχει περιττήν, ὥσε τὸ κάλλει  
 τῆς χροῆας ποιεῖν διαφορὰν.

is the Effect of the extreme Force of Fire ;  
 and that the best sort of Glafs is that in the ma-  
 king of which Flints have been used, is a  
 Truth as much known now, as it was in the  
 Days of *Theophrastus*.

The Things of which our Glafs is made, are,  
 Pot-ashes, some stony, arenaceous, or crystal-  
 line Matter, as Sand, Flints, or Crystal ; and  
 Manganese, a ferruginous Substance : To  
 which some add a small Quantity of pure Salt  
 of Tartar : These Ingredients are calcined into  
 what the Workmen call Fritt ; and after-  
 wards run, by Violence of Fire, into Glafs  
 of different Colours and Degrees of Purity, ac-  
 cording to the different Ingredients.

The Glafs of the Antients was, in the dif-  
 ferent Ages of the World, in different Degrees  
 of Purity and Excellence, according to the In-  
 gredients of which they made it ; which were



as some affirm, of the *Uelitis*, a vitrifiable Sand, it owes its Production to the extreme Force of Fire: The best is that, in the making of which Flints have also been used; for besides that they melt and mix with the running Mass, they have a peculiar Excellence in the making the Glass, insomuch that they give the Differences in the Clearness of the Colour.

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Sand, Natrum, and Flints. Sand was the first Ingredient ever used or thought of for the making Glass; and for many Ages, there was even no other Sand used among the *Greeks* than that found clean washed on the Banks and in the Beds of Rivers, and this, from its Use, might very probably acquire the Name of *Uelitis*, or Glass-sand.

In the beginning of this Sentence, the other Copies of this Author have *υελιδος*. I have ventured to follow *Salmasius* in his most rational Opinion, that it was in the Original *υελιτιδος*, and a little afterwards to give *χαλκι*, for what has hitherto stood *χαλκω*, according to *De Laet*; who very justly suspects, that Flints were much more likely to be made an Ingredient in Glass than Brass. And, indeed, when we consider the many Chasms and greater Er-



πέ. Περὶ δὲ Κιλικίαν, <sup>b</sup> ἐστὶ τις ἢ ἔψεται γῆ, ἣ γίνεται γλιχρά. ταύτη δ' ἀλείφουσι τὰς ἀμπέλους ἀντὶ ἰξῶ πρὸς τὴν ἴπας.

πς'. Εἴη δ' ἂν <sup>c</sup> λαμβάνειν ἣ ταύτας τὰς διαφορὰς ὅσαι πρὸς τὴν ἀπολίθωσιν

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rors in the Copies of this Author, we cannot wonder that such as these have been passed over, which were only Errors in a Letter or two.

<sup>b</sup> The *Cilician* Earth, used as a Preserver of Vines from Insects, was of the Class of the harder Bitumens, which the Heat of boiling Water would just bring to a proper Consistence for spreading over the Trunks of those Shrubs; and partly by entangling and smothering Insects that were climbing up, and partly by driving them away by its Smell, it preserved the Buds from being destroyed.

<sup>c</sup> The various Accounts we have of petrifying Earths and Waters, are all idle, erroneous, and imaginary, according to the ingenious and excellent Dr. *Woodward*; who affirms, that



LXXXV. There is in *Cilicia* a kind of Earth, which by boiling becomes tough and viscous; with which they cover the Vines instead of Birdlime, to preserve them from the Worms.

LXXXVI. It may also be proper to mention here the Earths which are naturally endued with a Quality of petrifying Substances immersed in them; since those which yield peculiar and different Juices, have unquestionably some fixed and peculiar Properties, and

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even what has been reported so confidently of the petrifying Water of the Lake *Neagh* in *Ireland*, one of the most famous petrifying Springs on record, has been shewn, by a more accurate Enquiry and Trials, not to be true; but that the petrified Wood brought thence, has been all of it lodged in the Earth at the Bottom of that Lake at the Time of the Deluge. If this be the Case here, it is, in all Probability, in other Places too; and what gives it the better Face of Probability is, that petrified Wood is as often found in the loose Strata of Gravel, &c. and lodged in Earth or Stone, as in the Beds of these Waters. Some may imagine, from having seen the Effects of the dropping Well at *Knareborough, Rushbank,*



εὐφυεῖς· ἐπεὶ αἶγε, τὰς τέτων ποιῆσαι χυ-  
μὸς διαφορῶς, ἀλλήλων τιν' ἔχεισαι φύσιν·  
ὥσπερ καὶ αἱ τὰς τῶν φυτῶν<sup>d</sup>.

πζ'. Ἀλλὰ μᾶλλον ἂν τις τὰς τοῖς  
χρῶμασι διαριθμήσειε, οἷσπερ καὶ οἱ γρα-  
φεῖς χρῶνται.

πή. Καὶ γὰρ ἡ γένεσις τέτων, ὥσπερ  
ἐξ ἀρχῆς εἶπομεν, ἦτοι συρρόης τινος, ἢ  
διηθήσεως γενομένης.

πθ'. Καὶ ἐνιάγε δὴ φαίνεται πεπυ-

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and several other Springs in *Northamptonshire*,  
*Cbedworth*, and *Norleach* Springs in *Gloucester-*  
*shire*, and many other petrifying Springs, as  
they are called, in *England*, and elsewhere, that  
this is denying Things for which they have the  
Evidence of their Senses : But such Persons are  
to be taught, that what they esteem Petrifa-  
ctions, are no other than Incrustations of sparry,  
argillaceous, and other Matter, brought away  
with these Waters in their Passage through the  
Strata, and settling from them again. There  
is great Difference between changing the Sub-  
stance, and only covering the Surface of a  
Body. These Petrifications, as they are called,



are distinct Kinds; as are also those which supply Nourishment to Plants <sup>d</sup>.

LXXXVII. Nor ought those to be less considered which are singular and remarkable in their Colours, and for that Reason used by Painters.

LXXXVIII. The Production of these, as was observed in the Beginning of this Treatise, is from the mere Afflux or Percolation of their constituent Particles.

LXXXIX. Some of these seem burnt,

being no other than Precipitations of Matter too heavy to be longer sustained in the Water; and which, being very fine, adapts itself to every Prominence and Cavity of the Body it settles upon, and exactly assumes its Shape. The first Process in these Operations of Nature forms only an extremely thin Crust over the Body; on which there after settle at Times many more, often to a Covering of considerable Thickness in the whole, but always giving evident Proofs of the Manner in which it was successively formed, by the Number of thin Strata of which it is composed.

<sup>d</sup> Vegetable Mould, I have before observed, is no genuine Fossil.



ρωμένα, ἢ οἶον κατακεκαυμένα, οἶον ἢ ἢ<sup>ο</sup>  
 Σανδαράκη ἢ τὸ Ἀρρηνικόν, ἢ τὰ ἄλλα  
 τὰ τοιαῦτα. πάντα δ', ὡς ἀπλῶς εἶπεν,  
 ἀπὸ τῆς ἀναθυμιάσεως, ταῦτα τῆς Ξηραῖς  
 ἢ καπνώδους. εὐρίσκεται δὴ πάντα ἐν τοῖς  
 μετάλλοις τοῖς ἀργυρείοις τε ἢ χρυσείοις<sup>ο</sup>  
 ἔνια δὲ ἢ ἐν τοῖς χαλκωρυχείοις.

ζ. Οἶον<sup>ο</sup> Ἀρρηνικόν, Σανδαράκη, Χρυ-

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° Orpiment and Sandarach have been spoken of in general already; they are found in different Degrees of Purity and Beauty: In some Places, instead of the fine foliaceous Flakes, or shining Glebes, in which they are dug in Mines, they are taken up impure, ill-coloured, and in form of a coarse Powder; the yellow looking more like dirty Fragments of common Brimstone, and the red like dusty Pieces of a bad Bole, than like what they really are. These are, however, purchased by our Painters for Cheapness; and they say, with proper Management, make as good Colours as the finer Pieces; though, in their Barrels, they look more like Ashes than the beautiful Substances they really are. These come from some Part of Germany. And if the Orpiments and San-



and to have suffered Changes by means of Fire, as <sup>e</sup> Sandarach, Orpiment, and others of that Kind; all of them, however, plainly speaking, owe their present Form to the Exhalation of their more humid Parts; and these, in particular, seem to have been dried, and, as it were, smoaked. They are found in Mines of Gold and Silver, and some in those of Copper also.

XC. Of this kind are <sup>f</sup> Orpiment,

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darachs which happened to come in *Theophrastus's* way, were of this Kind, there is nothing strange in his supposing them to have been acted upon by subterranean Fires. We know at present seven distinct Kinds; a plated and spangled yellow; a spangled red; a solid red: and a yellow, a green, and a white of these coarser kinds. All the yellow are red when burnt: but those here named are red naturally.

<sup>f</sup> The Ochre here meant is the common yellow Kind. A Confirmation that the ἀρρενικόν of the Antients was Orpiment, and not a white Arsenick, as some have erroneously judged, is this Passage of this Author, where he says, It is, when powdered, of the Colour of the yellow Ochre.

The Yellow Ochre of many Parts of this



σοκόλλα, § Μίλτος, Ὠχρα, Κύανος,  
 ἐλάχισος δὲ ἔτος, ἢ κατ' ἐλάχισα. τῶν

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Kingdom is excellent for the Use of Painters ; and some of it finer than any in the World : It is found of two Kinds ; the one in great Plenty, constituting, in many Places, whole Strata of very considerable Thickness. This is the most common, but is coarse, and often mixed with arenaceous and other heterogene Matter in different Quantities. The other Kind is found in the perpendicular Fissures of Strata. This is not common, nor to be had in any great Plenty, but is ever of a glorious Colour, and perfectly pure, and crumbles between the Fingers into an impalpable Powder. All the Matter which composes it must have been extremely fine and subtle, or it never could have got into those Places ; into which there was no way for it, but through the Pores of the solid Strata. I know not whether our Painters are acquainted with this Kind, but it must, as *Woodward* has observed, be highly preferable to the common ones for their Use, because of its Fineness ; and it might be had in some Quantity on searching the proper Places : I remember to have seen much of it in different Parts about *Mendip Hills* in *Somersetshire*, from whence I brought the Specimens in my Possession.

§ Reddle, or Red Ochre, is as common and



Sandarach, Chryfocolla, <sup>s</sup> Reddle, Ochre, and the *Lapis Armenus*; but this last

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as good in *England* as the Yellow : it is, like that, generally found itself forming Strata, but sometimes of a glorious Colour and extreme Fineness, in Fiffures of other Matter. I have a Specimen of some from the Forest of *Dean* in *Gloucestershire*, very little inferior to the Sort brought from the Island of *Ormuz* in the *Perfian* Gulph; and so much valued and used by our Painters under the Name of *Indian Red*. It is, indeed, so like, both in Colour and Quality, that it is used for it, as the People employed in taking it up informed me; and sent to *London* to be sold under its Name. On comparing it with some of the true *Perfian* kind, which I had from the *East Indies*, I find it of a paler Colour, but of a much finer Texture; and therefore, upon the whole, perhaps not less valuable.

Misunderstandings of *Pliny*, occasioned by Mistakes in the Copies, have been the Occasion of some very unlucky Errors about the  $\mu\acute{\iota}\lambda\tau\omicron\varsigma$  of the *Greeks*; which has been concluded, from what he has been supposed to have said, to be Cinnabar, which they called also *Minium*. The Passage which has given Occasion to these Mistakes stands in most Copies thus, *Milton vocant Græci Minium, quidam Cinnabari*; which seems an absolute Affirmation of this; but is, in



δ' ἄλλων μὲν εἰσι ῥάβδοι, τὴν δ' Ὀχρεαν  
 ἀθρόαν πῶς φασιν εἶναι. Μίλτον δὲ παν-  
 τοδαπὴν, ὡς εἰς τὰ ἀνδρείκελα χρῆσθαι  
 τὰς γραφεῖς. ἢ Ὀχρεα ἀντ' Ἀρρένικῃ,  
 διὰ τὸ μηδὲν τῇ χροῇ διαφέρειν, δοκεῖν δε.

ζά. Ἀλλὰ Μίλτε τε ἢ Ὀχρεας εἰσὶν  
 ἐνιαχθῆ μέταλλα. ἢ κατὰ ταῦτα, καθά-  
 περ ἐν Καππαδοκίᾳ, ἢ ὀρύττεται πολλή.  
 χαλεπὸν δὲ τοῖς μετάλλοις φασὶν εἶναι τὸ

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reality, no other than a double Error; in the  
 Words, and in the Pointing: And what *Pliny*  
 meant to have said is evidently no other than  
 this, *Rubricam Milton Græci vocant, & Mini-  
 um Cinnabari.* The *Greeks* call Reddle *Miltos*,  
 and *Minium Cinnabar*, which is exactly the  
 Truth. And the Passage, as thus restored by  
*Salmasius*, stands accordingly, *Jam enim Tro-  
 janis temporibus rubrica in honore erat, qui naves  
 ea commendat, alias circa picturas, pigmentaque  
 rarus. Milton vocant Græci, miniumque Cin-*



is scarce, and found only in small Quantities ; whereas there are sometimes whole Veins of the others. Ochre is said to be found generally heaped together ; and Reddle scattered, as it were, every way. Painters use this Reddle in their Pictures, as also Ochre, instead of Orpiment ; for when powdered they scarce at all differ in Colour, however different they appear in the Mass.

XCI. There are also in some Places peculiar Pits of Reddle and Ochre, as in *Cappadocia*, from whence they are taken in vast Quantities : But in these Pits, it is said, the Labourers are in Dan-

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*nabari*. Homer, speaking of the *Grecian* Ships, has Νῆας μιλοπαρήγες, and it is impossible he should mean by it, that they were stained with the *Minium*, or Cinnabar, which was not known till after his Time, as we shall see by this Author's Account of it. Cinnabar was originally the *Indian* Name of the Gum we now call *Sanguis Draconis* ; and was given to this other Substance (called also *Minium*,) from its Resemblance to that Drug in Colour.



πνίγεσθαι. ταχὺ γὰρ καὶ ἐν ὀλίγῳ τῷτο  
 ποιεῖν.

ζβ'. Βελτίστη δὲ δοκεῖ μίλτος ἡ Κεία  
 εἶναι. (γίνονται γὰρ πλείους.) ἡ μὲν ἔν ἐκ  
 τῶν μετάλλων, ἐπειδὴ καὶ τὰ σιδήρια ἔχει<sup>h</sup>  
 μίλτον.

ζγ'. Ἀλλὰ καὶ ἡ<sup>i</sup> Λημνία, καὶ ἡν κα-

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<sup>h</sup> Reddle always contains in it more or less of Iron; and there is one kind of it called Smitt in *England*, which is sometimes so rich, as to be worth working for that Metal, and has the Name of an Iron Ore. What this Author observes, of its being better in the Reddle Pits than in Iron Mines, is contrary to what we find now in *England*. The Reddle I just before have mentioned, as sometimes sold in *London* under the Name of *Indian Red*, is much the finest I have ever seen; and that was not from a Reddle Pit, but from among the Iron Ore in the Forest of *Dean*. I have seen the Pits peculiarly worked for this Substance in *Derbyshire* and *Staffordshire*, and have of the Reddle from them, which is good, but much inferior to that of the Forest of *Dean* in all Respects: And, indeed, Reason informs us



ger of Suffocation ; which unhappy Accident sometimes comes on very suddenly.

XCII. The best Reddle, for there are many Kinds, is thought to be that of *Cea*, and particularly that which is taken from the Reddle Pits ; for it is also sometimes found in <sup>h</sup> Iron Mines.

XCIII. There are beside these also, the <sup>i</sup> *Lemnian* Reddle, and the *Sinopic*,

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that it always naturally must be so ; for it must, as I before observed, necessarily be finer in the Fissures of Strata, than where it constitutes Strata itself. And as all Reddle owes its Colour, which is its Value, to Iron, it will naturally have most of it, when nearest the largest Quantities of that Metal : I can therefore see no Reason for that of the Pits being esteemed the best by the Antients, unless they valued it for its Texture and Consistence : Then, indeed, that must be preferred, as it is the most compact and dense ; the other being ever looser and more crumbly.

<sup>i</sup> There were among the Antients two Earths of *Lemnos* well known and in common Use, though to different Purposes : These Distinctions have been since lost, and that Loss has caused us a great deal of Confusion. These two



λᾶσιν Σινοπικὴν· αὕτη δ' ἐστὶν ἡ Καππα-  
 δοκική. κατάγεται δ' εἰς Σινώπην. ἐν δὲ  
 τῇ Λήμνῳ μεταλλεύεται καθ' αὐτήν.

were distinguished by the Names of *Terra Lemniā*, and *Rubrica Lemnia*, Γῆ Λήμνια and Μίλτος Λήμνια, the *Lemnian Reddle*, and *Lemnian Earth*: The first of these was used by Painters, as it was taken out of the Pit; the second was first made into Cakes, and sealed with great Ceremonies; and was in very high Esteem in Medicine. I shall be the more particular on these Earths, as it will naturally lead to a better Understanding of some other of the Earths now much in use in Medicine; the Names of which at least are so. The great Occasion of the Errors about the *Lemnian Earths*, is the Mistake of *Pliny*, in confounding them together, as he evidently has done; not distinguishing the medicinal sealed Earth of that Place, from the Reddle used by Painters. The sealed Earth was esteemed sacred, and the Priests alone were suffered to meddle with it. They mixed it with Goat's Blood, made the Impression of a Seal upon it; and it was, therefore, called σφραγίς, and *Sphragis* by the *Latins*; ἡ δὲ Λημνία λεγομένη γῆ ἐστὶν ἐκ τινὸς ὑπονόμου ἀνθρώπου ἀναφερομένη καὶ μιγνυμένη αἵματι ἀιγείου, ἣν οἱ ἐκεῖ



as it is commonly called ; but it is dug in *Cappadocia*, and thence carried to *Sinope*. There are particular Pits in *Lemnos*, in which nothing but the Earth is dug.

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ἄνθρωποι ἀναπλάσσοντες, καὶ σφαγιζόμενοι εἰκόνι αἰγός, σφαγίδα καλεῖσιν, *Dioscorides*. This, therefore, was the Sealed Earth of *Lemnos*, the Earth used in Medicine, and called by the Physicians *Lemnian Earth*: The Hand the Priests had in the making it up, got it the Name of Sacred Earth, Γῆ ἱερά. And this seems to be the very same with the true *Terra Lemnia* used at this time ; which is a fat unctuous Clay, of a pale red Colour, made up in Cakes of about half an Ounce Weight, sometimes less, and brought from *Lemnos*, and many other Parts of the *Turkish* Dominions : This we now call *Terra Lemnia Rubra*, by way of Distinction from a white Earth, less unctuous and more astringent than the red, which is dug in *Lemnos* only. And we have sometimes, beside these, an unsealed Earth from the same Place, which is yellowish, with blackish Specks : it has this Advantage of the other, that we are sure it is genuine ; for we are sensible they are too often counterfeited.

These were the *Terræ Lemniæ* used in Medicine. The *Rubrica Lemnia* was a kind of



ζδ. Ἐσι δὲ αὐτῆς γένη τρία<sup>κ</sup>. ἡ μὲν  
 ἐρυθρὰ σφόδρα, ἡ δὲ ἔκλευκος, ἡ δὲ μέση.  
 ταύτην αὐτάρκη καλεῖμεν, διὰ τὸ μὴ μίγ-  
 νυσθαι. τὰς δὲ ἑτέρας μιγνύουσι.

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Reddle of a firm Consistence and deep red Co-  
 lour, dug in the same Place, but never made  
 into any Form, or sealed; but purchased in the  
 rough Glebes by Artificers of many kinds, who  
 had Uses for it in Colouring. That *Pliny* con-  
 founds these two Substances is to be seen in  
 this Passage: *Rubricæ genus in ea voluere maxi-  
 mè intelligi. Quidam secundæ auctoritatis, pal-  
 mam enim Lemniæ dabant. Minio proxima hæc  
 est, multum antiquis celebrata, cum insula in qua  
 nascitur, nec nisi signata venundabatur: unde &  
 Sphragidem appellavere*: Where it is evident,  
 that he thought the *Lemnian* Reddle was the  
 Substance sealed and called *Sphragis*, or Sealed  
 Earth. But that they were not the same, and  
 the Earth, and not the Reddle was the Sub-  
 stance which was sealed, is evident from *Galen*,  
 l. i. de Antidotis, Καθάπερ ἐπὶ Λεμνίας γῆς καὶ  
 μίλτε, καλεῖν δ' αὐτὴν ἀμεινον ἢ μίλτον, ἀλλὰ γῆν.  
 ἐστὶ γὰρ τις Λεμνία μίλτος, ἐν τῇ Λήμνῳ, γεννομένη  
 πρὸς ἄλλας χρείας ἐπιτήδειος, ἢ μὴν εἰς ἄς ἢ καλε-  
 μένη Λημνία σφραγίς.



XCIV. There are three kinds of the <sup>k</sup> *Sinopic*; of a deep Red, another of a whitish Colour, and the other of a middle Colour between the other two, which is called the pure simple Kind, because it is used without mixing, whereas they mix the others.

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<sup>k</sup> The *Sinopic* Earth, which we know at present, is the first Kind mentioned by this Author; the other two we are wholly unacquainted with, though among the Antients they were much in Esteem with Painters. Our *Rubrica Sinopica* is a dense, heavy, firm Substance, of a deep red Colour, staining the Fingers in handling, and of a styptic astringent Taste. *Tournefort* imagines it a native *Crocus Martis*; and certain it is, that it owes its Colour, at least, to that Metal.

It is dug at this Time, as it was in that of *Theophrastus*, in *Cappadocia*, and carried to *Sinope* for Sale, from whence it has its Name, and from whence *Sinopis* became afterwards a general Name for the Red Ochres. *Μίλτος εἶδος ἐρυθρὸν Σινώπιδος*, *Hesychius*; and so many others. If the present Esteem for this Substance was greater than it is, as indeed I can on Experience affirm it ought to be, it might be had, I believe, in many other Places beside *Cappadocia*. I have some of it perfectly fine,



44. Γίνεται δὲ ἐκ τῆς Ὠχρας κατα-  
 καιομένης. ἄλλη χείρων· τὸ δὲ εὔρημα  
 Κυδίε. συνεῖδε γὰρ ἐκεῖνος, ὡς φασι, κα-  
 τακαυθέντος τινὸς πανδοχείε, τὴν Ὠ-  
 χραν ἰδὼν ἠμίκαυσον ἢ πεφοινιγμένην.

45. Τιθέασι δ' εἰς τὰς καμίνεσ χύτρασ  
 κενὰσ περιπλάσαντεσ πηλῶ. Ὀπτῶσι  
 γὰρ διάπυροι γινόμεναι. Ὅσῳ δ' ἂν μᾶλ-  
 λον πυρωθῶσι, τοσέτω μᾶλλον μελαν-  
 τέραν, ἢ ἀνθρακωδεσέραν ποιῆσι, μαρ-  
 τυρεῖ δ' ἂν ἡ γένεσισ αὐτό. δόξειε γὰρ τὸ  
 ὑπὸ πυρὸσ ἅπαντα ταῦτα μεταβάλλειν·

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which was dug in the *New Jerseys* in *America*,  
 where it is frequently found at about 15 or 20  
 Feet deep, and is called, (I suppose from its  
 Colour and staining the Hands) Blood-stone.



XCV. There is also a kind of this made of Ochre, by burning, but it is not nearly so good as the others. The making this was an Invention of *Cydias*, who took the Hint of it, as is said, from observing, in a House which was on fire, that some Ochre which was there, when half burnt, assumed a red Colour.

XCVI. The way of making the factitious is this: They put the Ochre into new earthen Vessels, which they cover with Clay and set in Furnaces; and these, as they grow hot, heat also the Ochre, and the greater Degree of Fire they give, the deeper and more strongly purple the Matter becomes. The Origin of the native Kinds seems to testify that this Method is not irrational, for all these seem to have suffered Changes by the Action of Fire:

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It was originally used, not only in Painting, but in Medicine; and though now neglected, and not known in the Shops, deserves to be brought into Use again, being a much better



εἶπερ ὁμοίαν ἢ παραπλησίαν δεῖ τὴν ἐν-  
ταῦθα τῇ φυσικῇ κομίζεσθαι<sup>1</sup>.

ζζ'. Ἐστὶ δ' ὡσπερ καὶ Μίλτος, ἢ μὲν  
αὐτόματος, ἢ δὲ τεκνική<sup>11</sup>.

ζη'. Καὶ Κυανὸς, ὁ μὲν αὐτοφυής· ὁ δὲ  
σκευαστός, ὡσπερ ἐν Αἰγύπτῳ· γένη γὰρ

Astringent, as I have found by repeated Trials of that from *America*, than any of the Earths now in use.

<sup>1</sup> The making a Red Ochre from the Yellow by burning is as well known, and as much practised among the People who deal in Colours for Painting now, as it was in the Time of this Author. I cannot but observe, however, that his calling this a *Sinopsis*, is a Proof of what I have before observed, that that Word became a Name for all the Substances of the Red Ochre kind. As to what this Author observes, of the native Red Ochres owing their Colour to Fire, it is very certain, that most of them shew no Marks of ever having been acted on by that Element. And we know very well, that the ferrugineous Particles which can make the Matter red in burning, can also impart that Colour to it without the Assistance of Fire.



From whence we may rationally conclude, that this way of making the factitious, is either of the same kind, or at least very analogous to that used by Nature for the Production of the genuine<sup>1</sup>.

XCVII. The Reddle also is of two Kinds, the native, and the factitious<sup>11</sup>.

XCVIII. There is also, beside the native *Lapis Armenus*, a factitious Kind made in *Egypt*. There are, indeed,

Notwithstanding which, it must be allowed, that there are some of these red Substances; and not only these, but some other Bodies, particularly some of the Hæmatites kind, which seem, even in their native Beds, to carry evident Marks of their having been wrought on and changed by Fire; though it is not easy to say, how or when it should have happened.

<sup>11</sup> The factitious *Sinopsis* just mentioned, was no other than a factitious Reddle, properly speaking; and what the Author here mentions, was probably another Kind, made from some other Species of Yellow Ochre, and called Reddle, from its being of a pale red, and resembling that of the common native Red Ochre; just as the other was called factitious *Sinopsis*, from its being of a deeper Colour, and resembling the genuine *Sinopsis* of *Cappadocia*.



Κυανῆ τρεῖς· ἢ Αἰγύπτιος, ἢ Σκύθης, ἢ  
 τρίτος ὁ Κύπριος <sup>m</sup>. βέλτιος δ' ὁ Αἰγύ-  
 πτιος εἰς τὰ ἄκρατα λειώματα. ὁ δὲ Σκύ-  
 θης, εἰς τὰ ὑδαρέςερα. Σκευασὸς δ' ὁ Αἰγύ-  
 πτιος. ἢ οἱ γράφοντες τὰ περὶ τῆς βα-  
 σιλῆϊς, ἢ τῆτο γράφουσι, τίς πρῶτος βα-  
 σιλεὺς ἐποίησε τεχνητὸν Κυανὸν, μιμη-  
 σάμενος τὸν αὐτοφυῆ.

Ἡ'. Δωρὰ τε πέμπεσθαι παρ' ἄλ-  
 λων τε ἢ ἐκ Φοινίκης· φόρον Κυανῆ, τῆ  
 μὲν ἀπύρα, τῆ δὲ πεπυρωμένα.

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<sup>m</sup> I have, in another Place, observed the Confusion which has arisen from *Pliny's* confounding the Cyanus Gem with the Cyanus Paint, or *Lapis Armenus*. We have a great Instance of that Error in his Translation of this Passage of our Author; of which he has given the Sense, but has rendered the Whole perfectly unintelligible, by saying all this of the Cyanus Gem, which it is most evident *Theophrastus* says of the *Lapis Armenus*, or Cyanus Paint. There can be no question but that this



three different Sorts of this ; the *Egyptian*, the *Scythian*, and the *Cyprian*<sup>m</sup> ; of which the *Egyptian* is the best for clear strong Paintings, and the *Scythian* for the fainter. The *Egyptian* is factitious ; and the Historians, who write the Annals of the Kings of that Nation, think it a thing worthy a Place in their Histories, which King of *Egypt* was the Inventor of the artificial *Cæruleum* in Imitation of the native.

XCIX. Presents are also made to great Persons, in some Places, of this Substance, as well that which has passed the Fire as that which has not ; and the *Phœnicians* pay their Tribute in it.

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Author is here treating of that Substance, the Cyanus Paint, or *Lapis Armenus*, and not the *Lapis Lazuli* ; as he has done with the Gems long since ; and is now treating of the Earths, and particularly those used in Painting : and his Description of the Use of it makes this so notoriously plain, that it is astonishing *Pliny* could mistake him : The Passage in *Pliny* is (speaking of the Cyanus Gem) *Optima Scythica, dein Cypria, postremo Ægyptia. Adulteratur maximè tincturâ, idque in gloria regis Æ-*



ε'.<sup>mm</sup> Φασὶ δ' οἱ τὰ φάρμακα τριβόν-  
τες, τὸν μὲν Κυανὸν ἐξ ἑαυτῆ̄ ποιεῖν  
χρῶματα τέτταρα. τὸ μὲν πρῶτον, ἐκ τῶν  
λεπτοτάτων λευκότατον. τὸ δὲ δεύτερον,  
ἐκ τῶν παχυτάτων μελάντατον.

εἰ. Ταῦτά τε δὴ τέχνη γίνεται, ἢ  
ἔτι τὸ ψιμύδιον<sup>n</sup>. τίθεται γὰρ μόλιβ-

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*gyptii ascribitur, qui primus eam tinxit; dividi-  
tur autem & hæc in mares fœminasque, inest ei  
aliquando & aureus pulvis, &c.*

<sup>mm</sup> The Colours, of different Degrees of Deep-  
ness, which were prepared from this Substance,  
were separated by means of Water: The Me-  
thod of preparing them was, bybeating the Mat-  
ter to Powder, and putting that in a large Quan-  
tity of Water, and saving, in different Vessels,  
that which subsided at different Times: the hea-  
vier Part, consisting of larger Particles, sinking  
almost immediately, and the lighter, which  
consisted of much smaller and finer, not till  
after a considerable Time. These different  
Quantities of Colour, that had subsided at the  
various Times, were then separately ground to  
a proper Fineness, and kept as different Paints  
for Use. And this is the Meaning of the λεπ-  
τοτάτων and παχυτάτων of our Author, and *Craf-  
siozem tenuioremve* of Pliny: Which some, who



C. <sup>mm</sup> People who prepare Colours say also, that the *Lapis Armenus* of itself makes four different ones; the two extremes of which are, first, that which consists only of its finest Particles, and is very pale; and the other, that which consists of its largest, and is extremely deep.

CI. But these are the Works of Art, as is also Ceruse<sup>n</sup>, to make which, Lead

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imagined they were talking of the Degree of Colour, and not of the Fineness and Coarseness of the Particles of the Matter, could not bring themselves to understand. Indeed, in many of the Passages complained of as unintelligible in the Antients, the Obscurity has been more owing to the wrong Apprehension of the Commentators, than the Perplexity of the Authors.

<sup>n</sup> We have three or four different Methods of making Ceruse now used among us; but all are of the same Kind with this of *Theophrastus*, and are the Effect of Vinegar on Lead. It is by some made by infusing Filings of Lead in strong Vinegar; which in twelve or fourteen Days will almost entirely dissolve them, and leave a very good Ceruse at the Bottom of the Vessel. Others make it, by plunging thin Plates of the same Metal into Vinegar, and placing them in a gentle Heat; these



δος ὑπὲρ ὄξους ἐν πίθοις. ὅταν δὲ λάβῃ  
 πάχος ἡλικὸν πλῆθος, (λαμβάνει δὲ μά-  
 λιστα ἐν ἡμέραις δέκα) τότε ἀνοίγῃσιν·  
 εἴτ' ἀποξύσῃν ὥσπερ εὐρῶτά τινα ἀπ'  
 αὐτῆ, ἢ πάλιν (τιθέασι) ἢ πάλιν εἰως  
 ἂν καλαναλώσῃσι. τὸ δ' ἀποξυόμενον, ἐν  
 τρικλῆρι τρίβῃσι, ἢ ἐφθῆσιν αἰεί. τὸ δὲ  
 ἔοχαλον ὑφιστάμενόν ἐστι τὸ ψιμύθιον.

εβ'. Παραπλησίως δὲ ἢ ὁ ἰὸς γίνεται.  
 Χαλκὸς γὰρ ἐρυθρὸς, ὑπὲρ τρυγὸς τίθε-  
 ται, ἢ ἀποξύνεται τὸ ἐπιγιγνόμενον. ἔτω  
 ἐπιφαίνεται τιθέμενος<sup>n</sup>.

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Plates will be, in about ten Days or less, cover-  
 ed with a white Rust, which is to be scraped  
 off, and the Plates plunged into the Vinegar  
 again; and so scraped at Times till they are  
 wholly eaten in Pieces: All the different  
 Scrapings are afterwards ground to Powder to-  
 gether and kept for Use. Others make it, by



is placed in earthen Vessels over sharp Vinegar, and after it has acquired some Thickness of a kind of Rust, which it commonly does in about ten Days, they open the Vessels, and scrape it off, as it were, in a kind of Foulness; they then place the Lead over the Vinegar again, repeating over and over the same Method of scraping it, till it is wholly dissolved; what has been scraped off they then beat to Powder, and boil for a long Time; and what at last subsides to the Bottom of the Vessel is the Ceruse.

CII. In a Manner also, something resembling this, is Verdigrise made; for Copper is placed over the Lees of Wine, and the Rust which it acquires by this means is taken off for Use: And it is by this means that the Rust which appears is produced <sup>n</sup>.

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putting Vinegar into an earthen Vessel, then covering it closely with a Plate of Lead, and setting it in the Sun in hot Weather: this Plate will, in about ten Days, be dissolved and precipitated in form of Ceruse to the Bottom of the Vessel.

<sup>n</sup> Our Manner of making Verdigrise is as

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ργ. Γίνεται δὲ ἢ Κιννάβαρι· τὸ μὲν  
 αὐτοφυές, τὸ δὲ, κατ' ἐργασίαν °. αὐτο-  
 φυές μὲν, τὸ περὶ Ἰβηρίαν, σκληρὸν σφό-  
 δρα ἢ λιθῶδες· ἢ τὸ ἐν Κόλχοις. τῆτο  
 δὲ φασιν εἶναι κρημνῶν. ἐνκαταβάλλουσι  
 τοξεύου]ες. τὸ δὲ κατ' ἐργασίαν ὑπὲρ

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like this of the Antients, as that of our making  
 Ceruse; and it is very evident, that both the  
 one and the other have been handed down from  
 very early Ages to us. The Manner in which  
 we make it is this: The Pressings of Grapes,  
 when taken from the Press, are spread on  
 Hurdles, and laid in the Sun to dry; after  
 they have lain in this Manner two or three  
 Days, and are pretty well dried, they are made  
 into a Paste with Wine; and left to ferment;  
 afterwards, while in a State of Fermentation,  
 they are rolled into Balls, and again laid in  
 Wine till thoroughly wetted with it; and then  
 are placed in proper Vessels at a little Distance  
 over the Wine, and shut up together in this  
 Manner for near a Fortnight. After this they  
 smell very strong and pungent, and are in a  
 Condition to extract the Rust from Copper.  
 They are then beaten together into a Paste, and  
 laid, *Stratum super Stratum*, with thin Plates



CHH. There are also two kinds of Cinnabar, the one native, the other factitious °; the native, which is found in *Spain*, is hard and stony; as is also that brought from *Colchis*, which they say is produced there in Rocks and on Precipices, from which they get it down with Darts and Arrows. The factitious

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of Copper, on wooden Bars in the same Vessels; and in a Week or ten Days the Verdigrise is formed. The Plates are then taken out, and wrapt in linen Cloths dipped in Wine, and laid for three Weeks in a Cellar. After which the Verdigrise is scraped off for Use.

° The Antients, we find, had what they called the native and factitious Cinnabar as well as we: their native Cinnabar was the same with ours, but the factitious widely different. Theirs was no other than a Preparation of a fine shining arenaceous Substance, which was the *Sil Atticum Romanorum*, injudiciously confounded by *Vitruvius* with the *Ochra Attica* of the Antients; whereas ours is a Substance formed, by the Art of Chemistry, of Quicksilver and Sulphur, into a dense heavy Mass, of a bright red, marked with shining silvery Streaks.

The native Cinnabar of the Antients and of the Moderns are, however, the same; and



Εφέσθ μικρὸν ἐξ ἑνὸς τόπου. μόνον δ' ἐστὶν  
 ἄμμος, ἣν συλλέγουσι λαμπυρίζουσαν,  
 καθάπερ ὁ κόκκος· ταύτην δὲ τρίψαντες  
 ὅλως ἐν ἀγγείοις λιθίνοις λειοτάτην πλύνου-  
 νουσιν ἐν χαλκοῖς, μικρὸν ἐν κάλοις. τὸ δ'  
 ὑφιστάμενον πάλιν λαβόντες, πλύνουσιν ἢ  
 τρίβουσιν. ἐν ᾧπερ ἐστὶ τὸ τῆς τέχνης. οἱ

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theirs, as well as ours, was a dense heavy mineral Substance, of a shining red Colour; from which Quicksilver was extracted. This Substance was also called *Minium*. In After-times, becoming subject to Adulterations with Lead Ore calcined to a Redness, after the two Names had long been used in common, the Word *Minium* became at last appropriated to the calcined Lead Ore only; and the Cinnabar was used only to signify what we now understand by it, the Substance from which Quicksilver was to be extracted.

The Word Cinnabar *κιννάβαρι*, however, among the old Writers in Medicine, frequently is used to signify a Thing of a very different Kind, a vegetable Juice, called by us Dragons-blood; and long idly believed to be really the



is from the Country a little above *Ephesus*; it is but in small Quantities, and is had only from one Place. It is only a Sand, shining like Scarlet, which they collect, and rub to a very fine Powder, in Vessels of Stone only; and afterwards wash in other Vessels of Brass, or sometimes of Wood: What subsides they go to work on again, rubbing it and washing it as before. And in this Work there is much Art to be used; for from

Blood of Dragons. This generally was, however, called *Κιννάβαρι Ἰνδικόν*, from its Country, to distinguish it from the other, or mineral Cinnabar, *γίνεται δὲ ἐν αὐτῇ καὶ Κιννάβαρι τὸ λεγόμενον, Ἰνδικόν ἀπ' τῶν δένδρων ὡς δάκρυ συναγόμενον, Dioscorides.*

This Cinnabar they therefore knew as a perfectly distinct Substance, though called by the same Name. And the mineral native Cinnabar, the Thing here spoken of, was, we find, a hard stony Substance: Ours is a compact weighty Body, found sometimes pure, and sometimes incorporated with different other Substances, or containing other Substances incorporated with it.

The pure Cinnabar is generally of a bright red, sometimes deeper, sometimes paler, but



μὲν γὰρ ἐκ τῆς ἴσης πολὺ περιποιῶσιν. οἱ  
 δὲ, ὀλίγον, ἢ ἔθεν· ἀλλὰ πλύσματι ἐπά-  
 νω χρῶνται, ἐν πρὸς ἐν ἀλείφουτες. γί-  
 νεται δὲ τὸ μὲν ὑψάμενον κάτω Κιννάβαρι·  
 τὸ δ' ἐπάνω ἢ πλείον, πλύσμα.

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commonly sparkling or glossy; some is found of a deeper and duskier Colour in the Mass, but becomes of a fine Red when rubbed to Powder: And some of it resembles the Hæmatites of certain Kinds.

When incorporated with other Substances, it is chiefly found in Spar, or in arenaceous or sparry Stones; sometimes, but much more rarely, in clayey Earth; and sometimes in a talky Matter, greyish, or bluish, or whitish.

It frequently holds incorporated with it, beside Quicksilver, Gold, Silver, sparry and marcasitical Bodies, and sometimes Lead.

It is found in *Hungary, Bohemia, Saxony, Spain, France, Italy,* and the *East-Indies*; but no where in greater Plenty than about *Rosenburg* in *Hungary*; where it lies chiefly in a whitish sparry Stone on the Sides of the Hills;



an equal Quantity of the Sand some will make a large Quantity of the Powder, and others very little, or none at all. The Washing they use is very light and superficial, and they wet it every time separately and carefully. That which at last subsides is the Cinnabar, and that which swims above in much larger Quantity is only the superfluous Matter of the Washing.

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and is gathered by the poor People, after it has been cleared and uncovered by Rains. The purer native Cinnabar has been used to be much esteemed both by the Painters and in Medicine; but our factitious kind equalling it in Beauty, and being much cheaper, has banished it from among the Painters. And it were to be wished the Case were the same in Medicine, for the Dose may be much better ascertained in the factitious, than the native; which we can never be sure of as to its exact Degree of Purity, and which may also contain other mineral Substances, which we have no Intent of giving, mixed and incorporated with it. That of *Hungary*, however, is what always ought to be kept for internal Use (if it be to be so used) as it is commonly more pure than that of any other Place.



ρδ'. Καλαδεΐσαι δέ φασι ἢ εὐρεῖν τὴν ἐργασίαν, Καλλίαν τινὰ Ἀθηναῖον ἐκ τῶν ἀργυρείων. ὃς οἰόμενος ἔχειν τὸν ἄμμον χρυσίου, διὰ τὸ λαμπυρίζειν, ἐπραγματεύετο ἢ συνέλεγεν. ἐπεὶ δὲ ἤθελο ὅτι ἐκ ἔχει, τὸ δὲ τῆς ἄμμου κάλλος ἐθαύμαζε διὰ τὴν χροάν, ἕτως ἐπὶ τὴν ἐργασίαν ἦλθε ταύτην. ἔπαλαιον δ' ἐστίν· ἄλλα περὶ ἔτη μάλισ' ἐνενήκοντα εἰς ἄρχοντα Πραξιβυλον Ἀθήνησι.

ρε'. Φανερόν δ' ἐκ τούτων, ὅτι μιμῆται τὴν φύσιν ἢ τέχνη, τὰ δὲ ἴδια ποιεῖ. ἢ τούτων τὰ μὲν χρήσεως χάριν, τὰ δὲ μόνον φαντασίας, ὡς περ τὰς ἀλιπέεις. ἔνια δ' ἴσως ἀμφοῖν. ὡς περ χυτὸν ἀργυρον <sup>ρ</sup>.

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<sup>ρ</sup> We have now many Ways of extracting the Quicksilver from Cinnabar, but all by the Af-



CIV. It is said, that one *Callias*, an *Athenian*, who belonged to the Silver Mines, invented and taught the making this artificial Cinnabar. He had carefully got together a great Quantity of this Sand, imagining, from its shining Appearance, that it contained Gold: But when he had found that it did not, and had had an Opportunity, in his Trials, of admiring the Beauty of its Colour, he invented and brought into use this Preparation of it. And this is no old Thing, the Invention being only of about ninety Years Date; *Praxibulus* being at this Time in the Government of *Athens*.

CV. From these Accounts it is manifest, that Art imitates Nature, and sometimes produces very peculiar Things; some of which are for Use, others for Amusement only, as those employed in the ornamenting Edifices; and others, both for Amusement and Use. Such is the Production of Quicksilver<sup>p</sup>, which

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sistence of Fire. Where the Mineral is rich, the common Way is by a kind of Destillation



ἔσι γάρ τις χρεία ἢ τέτρα. ποιεῖται δ'  
 ὅταν τὶ (Κιννάβαρι) τριφθῆ μετ' ὄξεος ἐν  
 ἀγγείῳ χαλκῷ, ἢ δοίδοκι χαλκῷ. Τὰ  
 μὲν ἐν τοιαῦτα τάχ' ἂν τις λάβοι πλείω.  
 ρς'. Τῶν δὲ μεταλλευτῶν τὰ ἐν τοῖς

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*per descensum*, in this Manner: After beating it to Powder, it is put into narrow-neck'd earthen Vessels, which are stopped with Bundles of Moss crammed pretty hard into them: These are then turned Bottom upwards, and their Necks, thus stopped, are let into the Mouths of other Vessels of a like Shape, which are buried in the Ground. After the Joinings are very firmly luted, a Fire is made about the Place; and when the Vessels grow hot, the Quicksilver gets loose, and draining through the Moss which stops the Mouth of the upper Vessel, in which it is, falls perfectly fine and pure into the lower. This is a common Way at the richer Mines. At others, the Cinnabar is put into Retorts, and set in proper Furnaces; and the Quicksilver is raised by the Heat in Fumes, and falls into the Receiver; which is filled three Parts with cold Water, to make it condense again the more readily. But there is a Cinnabar which contains so much Sulphur, that the Quicksilver it holds can never be got loose, without the Addition of something to



has its Uses : This is obtained from native Cinnabar, rubbed with Vinegar in a brass Mortar with a brass Pestle. And many other Things of this kind others, perhaps, may hit upon.

CVI. There yet remain also of the

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absorb the Sulphur. This Kind is generally distilled by the Retort, with Quicklime, Filings of Iron, Wood-ashes, Salt of Tartar, Pot-ashes, or something of that kind. And from the Residuum of these Distillations, a pure and genuine *Lac Sulphuris* may be prepared, by the common Way of boiling and precipitating with distilled Vinegar. Our factitious Cinnabar, made only by subliming Mercury and Sulphur together, exactly resembles the native of some kinds in all its Qualities ; and yields its Quick-silver pure and fluid again by the same Means.

But beside all these Ways of procuring Quick-silver from the Cinnabars, it is sometimes found pure, unmixed, and fluid in the Bowels of the Earth. And this Kind *Dioscorides* distinguishes by the Name of *ὕδραργυρος καθ' ἑαυτόν*. This is cleared from its Earth by washing in common Water ; and from some other heterogene Matters, by Salt and Vinegar, and then is strained through Leather, and called Virgin Quicksilver.

It is a Mineral of a perfectly singular kind,



γεωφανέσιν ἔτι λοιπά· περὶ ὧν ἡ<sup>9</sup> γέ-  
νεσις, ὡσπερ ἐλέχθη, κατ' ἀρχὰς ἐκ  
συρροῆς τινος ἢ ἐκκρίσεως γίνεται, κα-  
θαρωτέρας ἢ ὁμαλωτέρας τῶν ἄλλων.

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and when pure and unmixed, keeps constantly its fluid Form. It may be amalgamed with all other metallic Substances, but is most difficultly made to mix with Antimony, Iron, and Copper. It penetrates the Substance of all Metals, and dissolves, and makes them brittle. It is the heaviest of the Metals except Gold, which is to it as 4 to 3, or thereabout; and therefore will not swim in it, as all other Metals do. It is, however, notwithstanding its Weight, extremely volatile, and easily raised in Form of a very subtle Vapour; and in that Form is dissipated entirely by means of Fire.

Quicksilver, from its ill Effects on the Miners and People employed about large Quantities of it, was long esteemed a Poison among the Antients. *Dioscorides* reckons it a Thing which must have very pernicious Effects in Medicine; and *Galen* believed it highly corrosive. It first got into Use externally among the *Arabians*; and afterwards, but not till long afterwards,



fossile Kingdom certain remarkable Earths dug out of Pits, the Formation<sup>a</sup> of which, as was observed in the beginning of this Treatise (owing either to the mere Afflux or Percolation of their constituent Parts) is from a more pure and equal Matter than the other more common Kinds. And these re-

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was introduced into the Number of internal Medicines, from the repeated Observations of its Safety and good Effects when given to Cattle, and from the hardy Attempts of some unhappy People, who had ventured to take it down in large Quantities (in order to procure Abortion) but without any Effect.

<sup>a</sup> The various Operations of Nature, in the Formation of these and other fossile Substances, have been treated of at large in the Beginning of this Work; the greatest of all Distinctions among them, is that of such as are found in the perpendicular Fissures, and such as are deposited in Strata. The Difference between these Kinds, in their Degree of Purity and Fineness, is extremely great, and must necessarily be so, from their different Manner of Formation; as those of the perpendicular Fissures have been formed by Percolation, at different Times; and those of Strata, by mere Subsidence from among the Waters of the general Deluge.



χρώματα δὲ παντοῖα λαμβάνουσιν ἢ διὰ τὴν τῶν ὑποκειμένων<sup>†</sup> τε ἢ διὰ τὴν τῶν ποιόντων διαφορὰν. ἔξ ὧν τὰς μελανῶντες, τὰς δὲ τήκοντες ἢ τρίβοντες, συνλιθέασι τὰς λίθους τὰς ἐκ τῆς Ἀσίας εἰς ταύτας ἀγομένας.

ρζ'. Αἱ δὲ αὐτοφυεῖς, ἢ ἄμμα τῷ περιτῶ τὸ χηρσίμον ἔχουσαι, σχεδὸν τρεῖς εἰσιν, ἢ τέτταρες· ἢ τε<sup>†</sup> Μηλιας, ἢ

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<sup>†</sup> The high-colour'd Earths used by Painters, and in Medicine, owe their several Colours, in a great Measure, to the same Cause as the Gems, &c. do theirs; a Mixture of metalline Matter of various Kinds, which stains them, as it does those, with the Colour it naturally yields, in the particular kind of Solution its Particles have met with. Thus Copper, dissolved in a proper Alkali, makes, with a proper gemmeous Matter, a blue Sapphire; and with Earth, the *Lapis Armenus*, a Substance before described. And the same Particles dissolved in a proper Acid, give to gemmeous Matter the Colour which makes it an Emerald; and to Earth, that which makes it the *Terre verte*, an Earth used by our Painters, of a dusky greenish Colour, and dense, unctuous,



ceive their various Colours from the Differences as well of their Properties of acting on other Bodies<sup>r</sup>, as of their being subject to be acted on by them. Some of these they soften, and others melt, and afterwards reduce to Powder; and from these compose the stony Masses which we receive from *Asia*.

CVII. But the native, which have their Use as well as Excellence, are only three or four; the <sup>r</sup> *Melian*, the

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clayey Constitution; generally brought from *Italy*, but to be met with entirely as good here at Home: And Iron, which gives that glorious Red to the Ruby, the Garnet, and the Amethyst, with Earth, makes the red Boles, Ochres, and Clays.

<sup>r</sup> The *Melian* Earth of the Antients was a fine white Marle, of a loose crumbling Texture, and easily diffusible in Water or other Liquors. Some have imagined it to have been of other Colours; but that it was really white, we have the unquestionable Authority of the Antients: *Pliny* not only describes it to be so, in his general Account of it, but afterwards confirms it in another Chapter, where he says it was the White of the great Painters of Antiquity: *Lib. 35. c. 6.* speaking of it among



the other Earths, he says, *Melinum candidum et ipsum, est optimum in Melo insula.* And lib. 35. c. 7. speaking of the Painters of Antiquity, he says, *Quatuor coloribus solis, immortalia illa opera fecere, ex albis Melino, ex Silaciis Attico, ex rubris Sinopide Pontica, ex nigris Atramento.* I mention these two Passages, as the best Way of judging certainly from *Pliny*; for he often errs, and, where he has Occasion to mention the same Substance a second Time, frequently contradicts what he had before said of it. This is to be observed in too many Places in that Author, and has arisen from this; that he was a general Collector, and often carelessly put down what different Authors had said of the same Substance, either under the same, or under different Names, in different Places of his Work: Where two such Authors had been both uncertain as to the Truth, and probably the World in general also, they frequently made different Conjectures; and where one had erred, the other frequently corrected him. The Accounts of both, therefore, given by a third Person in their own Words, in different Parts of that Author's History, and that without mentioning them as the Opinions of different Persons, has been the Occasion of great Part of the Contradictions in that Writer. But where he has mentioned the same Thing in different Places, and that with the same Description, I always judge he may be depended on; and that the general Opinion of the World was on his Side.



With this Account of the *Melian* Earth, as white, it is very surprizing that the generality of Authors, and even those of the first Class, have constantly imagined it to be yellow. The Occasion of the Mistake has been, that the *Melinus Color* of the *Latins*, *Μήλινον χρώμα* of the *Greeks*, is yellow. This, they took it for granted, had its Origin from the Colour of the *Melian* Earth, a Substance antiently used in Painting, and which therefore they concluded must be yellow, and described it accordingly. In this manner have numberless other Errors crept into Natural History by Accident, and by Mistakes, and been afterwards sacredly propagated by a servile Set of Writers, who have never dared to think for themselves, but have taken upon trust whatever they have found in their Ancestors Works, however contrary to Reason, and, in many Cases, even to the Testimony of their Senses. The Occasion of this so general Error, in the present Case, is no more than the mistaking the Etymology of the Word *Μήλινος*, *Melinus*, which is not derived from *Μηλιάς*, or *Μηλία γῆ*, the *Melian* Earth here described, but from *μήλις*, *pomum*, an Apple; and exactly meant that kind of Yellow common on ripe Apples of many Sorts; and the strict Sense of the Verb *μηλίζειν*, is, according to the most correct Lexicographers, *Colore luteo esse, sive pomum referente*: These are their very Words. And hence, from an Error in a Subject foreign to the Matter, has happened, we see, an egregious Error in that Study, and which has been



ἢ ἡ Κιμωλία, ἢ ἡ Σαμία, ἢ ἡ Τυμ-  
φαϊκὴ τελέρη παρὰ ταύτας, ἢ Γύψος.

ρή. Χρῶνται δὲ οἱ γραφεῖς τῇ Μηλιάδι  
μόνον, τῇ ὕ Σαμίᾳ δ' ἔ, καίπερ ἕση κα-

propagated on from Author to Author, for want of consulting even a good Lexicon.

‘ The *Cimolian* Earth had (like the other Kinds) its Name from the Place where it was originally dug, the Island *Cimolus*. Many Authors have ranked this among the Clays, and *Tournefort* makes it a Chalk, but it appears to me to have been neither of these, but properly and distinctly a Marle; an Earth of a middle Nature, between both: It was white, dense, of a loose Texture, and generally impure, having Sand or small Pebbles among it, insipid to the Taste, but soft and unctuous to the Touch. Many have imagined our Fullers-earth to be the *Cimolia* of the Antients, but erroneously: The Substance which comes nearest it of all the now known Fossils, is the *Steatites* of the Soap Rock of *Cornwall*; which is the common Matter of a great Part of the Cliff near the *Lizard* Point. The Antients used their *Cimolia* for cleaning their Cloaths: And partly from the similar Use of our Fullers-earth, and partly from an erroneous Opinion of that's being the same with the *Cimolia* of the Antients, it has obtained the same Name. We,



<sup>z</sup> *Cimolian*, the *Samian*, and the *Tymphaican*, called *Gypsum*.

CVIII. Of these the Painters use only the *Melian*; they meddle not with the *Samian*, though it is very beauti-

indeed, know at present two different Substances under this Denomination, with the different Epithets of *alba* and *purpurascens*; a much more apposite one than the last of which might easily have been used. By the *Cimolia Alba*, we mean the Earth used for making Tobacco-pipes; and by the *Cimolia Purpurascens*, the common Fullers-earth, of such constant and important Use in the cleaning our woollen Cloths.

<sup>v</sup> The *Samian* Earth is a dense, ponderous, unctuous Clay, of a subastringent Taste, and either white, or ash-coloured; it is used principally in Medicine, and it has the same Virtues with the *Terra Lemnia*, and others of this Class. It is dug in the Island of *Samos*, from whence it has its Name, and never was found in any other Place that we know of. *Pliny*, indeed, says that it was also dug in the Island of *Melos*, but not used by the Painters because of its Fatness. He errs, however, in this, which is apparently only a careless Translation of the Passage before us. And it may be observed, from a thousand Instances of this kind, how necessary it was to bring the genuine Work of this Author on the Subject to a more



λῆ, διὰ τὸ λίπος ἔχειν καὶ πυκνότητα καὶ  
 λειότητα. τὸ γὰρ ἀραιὸν ἡμερον, καὶ τρα-  
 χῶδες καὶ ἀλιπές, ἐπὶ τῆς γραφῆς ἀρμόττει  
 μᾶλλον. ὅπερ ἡ Μηλιάς ἔχει ἐν τῷ Φά-  
 ριδι. εἰσὶ καὶ ἐν τῇ Μήλῳ, καὶ ἐν τῇ Σάμῳ  
 διαφοραὶ τῆς γῆς πλείους.

εθ'. Ὀξύτηλον μὲν εἶν ἐκ ἔστιν ὀρθὸν  
 εἶσαι <sup>w</sup> ἐν τοῖς ἐν Σάμῳ, ἀλλ' ἀναγκαῖον

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frequent and easy Use, to avoid the being misled by *Pliny* and others, who have misrepresented so many Things from him; and given those Misrepresentations and Errors, as Accounts from their own Knowledge: The Passage in *Pliny* is, *Melinum candidum et ipsum est optimum in Melo insula; in Samo nascitur, sed eo non utuntur Pictores propter pinguitudinem.* It is most evident, that this is taken from the Passage now before us in *Theophrastus*; but *Pliny* deviates from his Original into a very great Error: *Theophrastus* does not say, that the *Melian* Earth was dug in *Samos*, and was not used by the Painters; but that the *Samian* Earth, another Substance which he had just before mentioned, and was going to say something more about, was not used by them; and adds, that in both these Places there were



ful, because it is fat, dense, and unctuous; whereas such as are of a looser Texture, crumbling, dry, and without Fatness, are fitter for their Use; all which Properties the *Melian*, particularly that of *Pharis*, possesses. There are, however, beside these, in *Melos* and *Samos* both, many various kinds of Earths.

CIX. The Diggers in the Pits of *Samos* cannot stand upright <sup>w</sup> at their

many Kinds of Earth, but not that the Kind named from either, was found in the other.

<sup>w</sup> Our Author's Account of this Earth, and the Manner of digging it, has been generally copied by those who have described it since. *Pliny* says, *accubantes effodiunt ibi inter saxa venas scrutantes*. And in another Place, *Samiae duæ sunt, quæ Syropicon (or Collyrion) et quæ Aster appellantur*. And other of the old Authors much to the same Effect.

I have before observed, that this Earth was either white or ash-coloured; these two Colours constituted the Difference between the two Kinds, and were what were called the *Aster* and *Collyrion*: The white was the *Aster*, supposed by many to be a Talc, and so called, for its shining; and the ash-coloured was call-



ἢ ὕψιον, ἢ πλάγιον. ἡ δὲ φλέψ ἐπὶ  
πολὺ διαλείνει· τὸ μὲν ὕψος ἡλικὴ δίπυς,  
τὸ δὲ βάθος πολλῶ μείζων· ἐφ' ἐκάτερα  
δ' αὐτὴν λίθοι περιέχουσιν ἐξ ὧν ἐξαι-  
ρεῖται. διαφυὴν ἔχει διὰ μέσθ, καὶ ἡ  
διαφυὴ βελτίων ἔστι τῶν ἔξω. καὶ πάλιν  
ἑτέραν αὐτῆς καὶ ἑτέραν ἄχρι τετρα-  
γων ἔστιν, ἔχουσα. ἡ ἐσχάτη καλεῖται  
Ἄσηρ.

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ed, from its Colour, *Collyrion*, Κολλύριον. Κολλύρα among the *Greeks* signified a kind of Loaf baked in Ashes, and usually brought to the Colour of the Ashes in the doing: And from a Resemblance to this was this Earth called *Collyrion*, or the ash-coloured *Samian* Earth.

*Pliny* imagined it had the Name from its being a common Ingredient in certain Medicines for the Eyes, commonly called *Collyria*; but *Dioscorides*, from whom he took the Occasion of this Conjecture, does not attribute this Quality to the *Samian* Earth of either kind, but to the *Lapis Samius*, a Stone found



Work, but are forced to lie along, either on their Backs or on one Side ; for the Vein of the Earth they dig runs length-way, and is only of the Depth of about two Foot, though much more in Breadth, and is inclosed in on every Side with Stones, from between which it is taken. There is also in the Mass of the Vein a distinct Stratum near the Middle, which is of better Earth than that without it ; and within that there is sometimes another yet finer ; and even beyond that a fourth : The farthest of these is that which is called the *Aster*.

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among it. And from this Error alone it is, that so many have imagined that the *Samian* Earth was used in Medicines for the Eyes. Indeed, when an Error in regard to the Antients is once set on foot, there is no knowing what a Series of different Mistakes may be the Consequences of it. These Medicines for the Eyes, called *Collyria*, though they did not give the Name to the ash-coloured *Samian* Earth so called, may serve, however, to confirm the Opinion of its having obtained it on occasion of its Colour resembling that of Ashes ; since they had theirs from the same Cause, and were



ρί. Χρῶνται δὲ τῇ γῆ πρὸς τὰ ἰμά-  
τια, μάλισα Κιμωλία. Χρῶνται δὲ τῇ  
Τυμφαϊκῇ πρὸς τὰ ἰμάτια, ἢ καλεῖσι<sup>w</sup>  
Γύψον, οἱ περὶ Τυμφαίαν ἢ τὰς τόπους  
ἐκεῖνας.

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only called *Collyria*, that is ash-coloured Me-  
dicines, from their being made of Substances  
of the Tutty kind, and resembling Ashes in  
Colour.

<sup>w</sup> The Antients had many kinds of *Gypsum*,  
very different from one another, and used for  
different Purposes: but the principal were  
three; 1. the *Terra Tymphaica Gypsum incolis*  
*dicta*, ἢ Τυμφαϊκῇ ἢ οἱ περὶ Τυμφαίαν καὶ τὰς  
τόπους ἐκεῖνας καλεῖσι Γύψον, the *Tymphaican*  
Earth, called by the Inhabitants *Gypsum*; 2. the  
real genuine *Gypsum*, which was made, by  
burning, from a certain talcy Substance; and  
3. that made by burning many different Spe-  
cies of Stones of the Alabaster and other simi-  
lar kinds.

The *Tymphaican* here mentioned appears to  
have been an Earth approaching to the Nature  
of the Marles, but with this remarkable Qua-  
lity, that it would make a kind of Plaister or  
Cement by mixing with Water, without hav-  
ing passed the Fire. This Substance is yet to  
be found in many Places, if carefully sought



CX. Earths of some kinds are also used about Cloaths, particularly the *Cimolian*. The *Tymphaican* is also used for the same Purposes ; and the People of *Tymphæa* and the neighbouring Places call it <sup>w</sup> *Gypsum*.

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after. I remember to have taken up an Earth, which I found to have this Property, near *Goodwood*, the Seat of his Grace the Duke of *Richmond*, in *Suffex*. And Mr. *Morton* is recorded to have sent to Dr. *Woodward*, from *Clipston* Stone-pit in *Northamptonshire*, an Earth truly of this kind, and endued with this Quality, under the Name of *Calx Nativa*: His is described to be a whitish gritty Earth ; but what I found was a true genuine Marle, something loose in Texture, but with no Sand or other stony Matter among it ; and of this kind the *Gypsum Tymphaicum* evidently was. This Author calls it an Earth only, and observes, that the People about the Places where it was found called it *Gypsum*, I suppose from its having the Properties of that Substance. As to its Use about Cloaths, the Substance I picked up in *Suffex* seemed of a Texture so much resembling that of Fullers-earth, that if it could be conveniently used, it might promise to answer all the Purposes of it, and so did the *Gypsum Tymphaicum* of the Antients, of which *Pliny*



ριά. Ἡ δὲ Γύψος γίνεται πλείστη μὲν  
 ἐν Κύπρῳ<sup>x</sup>, καὶ περιφανεστάτη. μικρὸν γὰρ  
 ἀφαιρᾷσι τῆς γῆς ὀρύττοντες. ἐν Φοινίκῃ

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expressly says, *Græcia pro Cimolia Tymphaico  
 utitur Gypso*, lib. 36. c. 17.

This therefore, or something like this, must be the first of the three principal *Gypsums* of the Antients; the other two Kinds I shall have Occasion to mention hereafter; but must first observe, in regard to this Passage, that it has been strangely corrupted in different Copies; instead of Γύψον, it is in several Ψύχον; and what I have given Κιμωλία, from the very judicious Conjecture of *De Laet*, is in most Copies ἡ μόνον. The Use of our Fullers-earth about Cloaths, and, in all Probability, that of the *Cimolia* of the Antients, was the same: this is not only that trifling one, of the taking out accidental Spots of Grease got in the Wearing, but what is the most important of all things in the Woollen Cloth Manufacture, the cleansing the Pieces of it, at the time of making, from that vast Quantity of Grease, Tar, and other Filth they are fouled with, from the Tar and Grease used externally in the Disorders of the Sheep before shorn, and from the Oil necessary to be thrown into the Cloth in the working.

\* The *Cyprian Gypsum* here mentioned I ac-



CXI. *Gypsum* is produced in great Quantities in the Island of *Cyprus*<sup>x</sup>, where it lies open, and easy to be discovered, and come at, the Workmen having but very little Earth to take

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count a different kind from the *Tymphæan*, and to be, indeed, the true genuine *Gypsum* made from the talcy Substance before mentioned. *Pliny* seems to favour this Division of the *Gypsums* into three Kinds, where he says, *lib. 36. c. 23. Cognata Calci res Gypsum est; plura ejus genera. Nam e Lapide coquitur, ut in Syria ac Thuriis: & e terra foditur, ut in Cypro & Perribæis, e summa tellure & Tymphaicum est.* And according to this, the three Kinds before distinguished may be called the *Tymphæan*, *Cyprian*, and *Syrian*. The *Tymphæan* is the earthy one already described, which might, very probably, be found near the Surface, as being truly an Earth, not a Stone. The second is the true genuine *Gypsum*, made from the Talc, or *Lapis Specularis*, called also, for that Reason, *Metallum Gypsinum*. And the third, the Kind made from the Alabasters and other Stones of a similar Texture.

That this *Cyprian Gypsum*, or the Kind burnt from the *Lapis Specularis*, or genuine *Metallum Gypsinum*, was the finest and best of all the Kinds, we have also *Pliny's* Word, *lib.*



δὲ καὶ ἐν Ὑ Συρία καίουσιν τὰς λίθους ποιῶ-  
 σιν. ἔπειτα δ' ἐν Θυρίοις. καὶ γὰρ ἐκεῖ γί-  
 νεται πολλή. τρίτη δ' ἡ περὶ Τυμφαίαν,

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36. c. 24. *Omniū autem optimum fieri com-  
 pertum est e lapide speculari squamamve talem ha-  
 bente.*

γ The *Syrian*, or third kind of *Gypsum*, this Author here observes, was made by burning certain Stones, which he afterwards very well describes, and which we may see from his Account were of the very Kind with those we now principally use for that Purpose, and call *Parget*, or *Plaster-stone*, different Kinds of which are dug in *Derbyshire* and *Yorkshire* in *England*, and the Pits of *Montmartre* in *France*. There are many other Kinds in different Parts, both of *France* and *England*, very little different from these and from each other; but in general all of them very well answer the Description *Theophrastus* gives of the Stones from which what I have called the *Syrian Gypsum* of the Antients was made.

It is to be observed that we, as well as the Antients, burn many very different Stones into our *Gypsum*, or *Plaster of Paris*, as it is commonly called; some of which are of the Na-



away before they get it. In *Phœnicia* and *Syria* also they have a *Gypsum*, which they make by burning certain Stones. They have a *Gypsum* in *Thuria* too, in great Plenty ; as also about *Tymphæa*, and in the Country of the

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ture of the foliaceous, others of the fibrous Talcs ; others composed of Matter seeming the same with that of the Talcs, but amassed together in a different Form, being neither fibrous nor foliaceous, but seemingly in a coarse Powder, or arenaceous Particles of uncertain Figures, and held together in the same manner as the Grit of the Stone of Strata : And finally, others truly and legitimately of the Alabaster kind ; in many of these, Particles of genuine sparry Matter also discover themselves ; and in several, the Masses are wholly surrounded with, and in many Places their very Substance is penetrated by a reddish earthy Matter : These require different Degrees of burning, according to their different Texture, to bring them to the State proper for Use : But in most of them it is done in a very little Time, and by a very slight Calcination, in comparison to that required for equally altering most other Substances. The reddish Kinds burn to a *Gypsum* equally white with that made from the whitest. The *Gypsum* of *Montmartre* in *France*,



ἢ περὶ Περαιδίαν, ἢ κατ' ἄλλας τόπους.  
ἢ δὲ φύσις αὐτῶν ἴδια. λιθοδεστέρα γὰρ  
μᾶλλον ἔσιν ἢ γεώδης.

ριβ'. Ὁ δὲ λίθος ἐμφερῆς τῷ Ἰ' Ἀλα-  
βαστίτη. μέγας δ' εἰ τέμνεται, ἀλλὰ  
χαλικώδης. ἢ δὲ γλιχρότης ἢ θερμότης,  
ὅταν βρεχθῆ, θαυμασὴ.

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the best and finest in the World, is burnt to a proper State in about two Hours. Ours of *Derbyshire* takes but little more Time, if properly managed ; and that of *Yorkshire*, which is generally redder and coarser, a little more than that. We have no Opportunities of trying the *Lapis Specularis* of the Antients now ; but by the general Consent of the Writers of Antiquity, the *Gypsum* made of it exceeded all the other Kinds : The Substance itself from this obtained a Name, by which it became afterwards generally known, which was *Gypsinum Metallum*. The Want of knowing this, however, among the Commentators on some of the Works of the Writers since, has occasioned much blundering ; for finding Accounts, in the most express Words, of Windows and Reflecting Mirrors, made of the *Metallum Gypsinum* ; and not conceiving that this was only



*Perrhæbeans*, and many other Places; but these are of a peculiar Kind, and are rather of a stony, than of an earthy Texture.

CXII. The Stone from which *Gypsum* is made, by burning, is like <sup>z</sup> Alabaster; it is not dug, however, in such large Masses, but in separate Lumps. Its Viscidity and Heat, when moistened, are very wonderful.

another Name for the *Lapis Specularis*, which it had obtained from being the Matter of which *Gypsum* was made, they made no Scruple of blotting out the Word *Gypsinum*, because they did not understand it; a Thing too customary among this set of People; and supplied its Place with *Cyprinum*, leaving a Passage which they imagined very dark, much darker than they found it.

<sup>z</sup> *Pliny* says, the Stones burnt to make *Gypsum* ought to be of the Marble or Alabaster Kind; and that in *Syria* they chose the hardest they can get; *lib. 36. c. 24. Qui coquitur Lapis non dissimilis Alabastritæ esse debet aut marmoroso; in Syria durissimos ad id eligunt, &c.* His Commentators say he took this from our Author; *hæc ex Theophrasti, lib. Περὶ λίθων, Dal.* If he did, he has been very careless in translating him; a Fault I have been obliged



ριγ'. Χρῶνται γὰρ πρὸς τε τὰ οἰκοδο-  
μήματα τῆτον τὸν λίθον περιέχοντες.  
κἂν τε ἄλλο βέλωνται τοιῶτο κολληῆσαι.  
κόψαντες δὲ, ἢ ὕδωρ ἐπιχέοντες, ταράτ-  
τῃσι ξύλοις. τῇ χειρὶ γὰρ εἰ δύνανται, διὰ  
τὴν θερμότητα. βρέχῃσι δὲ παρα-  
χρῆμα πρὸς τὴν χρείαν, εἰ μὲν μικρὸν πρῶ-  
τερον ταχὺ πῆγνυται· ἢ ἐκ ἑσσι διελθεῖν  
ἅμα.

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to observe in some other Places, that he is too apt to be guilty of. In this Passage, however, I am of Opinion he is not justly to be accused of it; for, with his Commentators Leave, I must observe, that it appears very plainly, from this and the Context, that he did not take it from *Theophrastus*. This Author does not say, that they chose in *Syria* the hardest Stones, but τὰς ἀπλυστέρας, those of the simplest Texture; and the Remainder of the Sentence in *Pliny*, which is, *coquantque fimo bubulo ut celerius urantur*, being evidently from some other Source, as there is not the least Syllable of any



CXIII. They use this in Buildings, casing them with it, or putting it on any particular Place they would strengthen. They prepare it for Use, by reducing it to Powder, and then pouring Water on it, and stirring and mixing the Matter well together with wooden Instruments: For they cannot do this with the Hand because of the Heat. They prepare it in this Manner immediately before the Time of using it; for in a very little While after moistening, it dries and becomes hard, and not in a Condition to be used.

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Thing like it in this Author, 'tis probable, that he had it together from some other Writer, or from the common Tradition of his Time. I must confess, the Word *σερεσιτάτης* coming so close after the *μαρμάρης και άπλευσέρης*, would have made me very naturally suspect *Pliny* of taking his Account carelessly from this Author; but the Context, which is evidently not hence, may very reasonably clear him. This I have been the more particular in observing here, as it may be a Means of clearing that Author in some, at least, of the many Passages in which he may be, even more than he deserves, ac-



ριδ'. Ἔσι δὲ καὶ ἰαχύς. ὅτε γὰρ οἱ τοῖ-  
 χοὶ ῥήγνυνται καὶ διαφθείρονται, ἢ δ' ἄμμος  
 ἀνίησι. πολλάκις δὲ καὶ τὰ μὲν πέπρωκε  
 καὶ ὑφήρηται. τὰ δ' ἄνω κρεμάμενα καὶ συν-  
 εχόμενα τῇ κολλήσει.

ριέ. Δύναται δὲ καὶ ὑφαιεμένη, πά-  
 λιν καὶ πάλιν ὀπτᾶσθαι, καὶ γίνεσθαι χρη-  
 σίμη. Περὶ μὲν ἔν Κύπρον καὶ Φοινίκην  
 εἰς ταῦτα μάλισα. περὶ δ' Ἰταλίαν καὶ  
 εἰς τὴν <sup>a</sup> κονίασιν καὶ οἱ γραφεῖς ἕνια τῶν

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cused of misunderstanding the Authors he copied from: In too many Places he has indeed but too evidently done this, though in some, where he is suspected of it, perhaps he may not be copying from the Authors we accuse him of misrepresenting, but from others, who had either accidentally, or purposely, deviated from



CXIV. This Cement is very strong, and often remains good, even after the Walls it is laid on crack and decay, and the Sand of the Stone they are built with moulders away; for it is often seen, that even after some Part of a Wall has separated itself from the rest, and is fallen down, other Parts of it shall yet hang together, and continue firm and in their Place, by means of the Strength of this Matter which they are covered with.

CXV. This *Gypsum* may also be taken off from Buildings, and by burning, again and again, be made fit for Use. It is used for the casing the Outsides of Edifices, principally in *Cyprus* and *Phœnicia*, but in *Italy*, for <sup>a</sup> whitening over the Walls, and other Kind of Ornaments

<sup>A</sup>

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what those had written, and whose Works may be now lost to us.

<sup>a</sup> What I have given *εις την κονιασιν*, speaking of the Use of the *Gypsum* in *Italy*, has stood in most Copies *εις την οινειον*, which has been distrusted by many not to be the genuine Reading; but imagined by *Furlanus* to have been



κατὰ τὴν τέχνην. ἔτι δὲ οἱ κναφεῖς ἐμ-  
πάτῃοντες εἰς τὰ ἱμάτια.

ρις'. Διαφέρειν δὲ δοκεῖ καὶ πρὸς τὰ  
ἀπομάγματα πολὺ τῶν ἄλλων. Εἰς ὃ  
ἢ χρεῶνται μᾶλλον, ἢ μάλιθ' οἱ περὶ  
τὴν Ἑλλάδα, γλιχρότητι ἢ λειότητι.

ρις'. Ἡ μὲν δύναμις ἐν τέτοις ἢ τοῖς  
τοιείοις. ἢ δὲ φύσις ἔοικεν ἀμφοτέρᾳ πως  
ἔχειν, ἢ κατὰ τὰ τῆς κονίας, ἢ κατὰ  
τὰ τῆς γῆς, θερμότητα ἢ γλιχρότητα.  
μᾶλλον δὲ ἑκατέρας ὑπερεχέσας. Θερ-  
μοτέρα γὰρ τῆς κονίας, γλιχρότερα δὲ  
πολὺ τῆς γῆς.

---

erroneously put for εἰς τὸν οἶνον, and he has translated the Passage accordingly; the κονίασις is from the Opinion of *Salmasius*, and seems to have been the very Meaning of the Author; for having been just before mentioning its Use on the Outsides of Houses, and being going



within Houses. Some Kinds of it are also used by Painters in their Business; and by the Fullers, about Cloaths.

CXVI. It is also excellent, and superior to all other Things, for making Images; for which it is greatly used, and especially in *Greece*, because of its Pliableness and Smoothness.

CXVII. These Qualities of the *Gypsum*, therefore, fit it for these and such other Uses; for it seems naturally to have, as it were together, the Heat, and Tenacity of Lime, and the more viscous Earths. But it possesses both these Qualities in a much superior Degree to either of the others, which have them singly; for it acquires, on being moistened, a Heat much greater than that of Lime, and is much more tenacious than the most viscous of the Earths.

on to recount its other various Qualities; there was nothing so natural for him to mention next, as its Use in ornamenting the inner Parts of them, the very Thing for which it is most famous now.

The *Gypsum* is nothing more than a Selenite,



ρίη. Ὅτι δ' ἔμπυρος, καὶ κείθεν φανε-  
ρόν. ἤδε γάρ τις ναῦς ἱματηγός, βρεχ-  
θέντων ἱματίων, ὡς ἔμπυρώθησαν, συγκα-  
τεκαύθη ἢ αὐτή.

ριθ'. Καίεσι δὲ ἢ ἐν Φοινίκῃ, ἢ ἐν  
Συρίᾳ, καμινεύοντες αὐτήν ἢ καίοντες.  
καίεσι δὲ μάλιστα τὰς μαρμάρους ἢ ἀπλῶ-  
σέρας· σερροτάτης μὲν παρατιθέντες διὰ  
τὸ θᾶττον καίεσθαι ἢ μᾶλλον. δοκεῖ γὰρ

---

less elegant than the Rhomboidal or plated  
Kinds. Those resemble the foliaceous Talcs;  
and these the softer of the Alabasters. We may  
always by Glasses distinguish the flaky Tex-  
ture of the Selenite in the *Gypsum*; and those  
unerring Tests by Weight and Firmness, give  
convincing Proofs of the Truth. *Gypsum* is  
lighter as well as softer than Spar; but differs  
very little in either of these Qualities from the  
pure Selenite: To which we may add the  
Effect of Fire; for the finest Plaster in the



CXVIII. That its fiery Power is very great, is evident from this remarkable Instance: That a certain Ship which was laden with Cloaths, by some Accident letting in Water; the Cloaths being wetted by that Means, the *Gypsum* that was put among them took fire, and burnt both the Cloaths and the Ship.

CXIX. In *Syria* and *Phœnicia* they prepare a *Gypsum* by Fire; putting into proper Furnaces Stones, principally of the Marble, and other Kinds, which are of the most simple Texture, and heating them to a certain Degree; the harder Kinds they lay upon those which burn more readily; and when burnt,

World is made of an absolute pure plated Selenite, found in the Fissures of the Strata of the common *Gypsum* at *Montmartoe*.

We have, in *England*, five distinct Kinds of *Gypsum*: 1. A pure white tender Kind; 2. A grey, firm, and compact one: 3. A yellowish; this also is tender: 4. A reddish Kind; all these are of a dull coarse Aspect; but we have a 5th, which is bright, clear, and glossy, and is most excellent of all; and, beside these, *Saxony* affords a native Plaster Dust, white, and



θερμότερον εἶναι πυρωθέν, ἢ πλείστον  
 χρόνον διαμένει. ὀπλήσαντες δὲ κόπυσιν  
 ὡσπερ τὴν κοίαν.

ρηκ. Ἐκ τούτου δ' ἂν δόξειεν εἶναι φα-  
 νερόν ὅτι πυρωθῆς τις ἢ γένεσις αὐτὴ τὸ  
 ὅλον ἐστίν<sup>b</sup>.

---

resembling the others when they have passed  
 the Fire.

<sup>b</sup> The Observation with which the Author  
 concludes this Work is unquestionably most just.  
 We are well acquainted with the many Changes  
 which the Particles of Fire, insinuating them-  
 selves into Bodies, are able to make: Of which,  
 their changing the Talcs and Alabasters into  
*Gypsum*, and the Lime-stones of various Kinds

F I N I S.



the Matter appears to be of extreme Strength, and fitted for enduring a long Time: After this they beat the Stones to Powder like Lime, to make them fit for Use.

CXX. From all this it seems evident, that the Properties and Nature of this Matter, are in a great Degree owing to the Fire<sup>b</sup>.

---

into Lime, are not the least worthy our Observation, though, from their being common, and every Day before our Eyes, they are but little regarded. What the Nature of that Change is; and that the Expulsion of the fixed Air from the Stones is the great Cause, we have now learned with Certainty from the ingenious and excellent Dr. *Priestly*.



The patient appears to be of extreme  
strength and used to enduring a long  
time. After that they the stone  
to powder like lime, to make them fit  
for use.

CXX. From all this it turns evident  
that the Hippocampus and Dorsum of the  
brain, are in a great degree owing to  
the same.

the brain, and the left side of the  
brain, that they have common  
the same, they are on the same side  
into account. What the nature of the  
the same, but the nature of the  
the same, but the nature of the  
the same, but the nature of the



# APPENDIX I.

---

## OBSERVATIONS

ON

The new-discovered SWEDISH ACID;

AND ON

The Stone from which it is obtained.

SECT. I.

Of the MINERAL ACID in general.

**T**HERE exists in the Mineral World a native Acid; and probably only one; tho' it exhibits itself under different Forms.

Of the Existence of this we are certain; altho' we never have seen it pure; nor can: It never becoming an Object of our Senses, but  
in



in Mixture with other Bodies. It has been called the *Vague Acid*, and the *Universal Acid*.

We have been accustomed to meet with it under two distinct Forms; and to know it under the Names of two Species: These are the *Vitriolic* and the *Muriatic Acid*: And to these we are lately taught to add a third, which, from the Place where it has been discovered, Authors have called the *Swedish Acid*; and to which some, tho' very improperly, have given the Name of the *Sparry Acid*. Perhaps, in distinction from the other two, it may be better named the *Stony Acid*; since the Substance from which we obtain it is a Stone; tho' not a Spar.

There are many who hold these Acids to be essentially distinct. Perhaps they are so: But it seems more probable, that they are only different Modifications of one and the same Spirit: And perhaps it will not be carrying the Opinion too far to suppose this one universal Acid to be the Basis also, and Foundation of the nitrous; and even of the animal and vegetable Acids, the urinous, the fermented, &c.

Chymists of great Knowledge have proved the very near Relation between the vitriolic, and the nitrous Acid; and some by fair Experiments have also shewn there is a great Analogy between the nitrous and the marine or muriatic. They have endeavoured to prove, from these Experiments, that the nitrous, and the vitriolic on the one Part, and that the nitrous and muriatic, on the other, have so  
great



great Uniformity in many Instances, that they must be derived the one from the other: But it should seem most agreeable to Nature, to refer both; as also the new-discovered Acid of Stone; to one and the same general Principle; of which they all three partake, altho' each has its own distinctive Qualities from the others; and to determine that they all originate from, or are merely different Modifications of, the same original Principle, the *universal Acid*.

This we may at all Times meet with in the three separate and distinct Forms already mentioned, vitriolic, muriatic, and stony; tho' no Man ever saw it separate and in its own. We see it,

1. Combined with Metal, under the Form of Vitriol.

2. With an alkaline Earth, in the Condition of Fossile or Sea Salt.

And, 3dly, With a stony Substance, under the Form of this new-discovered Stone.

From all these Substances we can obtain it by Means of Distillation; united with more or less Water. And this is the only Condition in which we have, or can have any Acquaintance with it. From whichever of these Substances we thus produce it, there are certain general Properties in which it agrees: As also certain Powers or Qualities by which it differs; according to the one or other of these Bodies from which it is drawn.

From whichever of these Substances it is produced,



produced, it is sour, acrid, and dissolvent; but in different Degrees, from the various Kinds: And beside, it is separately endowed with different Characters from each.

Distilled from Vitriol, it is unctuous, heavy, and very corrosive: And after dissolving calcareous Earth, forms with it a Selenite. In its concentrated State it dissolves Silver, Tin, &c. when diluted, Copper, and Iron.

Distilled from Salt, it is not unctuous; is little heavier than common Water; less corrosive than from Vitriol; and after dissolving calcareous Earth, forms with it, not Selenite, but a fixed Sal Armoniac. In its concentrated State it dissolves Lead, &c.

Distilled from the *Swedish* Stone, it is heavier than Acid of Salt, less heavy than the Vitriolic. It dissolves the Calxes of Metals more readily than Metals themselves. In the very Act of Distillation, it corrodes Glass; and the Stone itself, mixed with a calcareous Earth, becomes a peculiarly corrosive Matter, which dissolves the best and strongest Crucibles.



## S E C T. II.

Of the Stone from which the SWEDISH ACID  
is obtained.

**T**HE Stone is of a peculiar Genus, differing both from Crystal and Spar; and demands a distinct Place and Name; as well from its natural Character, as for its artificial Products: It has been called *Fluor*, *Spatum vitrescens*, and *Fluss*. It is heavy, unctuous, soft, semi-transparent, and glossy: It breaks in a rudely plated Form; not rhombic.

We find it in large Masses; or Clusters of smaller Lumps; in some Degree resembling Spar, and of the like glossy Surface; but without the peculiar Form, or real Characters of that Stone.

A Knife will scratch it: It does not readily ferment with Acids, nor will it strike Fire with Steel: It neither burns to Glass, nor Lime; but exposed to the Action of a violent Fire, it splits into thin, irregular, flaky Fragments, and by Degrees crumbles into a Kind of Powder, over which the Fire has no farther Power. The Fragments do not this Way burn to Lime, nor can a calcareous Substance be any way extracted from them: But tho' no Fire will vitrify it alone, yet mixed with a calcareous Earth we see it runs freely into a Glass. And that it is of a



peculiar Nature, and in particular so corrosive that it dissolves all Vessels, in this State; just as, mixed with the vitriolic Acid, it does the Glass of the Retort in the usual Distillation. Mixed with crude Ores, it wonderfully promotes their Fusion.

A Degree of Fire sufficient to make the Stone red hot, destroys that phosphoric Light it yields when gradually and gently warmed. Slowly heated, it is phosphoric, as long as it continues warm: And it burns with a blue Flame without Smell. From these invariable Characters it is plain, that it is neither Crystal, Spar, Talc, or Selenite; but a distinct Genus of Fossil from them all.

It is found green, yellow, white, blue, and violet coloured. The green and yellow are common in *Sweden*: There is a deep green in *Saxony*: The blue is frequent in *China*; and there is some in *Bohemia*: The white and the violet-coloured we have in *England*.

The fossile Bodies that approach nearest to its Nature, are the *Swedish* Zeolite; the *Bolonian* Phosphorus Stone; and our Star upon the waxen Vein.

But the Zeolite dissolves in Acids;

The *Bolonian* Stone effervesces readily with them, tho' it be not soluble; and the Star burns to Plaister.

No one of all which Properties belong to this new Stone.

The Zeolite is phosphoric, just as it melts;

And



And the Star does not dissolve or effervesce with Acids: In these Things the two approach to the new Stone; but neither can be allowed the same.

The green owes its Colour, mostly, to Iron.

I am convinced that some of this Stone contains that Metal; but not all; and that the Iron, where it is found, is no Essential Part of the Body; but a mere accidental Mixture: For I have Pieces from *Sweden*, which, tho' very green, do not become red in burning; and other green Pieces that acquire that Redness, which appears after burning in all Fossils that have Iron in them.

The yellow holds a little Lead.

The blue does not owe its Colour to Copper; as is true also of the *Lapis Lazuli*; which is a Zeolite; and therefore allied to this Stone.

Of whatsoever Colour this Stone be, if carefully warmed, it has the electric Quality; less than the Tourmatine; but like it;

It has not the double Refraction of Spar; though it has much of its external Aspect.

From these palpable Qualities; and certain Characters; we may advance toward an Enquiry into what it is.

The Mineral Acid, every where present in the Earth, (tho' never seen unmixed, or in its pure, simple state) when joined with Metals, we see, forms the Vitriols; when united with Clay it makes the Alums; when mixed with



any Thing inflammable, it constitutes the Sulphurs; and when united with calcareous Earth, the Selenites.

Now, as this Acid can unite with Clay, and with Chalk; there is nothing contradictory to Reason, in supposing it may join also with an earthy or stony Substance, neither argillaceous or calcareous:

And as uniting with Clay it forms Alums, and with Chalk Selenites; if united with an Earth totally different in its Nature from these two, it will form a Body also different both from Alum, and from Selenite.

I am therefore led to suppose, that this Stone is a Combination of the universal Acid, with an Earth, differing from those wherewith we have at other Times seen it joined.

And from

1. The unctuous Quality of the Stone;
2. Its Difficulty of Fusion;
3. Its tenacious and gelatinous Nature in the Fire;
4. From its various Colours;

I think it most probable, that it is the Mineral Acid united with the Steatite; or Soap Rock.

For the Steatites has precisely all the Colours which we see in this Stone; and has no others: It is unctuous like it; it scratches like it, in the hardest Pieces; it will not dissolve in Acids; nor strike Fire with Steel: And in the last fiery Trial it has just this refractory Quality; only that here it is rendered a little more tractable by the Acid.



A Stone thus formed must have Qualities very different from all others; And such this affords on Trial.

There rises from it in Distillation an Acid, different from the vitriolic, nitrous, or saline.

And also a solid Sublimation; of a Stone-like Nature; utterly unknown from any other Substance.

The Process by which I tried the Substance was this:

Two Pounds of the green Kind of the Stone were powdered, and put into a Glass Retort;

Two Pounds of Oil of Vitriol were added to this;

And a Quart of Spirit of Wine was put into the Receiver.

No Heat, nor Ebullition whatsoever, followed the Mixture for some Time; and in the End but little.

The Vessels were closed; and kept in a Reverberatory Furnace for fourteen Hours.

The Fire was slow at first; else the Matter would have risen over.

No phosphorescent Light was visible at any Time.

The Fumes were at some Times visible, in the Receiver; at others not. Whereas in the marine Acid they are never visible; unless Air be admitted.

They were elastic; and had a Smell like those from Spirit of Salt.

The Surface waved, and rose a little; and there was on it an icy, and gelatinous Substance.



The upper Part of the Receiver became covered with a thin stony Crust.

The *Swedes* speak of a Crust of absolute Flint, upon the Surface of the Liquor in the Receiver: But they put Water there: This was the same Substance: And it remained fix'd on Part of the Receiver: While Part was displaced; probably by some light Vapour from the Spirit of Wine.

The Corrosion of the Glass of the Retort seems to be an Effect of that peculiar Sublimation which rises in the Distillation; nay, and begins to rise, even without that Operation: For watching attentively the Effect of mixing the vitriolic Acid with the Stone, I perceived, that tho' they seem'd to meet without any Effervescence, yet by Degrees there appeared a slight Commotion; which increased for a considerable Time, and, during which, this strange Sublimation of the Flores began to be made; and increased with it; even before any Fire was used.

Repeating this Trial, and breaking the Retort afterwards, no Fire at all having been used, I found it corroded in Waves; where the Flores had adhered to the Neck, and eaten in very deeply, just at the Surface of the Matter.

The Flores themselves are extremely acrid to the Taste, and are indissoluble in any Acid; nor can be run into Glass by any Fire.

The Acid of this Stone in its purest State, so far as I have seen it, is about one third heavier than Water.

After seven Hours a Hole was eaten thro' the Retort, and Fumes issued: But this was soon closed



closed by a Crust formed of the Matter within ; and so well stopped, that no Vapour escaped.

After this the Retort became corroded in a great many Places : Fumes issued, at them all, for a little While ; but they were afterwards stopped by Crusts of the same Kind as the former.

When the Operation was finished, there were found in the upper Part of the Retort a Kind of Flowers, dry and powdery ; and in the Neck a thick, slimy, moist Substance.

The Retort was corroded all round, just above the Top of the Residuum ; and this corroded Part crumbled to Dust between the Fingers ; having lost the Nature of Glass.

Here then is found a Fossil capable of dissolving Glass ; a Power not known in any other Body :

Subliming an absolute Stone during the Distillation ; a Quality equally unknown in other Bodies :

And burning with a violet, scentless Flame : A Thing equally unknown ; and the more strange, as the Stone holds no Copper.

To shew the violet Flame, some of the Stone is to be broken small with a Hammer ; and sprinkled on a red hot Heater, in the dark : The Flame rises very freely, and continues some Time ; and the Stone splits into thin irregular Flakes

The Uses of the pure Acid may be infinite : And it is easy to see the Knowledge of this Subject will lead us to a thousand unknown Truths in the Mineral History.



The Uses of the Stone itself may also be immense. We are well informed that the Steatites, and a Fossil of the Nature of the *Bolonian* Stone, are great Ingredients in Porcelane. This Substance seems to promise all that can be wished, without any farther Mixture. For the Matter in the Neck of the Retort, when hardened, differs little from the Substance of *China* Ware.

In Mineralogy there are laid open to us also a thousand Articles of Wonder; which naturally perplexed us before we were acquainted with this Stone: Because, not knowing this, which was the true Source of them, it was impossible that we should guess how they were performed.

LEHMAN, in a very excellent Letter to *Monf. BUFFON*, on the Subject of a red Ore of Lead found in *Siberia*, entertains a Conjecture, not only that this in particular, but many others, owe a great deal of their Qualities and Particularities to the Marine Acid. The Conjecture was good; but 'tis easy now to see, by numerous Instances, that the Acid, suspected by many, and absolutely discovered by this able Chymist, as performing many and great Things in the mineral World, is not the muriatic, but this stony Acid; present in a thousand Places where we do not suspect it; and performing a Multitude of Things which must have been unintelligible, and therefore wonderful to us, so long as we were not acquainted with it; or indeed knew of its Existence.



# A P P E N D I X II.

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A N

IDEA of an ARTIFICIAL ARRANGEMENT  
of FOSSILS, according to unalterable  
Characters, and superadded Qualities :

A L S O

Of a NATURAL METHOD; according to their  
Ascent toward their greatest Perfection.

FOSSILS may be arranged, according to the fol-  
lowing *permanent* Characters, into  
TWO SERIES,

1. *Simple,*

2. *Compound,*

According to the *Purity* or *Mixture* in the Body.

Each of these into Five TRIBES, by

Adding the Ideas of

1.—Vitrifiable,

4.—Incombustible,

2.—Inflammable,

5.—Soluble in Water,

3.—Calcinable,

6.—Metalline.

These into ORDERS, by superadding the Idea of

1.—Pellucid,

4.—Alkaline,

7.—Plated,

10.—Uniform,

2.—Opake,

5.—Solid,

8.—Thready,

11.—Malleable,

3.—Neutral,

6.—Fluid,

9.—Granulated,

12.—Friable.

These into GENERA, by superadding the Idea of

1. Form. by Trial by Acids,

and by Steel.

These into SPECIES, by superadding the Idea of

1. Gravity.

These into VARIETIES, by superadding to all this  
the Ideas of

1. Colour from Mixture.

1. Shape from Mixture.

And these into VARIETIES OF VARIETIES, by super-  
adding the Ideas of

1. Colour from double Mixture.

2. Shape from double Mixture.

And under these come all Individuals.



## EXAMPLE.

From the most complete of the Tribes.

An <i>unorganized natural Body</i> , is a FOSSIL.	
Add the Idea <i>pure</i> ,	
It becomes <i>Simple Fossil</i> .	This is its SERIES.
Add to these <i>calcinable</i> ,	
It becomes <i>Limey Fossil</i> .	This is its TRIBE.
Add to these <i>pellucid</i> ,	
It becomes <i>light Limey Fossil</i> .	} This is its ORDER.
Add to these <i>soluble in Acids</i> ,	
It becomes <i>light Limey soluble Fossil</i> .	} This is its FAMILY.
Add to these again <i>transparent</i> ,	
It becomes <i>Spar</i> *.	This is its GENUS.
Add to these a <i>columnar Figure</i> ,	
It becomes <i>Columnar Spar</i> .	This is its SPECIES.
Add to these a <i>yellow Colour</i> ,	
It becomes <i>Topazine Spar</i> .	This is a VARIETY.
Add to these a <i>blue Colour</i> ,	
It becomes <i>Smaragdine Spar</i> †.	} This is a VARIETY of a VARIETY.

After this there can be only the Difference of Bigness; and that distinguishes Individuals.

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\* Here Fossils begin to have distinct Names.

† The Blue mixt with the former Yellow producing a Green.



F O S S I L S.

Series 1.—Simple.

Series 2.—Compound.

SERIES I. Simple Fossils.

Tribe 1.—Vitrifiable	<i>Crystal.</i>
2.—Calcinable	<i>Spar.</i>
3.—Inflammable	<i>Sulphur.</i>
4.—Incombustible	<i>Talc.</i>
5.—Soluble in Water	<i>Salt.</i>
6.—Metalline	<i>Ores.</i>

T R I B E I.

Simple Vitrifiable Fossils.

Order 1.—Pellucid	<i>Crystal.</i>
2.—Opake.	<i>Earth neutral.</i>
Family 1.—Brittle.	
2.—Tough.	

T R I B E II.

Simple Calcinable Fossils.

Order 1.—Pellucid.	
2.—Opake.	
Family 1.—Soluble in Acids.	
2.—Indiffoluble.	

T R I B E



## TRIBE II. ORDER I. FAMILY I.

Simple calcinable Fossils soluble in Acids.

- |                    |                         |
|--------------------|-------------------------|
| Class 1.—Pellucid. | <i>Spars.</i>           |
| 2.—Opake           | <i>Earths alkaline.</i> |

## F A M I L Y II.

Simple calcinable Fossils not soluble in Acids.

- |                 |                       |
|-----------------|-----------------------|
| Class 1.—Plated | <i>Selenite.</i>      |
| 2.—Thready      | <i>Striated Talc.</i> |
| 3.—Granulated   | <i>Plaster.</i>       |

## T R I B E III.

Simple inflammable Fossils.

- |                |                 |
|----------------|-----------------|
| Order 1.—Solid | <i>Sulphur.</i> |
| 2.—Fluid       | <i>Naphta.</i>  |

## T R I B E IV.

Simple incombustible Fossils.

- |                 |                  |
|-----------------|------------------|
| Order 1.—Plated | <i>Talc.</i>     |
| 2.—Thready      | <i>Asbestos.</i> |

## T R I B E V.

Simple soluble Fossils.

- |                  |                   |
|------------------|-------------------|
| Order 1.—Neutral | <i>Rock Salt.</i> |
| 2.—Alkaline      | <i>Natrum,</i>    |

## T R I B E VI.

Simple Metalline Fossils.

- |                    |                     |
|--------------------|---------------------|
| Order 1.—Malleable | <i>Metals.</i>      |
| 2.—Friable         | <i>Semi-metals.</i> |

S E R I E S



S E R I E S II. COMPOUND Fossils.

Tribe 1.—Earthy	<i>Loams.</i>
2.—Stony	<i>Stones.</i>
3.—Metalline	<i>Ores.</i>

T R I B E I.

Compound Earthy Fossils.

Order 1.—Firm in Water	<i>Loams.</i>
2.—Swelling in Water	<i>Marles.</i>

T R I B E II.

Compound stony Fossils.

Order 1.—Vitrifiable	<i>Stones.</i>
2.—Calcinable	<i>Marbles.</i>
3.—Saline	<i>Alum Ores.</i>

T R I B E III.

Compound Metalline Fossils.

Order 1.—Sulphureous.
2.—Saline
3.—Arsenical.



## F O S S I L S.

## SERIES I. TRIBE I. ORDER I.

Simple vitrifiable pellucid Fossils.

## GENUS I.—Gems.

Generic Character.

Untouched by Acids, giving Fire with Steel ;  
hard, bright.

## SPECIES I.—Diamond.

Specific Character.

An Octohædron of unequal Sides, impene-  
trable, colourless, pellucid.

## VARIETIES

## 1. In Shape.

## 1 \*. Columnar Diamond.

A Column of six Angles with two short Pyramids.

## 2.—Squared Diamond.

A Column of four Angles, with truncated Ends.

## 3.—Pebble Diamond.

Without Angles, rounded or irregular.

## 2. In Colour.

## 4 †. Red Diamond.

Diamond coloured by Gold.

## 5.—Yellow Diamond.

Diamond coloured by Lead.

## 6.—Blue Diamond.

## 7.—Green Diamonds.

Diamonds, both coloured by Copper.

Variety of Variety.

## 8.—Purple Diamond.

Diamond coloured by Gold and Copper:

---

1 \*. Common Salt will shoot in Cubes, Pyramids, and Parellopedes, but it is still common *Salt* ; the same *Species* of Body under this Variety of *Form*.

4 †. Colours are Additions to the *Body*, not Changes of the *Species*.



• SPECIES 2.—Sapphire.

Specific Character.

A hexangular Column of six unequal Sides tapering from the Base, and terminated by a Pyramid of the same Angles, colourless, pellucid.

VARIETIES.

1. In *Shape*.

1.—Pyramidal Sapphire.

An hexangular Pyramid of unequal Sides.

2.—Columnar Sapphire.

An hexangular Column of unequal Sides, with two low Pyramids.

3.—Pebble Sapphire.

Without Angles, of an oval flatted Shape.

2. In *Colour*.

4.—Red Sapphire, called Ruby.

Sapphire coloured by Gold.

5.—Yellow Sapphire, called Topaz.

Sapphire coloured by Lead.

6.—Blue Sapphire, called Sapphire.

7.—Green Sapphire, called Emerald.

Sapphires both coloured by Copper.

8.—Flamy Sapphire, called Hyacinth.

9.—Crimson Sapphire, called Garnet.

Sapphires both coloured by Iron.

Varieties of Varieties.

10.—Firey Sapphire, called Carbuncle.

Sapphire coloured by Gold, with a little Copper.

11.—Purple Sapphire, called Amethyst.

Sapphire coloured by Iron and Copper.

12.—Blue



12.—Blue green Sapphire, called Aqua Marine.

Sapphire, coloured by Copper and Lead.

13.—Yellow green Sapphire, called Chryfolite.

Sapphire coloured by Copper and more Lead.

14.—Coarse green Sapphire, called Prasius.  
Sapphire coloured by Copper and Manganese.

These are the Oriental Gems.

They are all found in pebble or columnar Forms; singly and in Clusters; and of different Bignesses.

There are also Crystals of these Colours, which are called occidental Gems of the same Names.

We know the Ingredients which give their Colour, by Experiments in colouring Glafs and Pastes.

These with the Colour give no Addition of Weight.

There is beside all these a debased Sapphire, fouled by Earth.



SPECIES 3.—Crystal.

Specific Character,

An hexangular Column of six equal Sides, of the same Thickness from End to End; and terminated each way by an hexangular Pyramid; colourless, pellucid.

VARIETIES.

1. In *Shape*.

<sup>a</sup> By Accident in their Concretion.

Perfect,

1.—Close Crystal,

A Crystal of 18 Planes in a short Column, and two long Pyramids.

Wanting the intermediate Column,

1<sup>b</sup>.—Gibbous Crystal.

2.—Bellyed Crystal,

of 12 Planes, in two hexangular Pyramids, base to base.

3.—Edgy Crystal,

of 16 Planes, in two octangular Pyramids, base to base.

Wanting the lower Pyramid,

4.—Spiry Crystal,

of 12 Planes in a hexangular Pyramid, on an hexangular Column.

5.—Broad Crystal,

of 10 Planes in a pentangular Column, and pentangular Pyramid.

6.—Planed Crystal,

of 20 Planes in decangular Columns, and decangular Pyramid.

7.—Oblique



7.—Oblique Crystal,  
A Crystal of 12 Planes, with the Pyramid  
set on obliquely.

<sup>b</sup> By the Influence of Metals.

8.—Cubic Crystal.  
Crystal shaped by Lead.

9.—Pyramidal Crystal.  
Crystal shaped by Tin.

10.—Rhomboidal Crystal.  
Crystal shaped by Iron.

<sup>c</sup> Unshaped.

11.—Pebble Crystal.  
Crystal without Angles in roundish Masses.

Varieties of Crystal.

2. In *Colour*.

12.—Yellow Crystal, called Occidental  
Topaz.  
Crystal coloured by Lead.

13.—Blue Crystal, called Occidental  
Sapphire.

14.—Green Crystal, called Occidental  
Emerald.

Crystals both coloured by Copper.

Variety of Varieties.

15.—Purple Crystal, called Occidental  
Amethyst.

3. By Impurities.

16.—Whitish Crystal.  
Crystal debased by a white Earth.

17.—Brown Crystal.  
Crystal debased by a dusky Earth.

And



Upon this Plan it will not not be difficult for an accustomed Mind to arrange the whole Fossile World; and this may serve to give the intended Idea of an artificial Arrangement.

A general Instance of the Method of finding the Places of the several Species, may be seen in the Exordiums of the *Spatogenesis*. As for Example:

#### Of the ORIGIN of SPAR.

The Series of Fossils make one great Circle; for ever returning into itself.

There are a few primitive Bodies; Chalk, Clay, Bitumen, Talc, and the Mineral Acid.

These, variously mixed, form many different compound Fossils: Which mingling, in some Places, farther with one another, give Decompositions.

These (in other Places) give up their several Primitives again to Water: Which delivers them pure in some other Parts; ready to form mixt and compound Bodies again.

To trace them thro' these Combinations, and to their natural Analysis again, is the whole Business of the Student in this Science: For here is no Distinction but by Mixture: No Origin from Egg, or Seed.

A great deal of pure Clay mixed with a little Quantity of various Stones, forms the different Clays.

And a great deal of Stone with a little of the Clays, forms the various Species of Stones.



An Instance of this Course of Nature appears in the philosophic History of Spar.

1. The Primitives, as we have seen, are *Water, Bitumen, Chalk, Clay, Talc,* and *Mineral Acid*: To these the Operations of the Air, and Fire give great Powers of acting. We thus find

2. *Heavy Vapours*, formed of Air, and much Water. These, pervading all Things,

3. Meet the Mineral Acid\*, and uniting with it; if they run clear to the Surface, afford Medicinal Springs; but

4. Thus united, they may fall upon Bitumen: This is no where more frequent than in Limestone Rocks; and often stands in Puddles, in their natural Hollows †.

5. By this Mixture, uniting in its Course, is formed a real, tho' a fluid Sulphur: For Sulphur is nothing else; nor can be formed by any other Means ‡.

6. This Sulphur, not yet concreted, passes in its liquid Form thro' the Pores of the Lime-

\* The Electric Æther of the under World; present every where, but only seen concentrated, or in its Mixtures. It affects some Things, Bitumen most: And avoids others.

† At *Naples*; in the *Venetian Territories*; and in *Persia*, this is very common.

‡ Absolute Sulphur may be made by Art with Ease and Certainty this Way. The Acid of Vitriol, with any Thing inflammable, affords it.

stone;



stone; dissolving Part of its purer Chalk as it goes\*.

7. Water thus saturated with the Principles of Sulphur, and with Chalk, keeps on its gradual Course horizontally thro' the same Lime Rock, till it meets a Fissure; a perpendicular Crack, or Opening; dividing one Part of the Rock from another. Here it ouzes forth: and meeting with a lighter Air, hangs; and evaporates slowly.

8. Slow Evaporation, and perfect Rest, are the Requisites of Crystalization. The Sulphur and pure Chalk thus united, form one solid Body; which crystalizing gradually, appears in regular rhomboidal Particles: and is the Substance we call Spar †.

\* Limestone is only coloured, hardened Chalk; and Marble is the same. Marble is a purer Limestone, and Limestone a coarser Marble.

† Spar supposed to be one Thing, is therefore a mixed Body, and so are the purest Salts. We can make a Substance of the Nature of Spar, by crystalizing the Lixivium of Lime and Sulphur.



## NATIVE FOSSILS.

## CLASS III.

## SPAR.

## SPATUM.

A pure Fossil ; composed of Brittle Rhombs.

**S**PAR is known from Talc by its Want of Elasticity ;

— from Selenite by its Want of Flexibility ;

— from Crystal by its Dullness, and by fermenting with Acids.

It is heavier than any of the three other pellucid Fossils ; and is known from all Bodies in the World (when pure enough to be seen through) by its doubling Lines laid under ; and viewed through it.

This last Property has been supposed peculiar to that Species of Spar called Island Crystal : And the greatest Writers, *Linnaeus*, *Wallerius*, *Cronstedt*, and the long *et cætera*, have separated



that Body from the pure Rhombic Spar; which they supposed not to have the double Refraction. But this Power resides in all Spar I have examined: And is of its Nature: As it arises from the internal Construction of the Body, which is made up of smaller Rhombs, applied one to another.

The very Atoms of Spar are Rhombic; and those smallest Pieces into which it may be separated by gentle Acids, without Solution, applied to the Microscope over a Line proportionably fine, have the same Power.

No Body has this Construction except Spar; therefore no other natural or artificial Substance has this Power of double Refraction. Even Sir *Isaac Newton* has said, Crystal has something of this Power; in vain: For no Authority can stand against the Testimony of the Senses. All different Mediums vary in Refraction; but this peculiar Power resides only in a pellucid Body formed of connected Rhombs.

The State of Refraction in the pellucid natural Bodies is this,

1. Talc in thick Masses elevates the Line.
2. Selenite waves it.
3. Crystal distorts it.
4. Spar gives it double.

All Spar does this, even that which takes the Form of Crystal, in Pyramids, and Columns: Therefore even the variously angulated



Forms of Spar are composed of Rhombs; and the Construction of Spar, and of Crystal, are perfectly different, even while their Forms are the same.

Spar is seldom found original, and free: A few pure Rhombs; and two Columns, double pointed, which were dug in the Hartz Forest; are all I have of it.

Nature has mixed its Particles among the Matter of the Marbles and Limestones; from whence it is washed forth by the pervading Water, and left slowly by it, in their Cracks and Fiffures; where it assumes these various Forms:

1. Pure Rhombs of a larger Size.
2. Rude Masses, formed of coarse connected Rhombs.
3. Plates composed of connected Rhombs.
4. Columnar, Pyramidial, and Cubic Figures, fixed upon the Surface of these rude Masses\*.

In this latter Case the rude Mass continues uncoloured, and is the Root; and the columnar or pyramidal Figures rise from it frequently yellow, often of other Colours: These cut into a Kind of Gems, but still have the double

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\* The Stone from which the *Swedish Acid* before described is obtained, has been added to these; but erroneously. It is a distinct Body.



Refraction equally with that Part we call the Root.

5. Icicles and Dropstones.

That the Spar formed in Fissures of Rocks, is thus washed out of the Limestone itself is certain :

Because none but Limestone Rocks have Spar in their Fissures ; Rocks of Crystalline Matter, or formed of vitrifiable Stone, have Crystal ; never Spar in their Cracks.

*Linnæus* wonders at the Nature of that Force which split the Rocks into these Cracks : But probably the Cause is very familiar ; they were formed moist, and cracked in drying.

Spar grows continually ; for wheresoever there is a Crack in a Limestone Rock, new, or old ; Spar always fills it ; and over-runs the Surface.

Letters cut hollow in a living Rock of Limestone, fill up, in a Course of Years, with Spar ; and what were made in Creux are found in Relief. This has been seen in *Gothland* by the eminent *Swede* ; and in the Grotto of *Antiparos* by *Tournefort*. The very Time may be determined by the Dates, which are often a Part of the Inscription ; but it is always long. The Spar stands higher as the Time is more distant : and has been seen in some Places a Quarter of an Inch above the Level of the Surface.

If there could want a Proof of the continual Growth of Spar, the Stalactites would shew it ; and the Incrustations, in what are called our



petrifying Springs ; but that is a fouler Sort : There is in *Norway* a Pyramid of Spar two Inches long, which was once mine ; in which two Branches of the solid Heath Moss, or Lichen, are perfectly embodied.

It has been thought the Spar in Cracks of Rocks was brought from elsewhere by Water ; or was and is originally in all Water : The latter is the Opinion of *Linnæus* ; *Henkell* maintains the former. But if either were the Case, Spar would be sometimes found in vitrescent Rocks, and Crystal in those of Limestone ; which Observation denies.

Spar they say will be formed where Water can be retained ; but indeed also where it cannot ; 'tis enough that it ouzes slowly : Nay, not Water alone dissolves Spar ; but it can be retained in Vapour. I have from *Cornwall* Incrustations of true Stalactite, formed in the Pipes of Fire Engines in the Mines, at Heights to which the Water never ascends, by many Feet ; but only Vapour.

Mundick is also thus a Creature of the Air, in many Places. I have trigonal Pyramids of Spar, which hung from the Top of the *Bauman's* Cave, in the *Hartz*, covered with Cubic Mundick ; there is none in the Spar itself ; and from the particular Circumstances of the Specimen, Water could not have lodged upon it, only Vapour.

Spar is one Thing, of one Weight, one Hardness, and when pure can never be mistaken for any other Fossil. It is liable to have  
other



other Bodies mixt with it; and to be altered in its Condition by that Mixture: But 'tis itself the same. *Wallerius* distinguishes three Degrees of Hardness in this Fossil; but they are owing to those Mixtures; the least hard is the true Condition of Spar; the other Degrees arise from Iron, or other Additions.

It is the Opinion of *Linnæus*, that Spar owes its angulated Form to Sea Salt; and the Crystals to other Salts: But there is no Warrant in Nature for this Judgment. Salts are acrid, and dissolve in Water. These Fossils have neither of those Qualities: And who shall tell us that the Property of forming itself into regularly angulated Figures is peculiar to Salts? We have no Authority to believe it is wanting in Crystal, and Spar; and we have the Evidence of our Senses that they have it.

The ingenious and ingenuous *Cronstedt* well observes, these Figures ought not to be ascribed to Salts, till the Presence of such Salts can be proved in them.

The calcareous Nature of Spar is of its Essence; and no Form, nor all the other Characters in the World, could constitute a Thing a Spar that wanted this. They all ferment with Acids, and they burn to Lime: Nor is this latter Quality equivocal, as some would think, because by the Fire of a great Burning Glass, Spar vitrifies. This is not the Fire, when we speak of Lime; and it can be a Test of nothing because all Things vitrify before it:  
That



That is the extreme Force of Fire: And the ultimate Effect of Fire on all Bodies is Vitri-  
fication.

*Linnæus* says, the Spar he calls *Natro-spa-  
tosum*, scarce does effervesce with Acids: And  
it may be added, that the Particles of that Spar  
are scarcely at all rhombic: Spar and Crystal  
are mixt in those Bodies; and they have mixt  
Qualities; but still as there is some Spar, there  
is some Effervescence.

'Tis vain to give the Forms of Spar to Na-  
trum; for we not only find no Natrum there,  
but different Spars have Forms of different Salts;  
and the great Patron of the Salt System allows,  
that some of them affect the various angulated  
Figures of Alum, Sea-Salt, Vitriol, and the rest.  
'Tis true, they resemble those Forms; but they  
have not those Forms exactly: Nor is either of  
these, or any other Salt whatever, to be found  
existing in any of them.

But whither will not the Wind of Theory  
blow even the steadiest Judgments? The fore-  
most of the Writers, who favour this System,  
because there are in Spars certain Forms that  
do not agree with those of any known Salt,  
fancies for the Formation of these that there  
exist Salts, not otherwise known to us, but by  
this Operation. When Theory can reach this  
Heighth, it may do what it pleases: To create  
Causes, because we see Effects that seem to us  
to require them, is to make all Things easy;  
and at the cheapest Rate.

If



If we can ever bring Spar, after Solution, to recrystallize, as Salt; we shall see all Things explained in this Particular. 'Tis what I have tried four Years, with poor Success; and I have now requested the ablest Chymist that we have, to join with me in the Attempt. What may arise under his experienced Hand, I know not: All I have found is, that the swifter the Fluid is evaporated, the coarser is the Matter left behind; and the more Length of Time is given, the nearer it approaches to a Promise of Crystals.

I think when this shall be accomplished, we shall find all Spar to be but one Thing; differing only according to the other Matters mixed with it. 'Tis said, the Selenite powdered and mixt in Water affords Crystals; and *Kabler* gives the Authority of an eminent Metallurgist for it: With me neither has this succeeded yet: But I have no Despair; and tho' it never should succeed with me, it may with others: When that is seen, the other, more important as it is, need not be supposed impossible.

Nothing is more familiar than the Production of what it is the Custom to call, Selenitical Salts; Urine affords them; and some Preparations of Sulphur; but to recrystallize Selenite is, to produce, from a clear Fluid, pellucid dodecahedral Rhombs, flexile, not elastic, and not soluble again in Water: And he who shall effect this, need not despair of recrystallizing also Spar,



The Salts in Urine that has stood long come nearer the Nature of Fossils than any Thing we know; and Tartar, formed from Wine, is very difficult of Solution: Yet both these may be melted in pure Water. The Salt produced by slow Crystallization from a Lixivium of Lime and Sulphur, comes nearest of all to Spar; but still it is but an Approach; and not a Sameness: As he who is well acquainted with all the Qualities of the vitriolated Tartar will perceive: Nor do I conceive *Henkel's* Receipt, formed on the same Foundation, would go any farther: But till Men speak plain, 'tis vain to war against their buried Meaning.

In fine, the Formation of Spar is yet a Subject of Enquiry: Its Atoms are all Spar; each Particle into which we can without Violence divide it, is the same in all Respects as the Whole: And as the Fossil World admits no Generation, or Birth, by Egg, or Seed, it seems most probable that all the Variety of Forms in which we see this Protean Mineral, are owing to no Cause beside the Arrangement of Rhombs into as many Forms as they are capable of producing. It fills the Cracks of its own Rocks: And of no other: For Crystal Columns rise from crystalline Rocks; and from metallic Masses, fractur'd, grow Pyritæ; each separated from the great mixt Body we see split; and each formed into Figures by its own Laws, without the Intervention of Salt, or other Matter.

We



We find hollow Crystals, and we have hollow Pyramids of Spar; but 'tis a rash Thought, tho' of a great Man, to imagine that a Crystal of Salt was first formed in these Cases; and when the stony Coat was finished over, it melted away again: This is Imagination: But there is not a hollow Stalactite that may not shew the Senses, and convince the Reason, that this Shell of Spar, or Crystal, may be formed without a solid Nucleus.

There are no entire Rocks of Spar; and they who thought they had seen such of Crystal, perhaps mistook pure Ice for them. Both Spar and Crystal rise in general from fowl Stones; and they who thought Ice grew to them in Time, were scarce more pardonable than such as took Ice for them. *Scheukzer* has seen the Difficulty of accounting for their Forms, and joined the Lamentation of Philosophers upon that Subject; for the Salt System was not then in being: But the old *Pliny* has not only lamented this Difficulty, but assigned its Cause; and this a Cause to overthrow that System utterly: It is, that tho' the Figures be all regular, they are not all alike; or all resolvable into the same Laws.

'Tis an invidious Office, and unpleasing, to dwell upon the Errors of those who wrote before; but these are so received, and so established, that there is no other Way to Truth.

*Wallerius* says, that Spar is composed of rhombic and pyramidal Particles: And therefore



fore breaks into both these Forms. It is unwillingly I dissent in a few Particulars, from an Author with whom Reason and Observation command me to agree in a great many: But this is a Doctrine which strikes at the Root of all accurate Knowledge in respect of this Body.

By this Account Spar would be two Things, not one: Its Atoms would have two Figures; and we should lose the great Distinction by which it is kept separate from all other Bodies. I have examined this Point with all possible Attention; and find the pyramidal Figures of Spar, whether in greater or smaller Pieces, to be a secondary Form; composed always of Rhombs: But the rhombic Figure never to have any Form in its constituent Parts beside its own. The Pyramids, great or small, separate into Rhombs; the Rhombs never into Pyramids. The true Way of dividing Spar is, by an Acid, carefully managed; for the Parts are always separated, before they are dissolved.

It is a singular and a just Observation of the same Author, that no pentagonal Spar has ever been found; tho' Angles in most other Numbers are frequent; but this is not to be attributed with him, to an imaginary Salt, Alkaline, and Muriatic; it rests upon a much more solid Base: Which is, that the particular Figure of the Rhombs of Spar, admit the constructing any other angulated Form, only not pentagonal.

It



It has been said, that Island Crystal shines in the Dark after it has been calcined in Manner of the *Bolonian* Stone; but this is not particular to that Species: It is the Quality of all Spar as Spar; only there requires great Nicety in the Calcination: Perhaps Selenite also has this Power. *Linnaeus* refers the *Bolonian* Stone to Spars: To me it has appeared rather a Selenite; and of all Bodies in Nature, most of Kin to that Species of Selenite we call the Star, upon the waxen Vein. I have therefore retained it in that Place, till more of this scarce Fossil comes in my Way for Trial: If it proves Spar, 'tis easily removed into that Class; and thus, and only thus, we can arrive at Truth; after a thousand Errors.

That the Hog Spar affords Flowers on Sublimation, has been urged as a great Proof of its containing Salts of some Kind or other; known or unknown: But surely this Property is more naturally resolved into another Source. All Bitumens yield Flowers on Sublimation; and we have the Testimony of our Senses to the Presence of a Bitumen in the *Lapis Suillus*: It stinks of it. Nay more, there is a Smell of Sulphur in all Spar, when calcined: *Henkel* and *Wallerius*, as well as I, have found it; and if we could give way to any Thought of secondary Forms in a Fossil whose Construction appears perfectly homogeneous, and simple, my Sense of it would be, not to seek them in imaginary Salts, but real Sulphur.

We



We see the Way Art imitates it best, is by the Crystals of a Liquor in which Lime and Sulphur have been boiled. Sulphur is thus disclosed on the calcining of Spar; and for the other Ingredient, Lime, we cannot be at a Loss; since it has been observed, no Spar is ever produced in Cracks of any Rocks, except those of Limestone: Nay, and what may strengthen this Opinion, the Lime of Spar is weaker than that of Limestone, which a little Sulphur may cause. All this, is but Conjecture; and is delivered as such, and no other; but yet it rests on the Testimonies of the Senses; not on the Flights of the Imagination: And it is by Conjecture, in these dark and difficult Researches, we must arrive at Truth.

I claim no better Authority for many of the particular Observations here, than for this general one; they are indeed all founded on Examination, and Experiments, now made on the Occasion; but they are Examinations and Experiments made only on the Bodies in my own scanty Store: I invite, I solicit, and intreat with my best Earnestness, others to repeat them on their own. If they answer as in mine, the Doctrines are established; if they differ, there is no one in the World to whom that Truth will be more welcome than to myself. To equivocate about an Error, is pitiful: to attempt to justify it, is disingenuous: No Man should be ashamed of setting right his own Mistakes (especially in  
Matters



Matters where Mistakes are unavoidable) whether by his own or others Observation. With how many hundred Errors did the *Species Plantarum* make its first Appearance; how many of them have been rectified; and how many yet remain to be set right? Yet no one ever blamed *Linnaeus* for his first Conjectures; nor has the World seen any other Book of Science of equal Value.

Such Errors are the Children of imperfect Information; and must be found in all who attempt to write for general Utility.

Let others therefore freely repeat these my Experiments, and add more of their own; and with an honest Freedom tell the Result of all. My single Attention can only make a few Experiments, where true Knowledge demands a thousand: But the Result of different Trials will bring forth Truth.

It never was more needed in Philosophy than in the Part before us; for with all the Plausibility of System, we cannot but perceive, upon this free and fair Enquiry, that the Student in Fossils has yet to work upon a Chaos: And that the Paths into a better Light, are stopped and closed up utterly: Not by Ignorance; but what is much worse, by authenticated Error; authenticated even by greatest Names. We must unwind this Charm, if ever we hope to gain the right Clue to lead us thro' the Labyrinth of Nature: We must break the fated Talisman; and all the seemingly impregnable



Structures will vanish: The Ground will be clear before us; and if we lose ourselves in the open Way, 'tis easy to be set right again.

Spar formed by Nature, as above related, may either concrete in its pure State as soon as made; or it may pass, while yet fluid, thro' various Strata of earthy, saline, Mineral, and other Matter, and receive great Changes both in Form and Colour from them: It may appear to us therefore, according to these Circumstances, either

in its own pure State of a colourless Rhomb;

or foul'd by Earths; or tinged by Metals;

or plated, by an Admixture of Talc;

or rendered cubic by the Natrane Marle; and those Cubes stained to a Mimickry of Gems by Metals;

or it may be shaped into Polygons by an aluminous Earth;

or thrown into Pyramids, with or without Columns, by the Salts of Mineral Waters:

Or from the mere Nature of its Concretion, it may appear as Curtains spread upon a Wall;

as Icicles hanging from a Roof;

or Globules drop'd upon the Floor;

or as a Coat upon Mosses, or Shells, or various other Matters.

According to these Accidents it may be thrown into a Kind of Method, under the Terms Genus and Species, to great Advantage.



The obvious Characters giving an artificial Method; and the Consideration of their Origin a natural one.

Nor is it more difficult, with due Care and Attention, to follow the several other Fossils thro' their gradual Approaches to Perfection, in their various Kinds; and by marking the Degrees and Steps of this Ascent, to lay down a sure Foundation of the most desirable of all Attainments in this Study, a natural Method: Dividing them into Genera, Species, Varieties; and a yet subordinate Distinction to all, Varieties of Varieties. For Instance;



Genus. Species. Variety.  
Marles,

In their Ascent to Ochre, assume the following Names and Characters :

1. White Marle—*Melinum* of the Antients.

This takes in *Chalk*, and becomes,

The CIMOLIA of the Antients.

*Bole*, and becomes,

The COLLYRIUM SAMIUM of the Antients.

*Clay*, and becomes,

The MARGA FUNGOSAI.

*Spar*, and becomes,

LAC LUNÆ.

*Talc*, and becomes,

The ASTER SAMIUS of the Antients.

2. Brown Marle—*Fullers Earth*.

This takes in *blue Clay*, and becomes,

The BLUE MARLE of *Staffordshire*.

*brown Clay*, and becomes,

The BROWN MARLE of *Suffex*.

*Sand*, which is *Crystal*, and becomes,

The TERRA SAPONARIA of *Kentman*.

3. Red Marle—*Reddle*.

This takes in *Fullers Earth*, and becomes,

The MARGA SAXATILIS INCARNATA of *Worm*.

*Bole*, and becomes,

The RUBRICA FABRILIS of *Kentman*.

*Clay*, and becomes,

The RED STONY MARLE of *Yorkshire*.

4. *Black Marle*.

This takes in *decayed Animals and Vegetables*, and becomes,  
GARDEN MOULD.

This is shown by their Decomposition; and proved by their specific Gravities.



Variety of Variety.

This *Cimolia*, taking in *Bole*, becomes,  
The TERRA MELITENSIS of the Shops.

This *Fungosa* takes in *Chalk*, and becomes,  
The TERRA CHIA \* of the Shops.

This *Lac Lunæ* takes in *Chalk*, and becomes,  
The GYPSUM TYMPHAICUM of  
the Antients.

This *blue Marle* takes in *Morochthus*, and becomes,  
The MARGA COLUMBINA of *Pliny*.

This *brown Marle* takes in *Chalk*, and becomes,  
The MARBLED MARLE † of *Yorkshire*.  
*yellow Clay and Sand*, and becomes,  
The YELLOW MARLE of *Suffex*.  
*Clay and Selenites*, and becomes,  
The STONY MARLE of *Staffordshire*.

This *Saponaria* takes in *White Tripela*, and becomes,  
The TERRA NOCERIANA of the Shops.

This *Rubrica Fabrilis* takes in *Clay*, and becomes,  
The HEAVY RED MARLE of *Kent*.  
*Red Bole*, and becomes,  
The ALMAGRA ‡ of *Spain*.

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\* This *Chia* takes in white *Bole*, and becomes,  
The PIPE EARTH of the *Isle of Wight* \*.

† This *marbled Marle* takes in *Sea Shells*, and becomes,  
The SHELLY MARLE of *Suffex*.

‡ This *Almagra* takes in *yellow Sand*, and becomes,  
The SIL SYRICUM of the Antients.

\* A most amazing Mixture; but proved by the irrefragable Testimony of  
separated Parts and their specific Weight.



Genus. Species.

Variety.

Ochres,

In their *Ascent* to *Tripelas*, assume the following Names and Characters.

1. White Ochre—The *Terra Melia* of the Antients.
2. Yellow Ochre—The *Ochra Attica* of the Antients.  
This takes in *Bole*, and becomes,  
The HARD OCHRE of the Painters.  
This takes in *Iron*, and becomes,  
The PENNSYLVANIAN OCHRE \*.
3. Red Ochre—The *Sil Atticum* of the Antients.  
This takes in *Spar*, and becomes,  
The FLORIDA OCHRE.  
*Clay*, and becomes,  
The RED VIRGINIAN OCHRE.
4. Purple Ochre—The *Terra Sinopica* of the Antients.  
This takes in *Cryſtal*, and becomes,  
The SIL MARMOROSUM of the Antients.  
*Iron*, and becomes,  
The OCHRE OF DEAN.
5. Brown Ochre—*Umber*.  
This takes in *putrified Wood*, and becomes,  
COLOGN EARTH.
- 6.—Green Ochre—The *Lapis Armenus* of the Antients.  
This takes in *white Sand*, and becomes,  
The GREEN OCHRE of Germany.]
7. Black Ochre.

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\* There is also a pure yellow Ochre of Chalybeate Springs, which is the *Earth of Iron*,



Variety of Variety.

- This *hard Ochre* takes in *Clay*, and becomes,  
The HEAVY OCHRE of *Yorkshire*.
- This takes in *Lead*, and becomes,  
The GIALLOLINO OF NAPLES.
- This *Sil Atticum* takes in *Chalk* and *Bole*, and becomes,  
The BENGAL EARTH.

This *Terra Sinopica* takes in *White Bole* and *Clay*, and becomes,  
The VENETIAN RED BOLE\*.

This *Green Ochre* of *Germany* takes in *Copper*, and becomes,  
GREEN MINE OCHRE.

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\* This *Venetian Red* takes in *Iron*, and becomes,  
The PERSIAN EARTH of *Ormuz*.



Genus. Species.

Variety.

Tripelas,

In their Ascent to *Boles*, assume the following Names and Characters.

1. White Tripela—The *Creta Argentaria* of the Antients.

This takes in *Ochre*, and becomes,

The COMMON TRIPELA, or Gleba  
Alanar.

*blue Clay*, and becomes,

The TERRA MELIA of *Dioscorides*.

*Spar*, and becomes,

HARD CHALK,

2. Brown Tripela—called *Rotten Stone*.

This takes in *Spar*, and becomes,

The FRENCH ROTTEN STONE.

*Talc*, and becomes,

The WILTSHIRE ROTTEN STONE,

3. *Red Tripela*.

This takes in *Talc*, and becomes,

LAMINATED TRIPELA,



These several Varieties are not found to admit of any other Mixture.



Genus: Species.

Variety.

Boles,

In their Ascent to *Clays*, assume the following Names and Characters.

1. White Bole—The *White Bole Armenic* of the Shops.  
 This takes in *Chalk*, and becomes,  
     The FRANKFORT EARTH of the Shops.  
*Marle*, and becomes,  
     The TERRA LIGNICENSIS of the Shops.  
*Clay*, and becomes,  
     The TERRA MELITENSIS of the Shops.  
*Spar*, and becomes,  
     The WHITE TUSCAN EARTH.  
*Crystal*, and becomes,  
     The TERRA LEMNIA ALBA of the Shops.
  
2. Yellow Bole—The *Yellow Lemnian Earth* of the Shops.  
 This takes in *Marle*, and becomes,  
     The TERRA LIGNICENSIS LUTEA of  
     the Shops.  
*Clay*, and becomes,  
     The BOLUS TOCCAVIENSIS of the Shops.  
*Spar*, and becomes,  
     The BOLE ARMENIC OF GALEN.  
*Iron*, and becomes,  
     The TERRA LIVONICA LUTEA of the  
     Shops.  
*Copper*, and becomes,  
     The GREEN BOLE of *England*.
  
3. Brown Bole—The *Silesian Bole*, or *Axungia Solis*.  
 This takes in *Marle*, and becomes,  
     The PALE GERMAN BOLE.  
*Clay*, and becomes,  
     The GOSSELAER BOLE.
  
4. Orange Bole—The *Bolus Bohemica* of *Kentman*.
  
5. Red Bole—*Red Bole Armenic*.  
 This takes in *Marle*, and becomes,  
     The CAROLINA BOLE.  
*Tripela*, and becomes,  
     The TERRA PORTUGALICA of the Shops.  
*Clay*, and becomes,  
     The TERRA SIGILLATA RUBRA MAGNI  
     DUCIS.



Variety of Variety.

This *Frankfort Earth* takes in *White Clay*, and becomes,  
BENGAL BOLE.

This *Malta Earth* takes in *Natron*, and becomes,  
The TERRA ERETRIA of the Antients.

This *Goffelaer Bole*, takes in *Pnigitis*, and becomes,  
SPOTTED BOLE. 16.

This *Bole Armenic* takes in *Bitumen* and *Natron*, and becomes,  
The TERRA LEMNIA RUBRA.

This *Carolina Bole* taking in *Spar*, becomes,  
The BOLE OF BLOIS.

This *Portugal Earth* taking in *Marle*, becomes,  
The TERRA TURCICA of the Shops.

This *Tuscan Earth* taking in *Marle*, becomes,  
The TERRA LIVONICA of the Shops.

*Spar* and *Clay*, becomes,  
The EARTH OF STRIGA.



Genus. Species.

Variety.

Clays,

As they advance in Purity, assume the following Names and Characters.

1. White Clay—*Tobacco Pipe Clay* of *Pole*.  
This takes in *blue Clay*, and becomes,  
The PIPE CLAY of *Northampton*.  
*Spar*, and becomes,  
The PARETONIUM of the Antients.
2. Yellow Clay—*Brewers Clay*.  
This takes in *Chalk*, and becomes,  
The YELLOW POT EARTH of *Staffordshire*.  
*Crystal*, and becomes,  
HEDGERLY LOAM.  
*White Sand*, and becomes,  
NORTHAMPTONSHIRE POT EARTH.  
*Pale yellow Sand*, and becomes,  
COMMON LOAM, or Brick Earth.
3. *Brecon Clay*—from *Chedder Rocks*.  
This takes in a fine *black Marle*, and becomes,  
The MARBLED EARTH OF LEMNOS.  
*Selenites*, and becomes,  
FINE TILE CLAY.  
*Yellow Sand*, and becomes,  
FOUNDERS CLAY.
4. Blue Clay—in the Cracks of Strata.  
This takes in *Marle*, and becomes,  
The COARSE POT EARTH of *Leicestershire*.  
*Bole*, and becomes,  
One of the CHINA EARTHS.  
*Yellow Sand*, and becomes,  
SHROPSHIRE POT EARTH.  
*Talc*, and becomes,  
The NORTHAMPTON CLAY.
5. Green Clay—from Ochre Pits.  
This takes in *Marle*, and becomes,  
The MENDIP CLAY.  
*Selenites*, and becomes,  
The DORSET CLAY.
6. Red Clay.—*Mahogany Earth* of the *Isle of Wight*.  
This takes in *Spar*, and becomes,  
The FINE RED STAFFORDSHIRE EARTH.  
*Crystal*, and becomes,  
The PALE STAFFORDSHIRE EARTH.
7. Black Clay—The *Pnigites* of *Galen*,  
This takes in *White Clay*, and becomes,  
The SUSSEX PIPE CLAY.



## Variety of Variety.

- This *Northampton Pipe Clay* takes in *yellow Sand*, and becomes,  
COMMON POT EARTH.  
*White Sand*, and becomes,  
The HARSH CLAY OF STAFFORDSHIRE  
*Brown Sand*, and becomes,  
The FINE STAFFORDSHIRE EARTH.  
*Large pale yellow Sand*, and becomes,  
FINE GREY BRICK EARTH.
- This *Parretonium* takes in *White Sand*, and becomes,  
GOLT.  
*Yellow Sand*, and becomes,  
LEICESTERSHIRE POT EARTH.
- This *yellow Stafford Earth* takes in *Crystal Sand*, and becomes,  
POOR EARTH OF STAFFORDSHIRE.  
*Talc*, and becomes,  
SHROPSHIRE BRICK EARTH.  
With *yellow and white Sand and Talc*,  
DORSET BRICK EARTH.
- This *Tile Clay* taking in *white Clay*, becomes,  
The HARD STAFFORDSHIRE EARTH.  
*Spar*, becomes,  
The OXFORDSHIRE FLOOR CLAY.
- This *Founders Clay* takes in a *large white Sand*, and becomes,  
The RED BRICK CLAY.  
*Garden Mould*, and becomes,  
TILLAGE LAND.
- This *Shropshire Pot Earth* takes in *Spar*, and becomes,  
GALLYPOT EARTH.  
*Selenites*, and becomes,  
BLUE BRICK EARTH.
- This *Mendip Clay* takes in *Spar*, and becomes,  
The GREEN HAMPSHIRE EARTH.
- This *Staffordshire Red* takes in *Spar*, and becomes,  
The PURPLE STAFFORDSHIRE EARTH.  
*Brown Clay*, and becomes,  
COARSE BRICK EARTH.  
*Iron*, and becomes,  
The RED LAND of *Roswell*.
- This *Suffex Pipe Clay* takes in *Selenites*, and becomes,  
The LIGHT MENDIP CLAY



And in this Manner may the whole Fossil World be arranged, upon the certain Principles of Decomposition, and the specific Gravities of the several separate Parts: It will be a Work of Time; but the Plan is here.

S. I. N. I. S.

G R E E K



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T W O  
L E T T E R S:

O N E,

On the Colours of the SAPPHIRE  
and TURQUOISE.

AND THE OTHER,

On the Effects of different Menstruums  
ON COPPER.

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LETTERS  
TWO  
LETTERS

On the Colours of the Sapphire  
and Turquoise  
AND THE OTHER  
On the Effects of different Medicines  
on Colours



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# L E T T E R I.

## On the Colours of the S A P P H I R E and T U R Q U O I S E.

S I R,

**W**HEN my Notes on THEOPHRASTUS were mentioned Yesterday, some objected to the *Sapphire's* being coloured by Particles of *Copper*, and seemed very firm in the Opinion, that that Gem owes its Dye to a *Native Zaffer*.

I am sorry I have only Room to name Things in those Notes, without Opportunities of entering into a Detail of the Experiments. Thro' the Course of those Notes I have not tied myself down to the Sentiments of any particular Author, but have, as my own Experiments and Observations directed, at Times agreed to, and in other Places dissented from, the Opinions of the whole Number. And how I have succeeded in this Example, the fairest Way of judging will be



first, fairly to give the Arguments used in Support of the other Opinion ; which are principally three, and have the Appearance of being of some Weight. They are :

1. That the *Turquoise* is evidently coloured by the same Matter with the *Sapphire*, and that the Matter of its Colour is known to be a *Native Zaffer*.
2. That *Copper* is not capable of giving the deep Blue of some of the deeper *Sapphires* ; and of the *Veins* and *Striæ* of the rough native *Turquoises*.
3. That *Zaffer* is the Substance which colours the common blue Glass ; and that it is capable of giving it the Colour of the deepest native *Sapphires* ; as is evident from the counterfeit ones which are coloured with it, and are of all the Degrees of Colour of the genuine,

To which permit me to answer,

*First*, That it was incumbent on the Assertors of this Doctrine, to have proved the Existence of this *Native Zaffer*, before they attributed such great Effects to it. I am not ashamed to say, that I don't know what *Native Zaffer* is ; that I never yet saw any such Fossil, nor believe I ever shall : And, notwithstanding that Dr. *Woodward*, and some other able Naturalists have ventured to name some of their unknown Specimens native *Zaffers*, I cannot bring myself to think that Nature  
ever



ever formed any Substance that could be properly so called; all that I have been shewn as such, having been Things which a little Chemistry was able to shew that Naturalists ought to have been ashamed of calling by such a Name: Not that I would pretend to limit the Operations of Nature within the Bounds of our narrow Understandings; or declare any Thing impossible, because it has not yet been seen to be effected: But I think the Assertors of such great Effects from so very uncertain a Substance, ought, if ever they had seen it, to have given a more rational Account of it than any we have at present.

The *Zaffer* we know, and with which the blue Glass and counterfeit *Sapphires* are stained, is a Preparation which seems to owe its present Mode of Existence to the extreme Force of Fire; and is perhaps no genuine Production of Nature, even in a latent State, except in its constituent Principles. It is prepared from *Cobalt*, affording, by the Assistance of Fire, the Arsenics, this Substance; and *Smalt*, with the Addition of a fixed Alkali. After the Fire of a reverberatory Furnace has driven off the arsenical Particles, the remaining Mass is powdered and calcined three or four Times over; and then being mixed with three Times its Quantity of powdered Flints, affords us the common *Zaffer*.

But it may be proper to examine what Weight, even allowing the Existence of a *na-*



*tive Zaffer*, there is in the Arguments founded on its supposed Effects.

And to the *First*, That the *Turquoise* and *Sapphire* are coloured by the same Matter, and that this Matter is universally allowed to be a *native Zaffer*: I shall answer, That I allow the *Sapphire* and *Turquoise* to be coloured by Particles of the same Kind; that I know it to be the common Opinion, that the *Turquoise* is coloured by *Zaffer*, and not by *Copper*: But that I also know it to be an erroneous one. I know the *Turquoise* owes its Colour to *Copper* only; having succeeded in a Course of Experiments, by which I have been able to divest the *Turquoise* wholly of its Colour; to precipitate and preserve that Colour separate and alone; to prove that Colour, by the Effects of different Menstruums, to be absolute Copper; and, by Experiments founded on this Process, to give, by a Solution of Copper in a volatile Alkali, the true *Turquoise* Colour to the Substance of the *native Turquoises*, which is absolutely no other than animal Bone; and to make, by that means, those factitious *Turquoises*, which have been put, before a judicious Assembly, to the severest Trials; and gave all the Marks of the genuine.

To the *Second* Argument, That *Copper* is not capable of giving so deep a Blue as that of some of these Gems; I have a Solution of *Copper*, the very one with which I stained the factitious *Turquoises*, which is of the true Colour



of the deepest Male *Sapphires*, and deeper than the commonly called *black Veins* of the rough native *Turquoises*, if carefully examined.

The Authors of this Objection might, indeed, have known, from the excellent Mr. *Boyle's* Experiments, that *Copper* is the last Thing to be, with any shew of Reason, suspected of wanting this Property; for that Gentleman has proved, that a Grain of that Metal is capable of giving a blue Colour to 530,620 Times its Bulk of Water.

In regard to the *Third* Argument, That the genuine *Sapphires* are probably coloured by *Zaffer*, because blue Glass, and the counterfeit *Sapphires* are so; I cannot but observe, that external Appearances are of little Weight in Philosophy; and I am sorry to say, that it was only a very superficial View of these Things, that could start an Objection to *Copper's* colouring the *Sapphire*, from them: For a more careful Examination of these very Bodies, must afford Arguments for the contrary, as it will evidently prove, that the Colour of the *Sapphire* cannot be owing to the same Substance with that of these Glasses: Since the very Heat necessary for forming them, would, in a few Minutes, wholly divest the finest *Sapphire* in the World of all its Colour.

The common blue Glass is made from the common or crystal *Frit* melted with *Zaffer*; and the finest counterfeit *Sapphires*, with a crystal *Glass*, worked with an Admixture of *Lead*, and this *Zaffer*, in the Proportion of



about one fiftieth Part. The *Lead* gives, in this Case, an additional Density to the Glass, which adds greatly to the Lustre of the counterfeit Gem; as the more dense the transparent Matter is, the more bright and vivid the metalline Tinge appears through it; but while *Lead* thus increases the Density, it debases the Glass in another respect of equal Consequence, in that it makes it softer. Whichever of these Substances, however, is made the Subject of this Experiment, the Effect will be the same; for if we bring to the Trial of only a clear Charcoal Fire, a genuine *Sapphire*, and either of these factitious Substances, and throw them together into it, we shall soon see that they owe their Colours to Particles of a very different Kind; for the Genuine will be seen to emit a fine clear blue Flame, the Counterfeit not so much as the least Vapour; and when, after this, they are taken out together, the true *Sapphire* shall be found wholly colourless and transparent as a Piece of Crystal, and the Counterfeit or Glass, unaltered.

Fire, which is thus able to divest the *Sapphire* of its Colour, has also the same Effect on the *Turquoise*; as the Workers on it well know: And this is easily accounted for, if they are coloured, as I am convinced they are, by a fine metalline *Sulphur*. But I will venture to affirm, that it could not be the Case, if those Gems were coloured by a *Zaffer*.

Let it not be here objected, that the Workers on the native *Turquoises* are obliged to have  
 Recourse



Recourse to Fire to give them their Colour; and that therefore it is not probable, the same Power should be able to take it away; for the Truth of this, is only, that the Colour of the native *Turquoises* of some Countries is not equally spread through the whole Mass, but lodged in different Parts of it in Form of *Veins* and *Striæ*: It is to dislodge the Colour from these *Veins*, and diffuse it equally thro' the whole Mass, that they have Recourse to Heat: A very gentle Fire is all they dare trust on this Occasion, and is always found sufficient. What I would observe from the Whole of this is, that this Effect of Fire on the rough *Turquoises*, is a Proof that their Colour is owing to the same Particles with that of the *Sapphire*; and that this dislodging and diffusing it through the whole Mass, is the first Step toward the dissipating and entirely driving it off; for a little too long Continuance in the same Heat, will, as the Workmen too often find to their Sorrow, wholly drive off the Blue, and leave the Matter colourless, as the *Sapphire* when taken from the Fire.

*I am,*

*S I R,*

*Your humble Servant,*

JOHN HILL.



## L E T T E R II.

On the Effects of different Menstruums  
ON COPPER.

S I R,

I N a Letter of the 19th of last Month, which you did me the Honour to read before the ROYAL SOCIETY, I endeavoured, principally by means of some Experiments I had been lately making, to settle the Question so much disputed among the present Naturalists, Of, what the blue Gems in general are coloured from. What engaged me in the Dispute, was an Objection raised against the Opinion I had declared myself of in this Case, in my Notes on *Theophrastus*: And I am very happy to find, that even the Gentlemen who made that Objection are now convinced, that it is to *Copper* alone that the *Sapphire* and *Turquoise* owe their beautiful Blue.

For myself, I must acknowledge, that tho' I have long been convinced of the Fact, the Manner in which it was effected, was long a great Difficulty to me: The Menstruum in which my Tincture of *Copper*, (which proved  
to



to the Senses, that *Copper* was capable of giving the deepest and finest Blue imaginable) was made, was a volatile alkaline Spirit: And where Nature could find, in the Bowels of the Earth, any Thing analogous to a volatile urinous Alkali, produced by Chemistry, was a Question not easily answered. The particular Salt of the mineral Waters seems to approach, indeed, something to a Menstruum of this Kind; and Dr. *Hoffman* has proved, that it is at least much fitter to be classed with the Alkalies than with the Acids. But the System of the Colours of the blue Gems being from *Copper*, must stand upon a very precarious Basis, if there could be found no other Menstruum than one we are so very uncertain about, to strike their Colour from that Metal.

*Copper*, however, is, in Truth, perhaps the farthest of all the Metals from being subject only to the Power of one appropriated Menstruum; and a Course of Experiments on it, have now shewn me, that we need not have Recourse to so uncertain a mineral Substance as this latent Alkali, for producing a Blue from it; but that Menstruums of another Kind, even Acids, and those the very Acids, whose Principles are the commonest of all others in the Earth, can afford us the same Colour; and are every where to be found in great Abundance. Gold is soluble only in *Aqua regia*; for all the other Menstruums that are talked of for it, have a genuine Sea-salt for their Basis, and are therefore only so many  
Kinds



Kinds of *Aqua regia*; Silver, in *Aqua fortis*, but not in *Aqua regia*, or *Spirit of Salt*, or *Oil of Vitriol*, or, in short, in any but the nitrous Acids: whence it may very properly be said, that Sea-salt is the true Dissolvent of Gold, and Nitre of Silver. Lead is readily dissolved by the weaker Acids, but not at all by *Aqua regia*, and but difficultly by many of the stronger; Iron by most of the acid Salts; and Tin by *Aqua regia*, and not easily by any other Menstruum, unless first divested of its Sulphur by Calcination; but *Copper* is to be dissolved by every Kind of Salt; and, in short, by almost every thing that ever had in Chemistry the Name of a Menstruum; and produces, with its different Solvents, an almost infinite Variety of very beautiful Colours: So that it may indeed have been the Basis of the Colour of, perhaps, more of the Gems than has yet been imagined.

Filings of *Copper* dropt into the Flame of a Lamp, thrown into an horizontal Direction by a Blow-pipe, emit a very beautiful green Flame.

Mixed with three Times their Quantity of corrosive Sublimate, and afterwards divested of the Mercury by Fire, they form, with the remaining Salts, a transparent Refin of a beautiful *Hyacinth* Colour, which will melt and burn in the Fire, emitting also a fine green Flame.

Exposed to the Fumes of Quicksilver, they become white and shining like Silver.

Melted



Melted with *Zink*, they make an uniform Mass of a fine gold Colour, as they do Brass with Calamine.

Held over melted Orpiment, they become not only white but brittle.

And by extreme Violence of Fire, are converted into a hard, dense, glassy Matter, of a deep Red; transparent, and in some Degree resembling the *Sorane Garnet*.

It has been the general Opinion of the Chemists, that Solutions of this Metal in Acids were green, and in Alkalies blue: Some, however have altered, from a few Experiments of their own, or perhaps only from what they imagined must have been the Success of Experiments, this general Account; and particularly among certain of the more modern Writers, it has stood, that *Copper*, dissolved in Acids or fixed Alkalies, affords a green Colour; and in volatile Alkalies, a fine Blue: But you will observe, by the following Experiments, that these Accounts are neither of them to be depended on: And, indeed, whoever has Disquisitions of this Kind to attempt, will always find, that it must be a Knowledge of Nature, and not of Books, that will afford him what he can depend on; and that Systems built on any Body's Experiments but his own, will be found to stand on a very infirm Basis.

What I have been able to learn, by repeated Experiments on this Metal in Menstrums of all Kinds, is, that the Solutions of it in different Fluids, cannot be, in regard to Colour, determinately



determinately reduced into Method at all: The different Acids having the Properties talked of in the Alkalies, of producing different Colours; and even the same Acid being sometimes capable of affording either a green or a blue Solution, according to the different Quantity of the Metal dissolved in it. In Cases of this Kind, however, I have every where judged the most perfect Solution the properest to describe the Effect of the Menstruum by: And of what I have principally learnt by these Experiments, be pleased to accept the following Account.

A Solution of *Copper* in Oil of Olives, is of a fine grass Green; in white Wax, of a bluish Green, approaching to the Colour of our *Aqua marine*; and in pure Water, of a dead whitish Green. In regard to these Menstruums it is, however, to be observed, that the expressed vegetable Oils do not dissolve *Copper*, as Oils, but by means of certain other heterogene Particles which they contain; for all expressed vegetable Oils contain in them Water, and a latent acid Salt: of both which, I am pretty certain, they may be wholly divested by Fire, and rendered, by that Means, incapable of acting as Menstruums on this Metal: For I have found, that Oil of Olives, after long boiling, has been capable of extracting scarce any Colour at all from *Copper*; and make no doubt but that it might be so perfectly deprived of its Acid, as well as Water, by long boiling with Litharge, or some similar Substance proper



per to imbibe its Acid, as to have no Power of dissolving this Metal at all. Nor is this latent Acid peculiar to the expressed Oils alone; those procured by Distillation evidently contain it also, as the excellent Dr. *Hoffman* has proved, who by grinding the distilled Oils of Lavender and Turpentine with Salt of Tartar, obtained thence a neutral Salt.

Wax, in like Manner, dissolves *Copper* no otherwise than by a true, genuine, and pretty sharp Acid, which it evidently contains, and which is easily separated from it by Distillation with a very gentle Heat. And in regard to Water, it may not be improper to observe, that though it is but a poor Dissolvent of Metals with us, yet it may in the Bowels of the Earth, do Wonders: For we find evidently, that the Power of Water, as a Menstruum, depends, in many Cases, exactly on its Degree of Heat; and as it is capable of the greater Heat, the greater Weight of the Atmosphere it is pressed by, we know not to what Height its Heat and dissolving Power may be raised at great Depths in the Earth.

Of the mineral acid Menstruums, Spirit of Sea-salt, Spirit of Nitre, and *Aqua regia*, all afford green Solutions of *Copper*, but with this Difference, that the Spirit of Salt gives a yellowish Green; the Spirit of Nitre a deep Green, with no Yellowness at all; and the *Aqua regia*, a bright vivid Green, but there is some Admixture of Yellow in it, about in the same Measure that it is in some of the Gems which

*Pliny*



*Pliny* describes by, *Quorum extremus igniculus in flavedinem exeat.* The Solution in Spirit of Nitre is of the true Emerald Colour, and extremely bright and vivid; and each of the others resembles very exactly the Colour of a particular Gem of the same Class; the first of them being perfectly of the Colour of the yellowish green *Prasius*, and the third of the *Smaragdo-prasius*.

These Colours are each of them very beautiful; and that of the Solution in *Aqua regia* is no other than what must be expected, when we know the Colours of the other two, the Spirits of Salt and Nitre being simple Menstruums, and affording a green, and a yellowish green Solution; and the *Aqua regia*, a compound Menstruum, partaking of the Nature of both the others, it must naturally give a Solution of a Colour between both, that is a Green with less Yellow than that of the Spirit of Salt.

But though these three acid Menstruums afford green Solutions of this Metal, it is too hasty a Conclusion to infer from thence, that all the Acid Menstruums will therefore do the same; for Solutions of Copper in Oil of Vitriol, Oil of Sulphur, and *Aqua fortis*, are all blue. They are in different Degrees, tho' all nearly approaching to each other, and the deepest of them not darker than that of the common *Turquoises*. These Solutions have also this peculiar Property, that they immediately precipitate their Copper on Iron, if immersed in them;



them; and may serve to explain the Effects of those vitriolic Waters which are said to convert Iron into *Copper*. A Piece of Iron Wire dipped into any of these Solutions, and taken almost immediately out again, is seen covered with *Copper* so far as the Menstruum has touched it; and by drawing the Fingers carefully over it, a fine thin Tube of pure *Copper* may be taken off from it: This may serve to shew us of what Kind the Menstruum is which Nature uses to produce the blue Vitriol from *Copper*, which in Solution has the same Effect; and proves that the Ziment or vitriolic Water, so famous for its supposed Virtue, of turning Iron into *Copper*, is no other than a blue Vitriol in a fluid State, because suspended in too large a Quantity of aqueous Matter; perhaps, indeed, containing Particles of many other Kinds, but evidently owing its characteristic Quality, to Particles of *Copper*, in a State very nearly resembling that of blue Vitriol, though at present in Solution.

That the natural Colour of Solutions of *Copper* in the vitriolic Acids is blue, is evident from only leaving a Drop of any of them on a Plate of *Copper*, which is presently covered with blue Crystals: And any one a little acquainted with Chemistry will know, that no Difference is to be expected in Solutions made with Oil of Sulphur from those with Oil of Vitriol; for these Acids differ scarce sensibly when both well rectified, and indeed appear, on strict Examination, to be really the same



Thing; the same universal mineral Acid, existent every where in the Earth, and sometimes perceivable by the Senses, in the suffocating Damps of Mines, being the certain Basis of both; as also of a third, that of Alum: And though the different Matter it meets with in Alum, Vitriol, and Sulphur, gives it a different Appearance in the Concrete, yet when freed from that Matter by Chemistry, and rendered as pure as that Art will make it, it appears the same Thing, whether drawn from one or the other of these Substances.

That Oil of Vitriol, therefore, and Oil of Sulphur, should produce a Solution of *Copper* of the same Colour, is no other than what must naturally be expected: But that *Aqua fortis*, which is a compound Menstruum, and made, though partly from Vitriol, which affords a blue Solution, yet partly also from Nitre, which we have seen before affords a fine green one, should give a simply blue Solution, as it evidently does, without the least Admixture of Green, may seem, at first View, something strange. But here I must observe, that Spirit of Nitre is the Menstruum I hinted at in the Beginning of this Letter, as capable of affording different Colours, from different Quantities of the Metal dissolved in it. And nothing, indeed, is more certain, than that the greenest Solution of *Copper* in Spirit of Nitre, may be turned into a pale Blue, only by adding more and more Filings of the same Metal, up to the proper Quantity for the Change,

These,



These, of all my Experiments on *Copper*, are what have afforded me the greatest Satisfaction in the Subject of the present Enquiry; as they shew, that Nature is so far from being tied to one single Menstruum for producing the *Sapphirine* Colour from *Copper*, that instead of the Colours of the blue Gems being owing only to the Effects of a single, scarce, and indeed uncertain Menstruum on that Metal, we find they are producible from the Action of others, and those the most common, most abundant, and indeed, universal Menstruums of the fossile World. We need be no longer at a Loss to find where Nature could meet with a sufficient Quantity of a proper Menstruum to extract from *Copper* the Colour necessary for the various blue Gems, when we see, that the universal native fossile Acid, whether in Form of Vitriol, Sulphur, or Alum, and unquestionably not less when alone; and even the nitrous, under proper Limitations, are able abundantly to produce it.

Of the vegetable Acids, distilled Vinegar, Lemon-juice, and Spirit of Verdigrease, all give green Solutions of *Copper*; but with this Difference, that the first gives some faint Bluishness with the Green; the second is a pale whitish Green; and the third, the true, pure, and unmixed Green of the *Emerald*.

The fermented vegetable Acids, therefore, have more Effect on this Metal than the native; this is evident from the deeper Colour, and from the much greater Quantity of the Metal separable from Solutions with them,



made in the same Proportions : And the Spirit of Verdigrease may very naturally excel both, as it is the strongest vegetable Acid that Art can any way produce ; though it is truly no other than a Vinegar absorbed by *Copper*, and afterwards driven from it again by the Force of Fire ; little altered, except as rendered more pure. It is remarkable, that *Copper* will thus part with this Acid in its proper and natural Form ; whereas no other Metal will ; for Iron and Lead, the only other Metals that will admit this Acid, alter it in the Mixture from its original Nature ; for it can never be produced from them again in its natural State, but is in both Cases quite a different Thing : When separated from Lead, it appears in Form of an oily fat Liquor ; and from Iron, little other than insipid Water. The Spirit of Verdigrease is, however, the strongest of all vegetable Acids ; and accordingly, extracts from *Copper* the Colour nearest approaching to that of the Solutions of that Metal in some of the strongest mineral Acids.

Of the fixed Alkalies, Salt of Wormwood, Potashes, and Oil of Tartar *per deliquium*, all afford Solutions of *Copper* of a glorious, deep, celestial Blue, and no way distinguishable from one another, if the Solutions are made in exact Proportions. An *Ærugo*, of a greenish Colour, is indeed producible on *Copper* by these Menstruums ; and a small Quantity of a similar Substance is sometimes found swimming on the Surface of these very Solutions : But this



is not purely the genuine Effect of the Menstruums, but a Change wrought in the Solutions made by them, by Particles of adventitious Salts floating in the Air; and mixing with a small Quantity of them. These Changes of Colour in the Solutions of *Copper* from an Admixture of Salts of a different Kind, tho' but in small Quantities, we shall see hereafter in this Letter are very natural and easily producible Effects; and we need not wonder at a small Quantity of an *Ærugo* of this Kind floating on the Surface of the Menstruum, or affixed to a Plate of Copper wetted with it, and exposed to the Air, tho' the true Solution of *Copper* in the Menstruum is blue; when we consider, that a Solution of the blue Vitriol in a Water impregnated with *Sal Armoniac* is green, notwithstanding that a simple Solution of *Copper* in that Salt is blue; (such is the endless Variety resulting from Mixtures of Salts as Menstruums) and that the natural *Ærugo* produced on *Copper* by the Salts floating in the Air, is green.

It is not to be wondered at, that the Solutions of *Copper* in the fixed Alkalies produced from different vegetable Substances, are no way different from one another, since these Bodies act in these Solutions, not as the peculiar Salts of this or that Plant, but as a Body made, not by any Operation of Nature, but by the Effect of Fire; which has strongly united the essential Salt, the Earth, and some small Portion of the Oil of the Vegetable they have been



been prepared from: For all these fixed Alkalies of Plants may be resolved into a bitter saline Substance, a stronger fixed Alkali, and a pure simple Earth; and in the Operation there will a small Quantity of an oily Matter always be discovered.

Of the volatile Alkalies, Spirit of *Sal Armoniac*, Spirit of Urine, and Spirit of Hartshorn, all afford Solutions of *Copper* of the most beautiful and vivid celestial Blue: This is of different Degrees, according to the different Quantity of the Metal dissolved; but in equal Proportions, and with the Spirits of equal Strength, the Colour is exactly the same in them all. The volatile Alkalies have in their Operations on this Metal, therefore, a great Analogy to the fixed. These Menstruums consist only of a very fine, subtle, volatile, alkaline Salt, suspended in a small Quantity of Water, which has no Share in extracting this glorious Colour; for the dry volatile Salts of the same Substances, mixed with Copper Filings, and corked up in a Vial together, acquire, in a Day or two, the very same Colour.

Of the neutral Salts, a Solution of *Copper* with crude *Sal Armoniac*, is of a glorious Blue; with native *Borax*, of a fine deep Green; and with Sea-salt, of a pale whitish Green: Of these, the *Sal Armoniac* dissolves it the soonest, the Sea-salt takes more Time, and the *Borax* is slowest of all. The rest of the Solutions also mentioned here, require different Time and different Methods to produce them; the  
Spirit



Spirit of Nitre dissolves the Metal almost instantaneously, *Aqua fortis* is nearly as quick in its Operation, and *Aqua regia* requires only a little Time: But of the others, some require long and tedious Processes, and others act best, or perhaps only, by Vapour; and one of these Processes shews, that where Mr. Boyle says, he knew a Menstruum which by its Vapour would dissolve a certain Metal, though it would scarce work on it at all in Substance; he is only talking of Copper and Vinegar. *Sal Armoniac*, it is to be also observed, affords us another Instance whence Nature may be supplied with a Menstruum for giving a blue Solution of *Copper*; since, tho' the *Sal Armoniac* common among us now is factitious, there is no Question but that there is, and ever has been, a true native *Sal Armoniac*; and there needs no more than *Copper* dissolved in Water impregnated with it, to give the different Blues of all the deepest *Sapphires* in the World; it being most easy to procure a Solution of *Copper* of any Degree of Blue, only from a Solution of this Salt in Water, digested for a few Days on Filings of that Metal.

Nature therefore is not tied to one Menstruum for the producing Blue from Copper; and that but a very scarce and uncertain one: Since it is evident, that the Bodies necessary to give it are many; and those, many of them, common and every where abundant. That the common and universal mineral Acid, so abundant every where in all the Kinds of *Pyrites*,  
the



the Acid of Sulphur, Vitriol, or Alum; which are, indeed, the same with the former, and with each other, in different Combinations, can do it: And even no better a Menstruum than common Water running over a Quantity of native *Sal Armoniac*, is able to produce from *Copper*, all the different Degrees of Blue, from that of the palest to that of deepest oriental *Sapphires*.

*I am,*

*S I R,*

*Your humble Servant,*

JOHN HILL.

GREEK







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ibid.	---	why supposed to
ibid.	---	the Arguments considered
175	---	Zinnion, n.
ibid.	---	about, n.
322	---	Zinc

F I N I S



