

not, therefore, impossible, that the Phœnician Navigators, who were always remarkably secret concerning the country from whence they obtained their tin,* might insinuate, that this metal was discovered to them by the Deity, who presided over the sea, (not the Neptune of the Greeks and Romans, but the more ancient Oceanus, who was, in Egypt, Phœnicia, and even Greece, in its earliest periods, confounded with the Supreme Being.)†

May I therefore be allowed to conjecture, that there was a prevailing tradition, that Tin was discovered to the Phœnicians by Jupiter himself?

Borlase admits the truth of this position in general, but insinuates, that, probably, the name was derived from a Phœnician word of similar sound and import.

Borlase, Antiquities of Cornwall, Ch. VII.

* See some remarkable instances of this disposition in *Borlase's* Antiquities, Ch. VII.

† Some of the ancient Greek writers expressly call Oceanus by the titles of the Supreme Being. We have in Homer the following expressions:

Ὠκεανὸς, ὃς περ γένεσις πάντεσσιν τετυχίας

Oceani, qui quidem Parens omnibus est.

Hom. Iliad. XIV. 246.

Ὠκεανόν τε θεῶν γένεσιν. Id. V. 200.

Oceanumque Deorum Parentem.

And Plutarch, in his *Isis and Osiris*, says directly “Ὠκεανὸν Ὀσιρίδα, that Osiris and Oceanus were the same.” See further in *Bryant's Account of Noah*. V. II. 269.

If it were possible to prove, that any traces of such an opinion as this subsisted at the time when the Alchemical doctrines began to be prevalent, we should not be at a loss to determine, why Tin was honoured with the symbol of Jupiter. But on this point, I have no other support than mere conjecture, which I submit, with the rest of the Dissertation, to the candour of the Society, hoping they will not mark with the severity of critical accuracy or censure, my endeavours to deserve the honour of becoming one of their members. Before I conclude, allow me to mention, that in the above dissertation, though I might frequently have drawn my illustrations from the Greek authors, I have principally confined myself to the Roman, and those the most common and familiar, as supposing these were most likely to be known, if any were known, to the Alchemical authors, who first transferred to the metals the ancient astronomical characters of the planets.

I am, dear Sir,

With great Respect,

Your sincere Friend

and obedient Servant,

M. WALL.

REMARKS

REMARKS *on the* KNOWLEDGE *of the* ANCIENTS,
By WILLIAM FALCONER, M. D. F. R. S.
Communicated by Dr. Percival. Read October 16,
1782.

THE superiority of the Moderns over the Ancients, in most branches of Natural Philosophy, is generally received as an acknowledged truth, and is, probably, well founded. Nevertheless, I am inclined to think, that the ignorance of the ancients has been over-rated, and, that several things were known to them, at least as facts, and matters of observation, which are not apprehended to be so, by the generality of people. Much learning and industry has been bestowed on this subject, by the Rev. Mr. Dutens, in his very ingenious Inquiry into the Origin of the Discoveries attributed to the Moderns, to which I beg leave to add a few remarks, that have occurred to me in the course of reading. And

I. I believe it is esteemed to be an original discovery of Dr. Black, That water which had been boiled was more easily frozen, than water that had not undergone that operation.

But, That water which had been heated, was by that means rendered easier to be cooled, was well known to the ancients.

Aristotle observes, That water freezes the sooner for having been before heated; and, that this fact was even known to some barbarous people upon the Euxine Sea, who made use of Ice as a kind of cement for their huts; and that the water frozen for this purpose, was first heated, in order* that it might concrete the sooner." Pliny† also mentions it as a discovery of Nero, to boil the water that was intended to be frozen, as that hastened its concretion.

Athenæus‡ also remarks, "that in the Isle Cermolus they placed water in their Refrigeratories which had been heated by the rays of the sun, and, that they reproved their servants, if the water they provided for freezing was not previously heated."

There is to this purpose, a curious passage in Hippocrates, in the sixth book and fourth section of the Epidemics; which, though I am unable to clear up, I think has some reference to this subject. The words are as follows.

Υδωρ αφηψηθεν, το μεν ως δεχεται τον αερα, το δε μη εμπλεων
ειναι, και επιδημα εχειν.

* Aristot. Meteorol. L. I. Cap. 12.

† Plinii Hist. Nat. L. XXXI. Cap. 3.

‡ Athenæi. Lib. III. p. 123. 124. Edit. Casaubon.

This direction is relative to the preparation of the water, to be drank by the patient, which is ordered to be, such as has been boiled; and part of the preparation was performed, with the water exposed to the air, and part, with the vessel closed up. *

The first, referred to the boiling or heating the water, and the latter, to the cooling of it; as I suppose, it was boiled, to throw out or expel the air, and then closed up, that it might not recover it again when cooling, which would have retarded its refrigeration, according to the modern theory. Galen, though he does not explain the meaning quite in the † same manner as I have done, imagines, that Hippocrates alludes to the boiling of water, that was afterwards to be drank cold, as, in the sentence just preceding the former, cold things had been recommended. Galen accounts for the obscurity of this passage, by informing us, that these works of Hippocrates were not written for publication, but as private notes to assist the memory.

* When water is boiled, care should be taken that air should be allowed admission to the vessel, that the vessel be not quite full, and that it have a cover. Farr's Transl.

† Galen, however, seems to think, that the water was to be boiled in an open vessel, and, when let down into the Refrigeratory, to be closed up, so as to exclude all air.

Galen Comm. in Lib. VI. §. 4. Epidem. Hippocr.

Galen himself was personally well acquainted with this effect of boiling, in disposing water to cool more rapidly, and to a greater degree. "When," says he, "we wish to render water as cool as possible, we first heat it, then surround with snow the vessel containing it, or, if snow be wanting, we place it in the well or stream of a spring, and thus its temperature is more easily changed."

This he ascribes to the rarefaction the water had before undergone, which is evidently not the true cause, as, upon cooling, it would be as much condensed as before. Perhaps, the true cause may be, what is generally assigned, the discharge of the air. But how does this operate in promoting the refrigeration? Is it, that after the water has been freed of its air, any part of its latent heat has flown off with it, and thus rendered it more easily accessible to cold? Or, is the refrigeration more easy, on account of the discharge of air; as the air, being united with the water, and requiring to be disengaged in freezing, might, by its attraction to the water, require more cold to disengage it, than would have frozen the water, had it not had that attraction to overcome?

It must, however, be remarked, that Galen not only speaks of water that has been previously heated, being more easy to be *frozen*, but also says, such water is more easily cooled, even to
any

any inferior degree: a fact worthy to be ascertained by experiment.

II. I believe the fact, Of the production of cold by the evaporation of fluids, is esteemed a modern discovery, as it justly may be: but it still appears (though the modern discoverers were not acquainted with it) that it was familiarly known to the ancients, and not only to the Greeks and Romans, but the Egyptians also.

Athenæus mentions, “that Protagorides, in describing the navigation of Antiochus upon the Nile, or Euphrates, relates the method used in that country, of cooling liquor, which was, by first heating it by exposure to the sun, and then straining it, and setting it in earthen jars in the highest, and most open and exposed part of the building, whilst two boys were employed all the night, in keeping the outsides of the jars moist. After this, they preserved the coolness of its temperature, by covering the jars with straw. This, says he, cooled the water to so great a degree, that they felt no want of ice.” *

Galen says, the method of cooling water, used at Alexandria, was as follows: “About sun-set, they poured water which had been first heated, into jars, which they hung up in the highest parts of the buildings, with the windows open, opposite to that point from whence the wind blew. Before sun-rise, they

* Athen. p. 124.

placed the jars upon the ground, and moistened the outside, and covered them with cool and succulent leaves, as of lettuce, &c. in order that the water might retain the cool temperature it had thus acquired." *

The modern method of making ice in the East Indies, resembles the above in many respects. Pits are dug in large open plains, places most exposed to circulation of air, and of consequence, to evaporation: these are strewed with reeds, in order to admit the circulation of air on all sides, and on these are placed shallow pans of earth filled with water, and the texture of these pans is so porous, as to admit the water to percolate through them, in such a manner, as to keep the outside always moist, and of consequence, producing cold by evaporation. The water used for this purpose has also been previously boiled. It is needless to remark, how much this process resembles those before quoted, and how probable it is, from the immutability of ancient manners, that it was a custom derived from very remote antiquity.

III. Some other discoveries, such as, "The solution of water in air, and that this solution is assisted by heat and agitation," appear not to have been unknown to the ancients, though their notions hereupon were far from clear.

* Galen Comm. in Lib. VI. Epidem. Hippoc. Comm. IV.

“ The moisture, says Aristotle, that is about the earth, being converted into vapours by the rays of the sun, ascends. When it has arisen, the heat, by whose assistance it had ascended, leaves the vapour (or, as Dr. Black would say, becomes sensible) and then, the vapour again assumes a consistence, and, from being in the form of air, becomes water. Meteorol. L. I. C. 9.

“ The reason, says Aristotle, why dew and hoar frost do not concrete in elevated situations, is, that in them the air is much agitated, which dissolves* the consistence of the water. Ibidem. Cap. 10.

Dr. Black's doctrine of Latent Heat, seems not to have been altogether unknown to the ancients.

“ Snow, says Aristotle, cannot be formed, without the cold prevails, much heat still remaining in it. For in a cloud, or vapour, there is much heat which remains of that fire, that has absorbed the moisture from the earth.” Aristotle here mentions, that heat or fire was still contained in the cloud or vapour, and so far is agreeable to Dr. Black's system ; but the latter discovered, that when the condensation took place, the heat, before latent, then became sensible.

* Ος διαλυει την τοιαυτην συσασιν.

N. B. Συσασιν means the consistence, or solid form of any thing, in its primary signification, and is often applied to water. Vide Lex. Budæi. Vox Συσασιν

IV. The ancients perfectly knew the reason, why the air near the earth was more heated, than in higher situations. Aristotle explains this, from the reflection of the solar * rays from the surface of the ground; which cause is also assigned by Seneca. † This is, I believe, generally understood to be a discovery of Sir Isaac Newton.

V. Aristotle ‡ assigns a cause for the sudden concretion of Hail Stones, to which he very properly attributes their largeness of size, which I have never before met with, and yet is, perhaps, the true one. He observes, “that hail generally falls most plentifully in hot weather:” and it is to this previous heat, which must have affected the vapour, and the water contained in it, that he ascribes the sudden congelation of the hail, in the same manner, as water, previously heated, is found to freeze more easily and suddenly.

VI. The fact || likewise, of the separation of air from

* ——— εἰς τὸν ἀνω τόπον μᾶλλον οὐτὰ ψυχρὸν διὰ τὸ ληγεῖν ἐκεῖ τὰς ἀπὸ τῆς γῆς τῶν ἀκτίνων ἀνακλαθεῖς.

Meteor, Lib. I. C. 12.

† ——— quod radii Solis a terra resiliunt et in se recurrunt, Horum duplicatio proxima quæque a terris calefacit. Quæ ideo plus habent teporis, quia solem bis sentiunt.

Seneca Nat. Quæst. L. IV. Sect. 8.

‡ Meteorolog. De Grandine.

|| τὸ μὲν αὐτὲ λαμπρὸν καὶ κουφὸν καὶ γλυκὺ ἐκκρίνεται καὶ ἀφανίζεται, τὸ δὲ θολωδέστατον καὶ σταθμωδέστατον λείπεται.

Hipp. de Aere Aquis et locis. §. XX.



Falconer, William. 1789. "Remarks on the knowledge of the ancients."
Memoirs of the Literary and Philosophical Society of Manchester 1, 261–270.

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