A Letter from Mr. Charles Leigh *of Brazen-Nose College in* Oxford. *to Dr.* Rob. Plot Director *of* Experiments *to the* Philosophical Society *of* Oxford, *and one of the* Secretaries *of the* Royal Society.

SIR,

SInce you gave me some specimens of the water of *Latron*, and likewise of *Nitrian Nitre*, I have found that those Descriptions which the Antients give of it, exactly agree with those specimens we have here; their encomiums of it were so many, but so different the names which they ascribed to it, as a sceptic indeed might equally question whether or no they writ of any thing else, or whether or no they writ of any such thing. That we might therefore the better understand the writings of the Antients concerning it, and the *Phænomena* which it afforded here, I have thought convenient to make use of this method. I shall in the first place shew whence *Nitre* has its denomination. In the second, the different names which ancient Authors ascribe to it. In the third, the different places whence it comes. In the fourth, a description of it as it is when a *Compositum*. In the fifth, the number of its principles when chymically resolved. In the sixth, the rise of them. In the seventh, its separation from the water of *Latron*. in the eighth, its use in Physick. In the ninth, in Agriculture and Mechanicks. In the tenth, wherein it differs from *Sal Armoniac*. In the eleventh, from *Salt-Petre*.

That all *Nitre* took its name from a Town in *Ægypt* called *Nitria*, I shall take for granted: I shall therefore in the next place give you an account of the different names, which by Authors are ascrib'd to *Nitre*.

By *Hippocrates* [a] it is sometimes called *Sal Ægypti*, *Sal in aquis crescens*, and *Nitrum Rubrum*. By *Basil. Serpens Terrenus*. By *Vitruvius*, *favilla salis*.

By *Pliny* [b] *Spuma Nitri*, and *Ros pinguioris Naturæ*, by the Græcians *Halmiraga*.

By *Encelius* [c] it is called *Chryso-Colla*, *Baurac*, *Sal lucidum*, *Sal petrosum*, *Sal Anderenæ*. But the word *Baurac* by the *Babylonians* is more restrain'd, for they divide *Nitre* into two species, the one they term *Sal petrosum*, *purpureum*, *Modice amarum*; the other species they term *Baurac*, which they used in seasoning their meat, the former of these may probably be the *Nitre* here spoke of, and the latter Salt-Petre.

By *Jungius* [d] and *Hofman* it is called *Cerberus Chymicus* and *Sal infernalis*. By *Rulandus* [e] and *Johnson* it is called *Fex vitri*, and *Cinis Clavellatus*, and so by *Fallopius*, and sometimes *Cabalatar*, *Algali*, *Anatron*, *Tincar*, *Sago*.

Here likewise it is to be noted, that *Aphronitrum* call'd by *Schwenckfeldius* in his Tracts *de Fossilibus Silesiæ* (*flos Asiæ* and *Spuma Nitri*) is not (as I conceive) specifically distinct from the *Natron* here spoke of.

For according to *Molenbrochius* [f] and *Junken* [g] that will ferment with an Acid, and is commended in the same distempers, as the *Nitre* of *Nitria*, again it's said by *Pliny*, *fontibus quibusdam innatat*, *videturque* Nilo *deferri*.

By *Encelius* it's said to be found either in *Armenia*, *Rabbath*, *Africa*, *Rome*, *Ægypt* or *Babylon*, and therefore by him is divided into these six species. *Nitrum vel est Armen. Afric. Ægypt. Rabbath. Rom. vel Babyl.* By *Wormius* it is said to be found in *nova Hispania*.

The *Natron* may be described thus; it is an Alkaly Salt perforated like a sponge, and of a lixivial taste; and

(a) *de natura & morbis mulierum.* (b) *naturali historia de nitro.* (c) *de re metallica.* (d) *physic.* (e) *Lexicon. Alchymiæ.* (f) *de Arthritide.* (g) *Medicus.*

thus

thus I find it deſcrib'd by *a Pliny*, a *Mathiolus* b and *Agricola*.c

Its principles I take to be chiefly two, *viz. a Sal marine*, and an *urinous Salt*.

That it contains a *Sal marine* ſeems manifeſt by theſe experiments; firſt becauſe a ſolution of the *Natron* has the ſame taſt that a ſolution of *Sal marine* hath; ſecondly in evaporation the particles of the *Natron* incruſtated upon the ſurface of the water as the particles of Sea-Salt do in evaporation. Thirdly becauſe the *Natron* is perforated, which proceeds (as I ſuppoſe) from a *Sal marine*, for that when it cryſtallizeth, ſhoots with little cavities. Fourthly if the *Natron* be mixt with Salt of Tartar it emits the ſame ſpirit, as Sal Armoniac when mixt with the ſame Salt And laſtly, that it contains a Sea-Salt ſeems plain from *Ceſalpinus*. ſays he, *efflorescit etiam ſpongia non ſolum in ſalinis adſimilitudinem lanuginis caneſcentis, ſed etiam in vaſis in quibus ſal continetur*.

But here it is to be noted that though the *Nitrian Water* is of a bluſhy colour, and makes a brisk fermentation with an Acid; yet a ſolution of *Natron* looks clear and will not ferment with an Acid. The reaſon why a ſolution of the Natron looks clear, though the *Nitrian Water* which is but a ſolution of the ſame ſalt is of a bluſhy colour, may perhaps be this;

I ſuppoſe that the water of *Latron* receives its redneſs from a red clammy ſubſtance, which ſerves chiefly to cement the two ſalts together, and this I the rather conjecture becauſe after a ſolution of the *Natron* had paſt through a filtre there ſtuck to it a red clammy matter, and the ſolution was clear; and the reaſon why a ſolution of the *Natron* will not ferment with an Acid, I conceive to be this; becauſe that in a perfect diſſolution its parts being ſeparated one from another by the parts of the water, their ſtruglings are too weak to make an effer-

(a) *nat. hiſt.* (b) *comment. in Dioſcor.* (c) *cap. de nitro.*

veſcency

veſcency with an Acid, and in this I was further confirm'd by theſe two experiments.

I found that if into a ſolution of the *Natron* I pour'd an Acid, while the water look'd whitiſh or diſturb'd the Salt not being perfectly diſſolved it made a brisk fermentation: but when the water came to be clear, the Salt then being perfectly diſſolved, if I then poured an Acid upon it, it would not ferment: I likewiſe found that this ſolution being evaporated to a third part would ferment again.

It's ſecond principle I take to be an *urinous Salt*, firſt becauſe if mixt with ſalt of *Tartar* it ſmells like *Sal Armoniac* when mixt with the ſame Salt.

Secondly, when it was diſtill'd with ſalt of *Tartar* in a Retort, it afforded an urinous ſpirit as piercing as the ſpirit of *Sal Armoniac*.

I come now to the riſe of its principles *Sal Marine* and a *Volatil Alkaly*; *Sal Marine* being a foſſil Salt I ſhall take for granted it receives from the earth and ſhall endeavour to illuſtrate that it hath its Volatile Alkaly from the air, firſt becauſe its ſaid by *Pliny*, *Spumam Nitri* (which is the *Natron* here ſpoke of) *Antiqui negabant fieri niſi cum ros cecidiſſet*. By Mounſieur *de la Chambre*, it is affirmed that three or four days before the Nile begins to overflow, there falls a certain dew which hath a fermenting vertue, and leavens a paſt expos'd to the air, and at that time ſaith *Pliny*, and Mounſieur *de la Chambre* the Nitre Pits grow full of Nitre. And *Sands*, *Vanſlebius* and ſeveral ſay, that tho 500 in a day die in *Grand Cairo* of the Plague before the beginning of the inundation of *Nile*, yet the very day after, there does not one die, which doubtleſs could not proceed from any other reaſon, then becauſe at that time, the air was impregnated with this Volatile Alkaly, for at that time the *Nitre* Pits grow full and this dew falls; (this I think) may ſufficiently hint to us the great uſe of its volatile ſpirit eſpecially in peſtilential diſtempers.

Laſtly, about that time that the *Nile* begins to over flow

thoſe

thoſe ſpecimens which we had here grew heavier by being expoſed to the Air.

Here it is to be noted that this *Alkaly* is not made ſo by fire: I cannot therefore conclude with *Helmont* that all Alkalies are made ſuch by that element.

The next thing to be conſidered is its ſeparation from the water in *Latron*, of which the Learned Dr. *Huntington*, (who was at *Nitria*) gives us this account.

There is a town in *Ægypt* called *Nitria* which gives name to the *Nitrian Deſert*, where there is a lake called *Latron*, taking up an Area of ſix or ſeven acres ſituate about 30 miles Weſt and by South from *Terana*, a Town lower upon the *Nile* than *Grand Cairo*, and about the ſame diſtance North-weſt from the *Pyramids*, from the bottom of this Lake this ſort of Nitre called *Natron* ariſeth to the top (as they do apprehend) and there by the heat of the Sun condenſes into this kind of ſubſtance. That all the Nitre comes from the bottom to the top I dare not affirm, & ſhall therefore premiſe ſome *Phænomena* which it affords. in evaporation, before I give you my conjecture about it.

I took an evaporating glaſs which held about 4 ounces, and poured into it 2 ounces of the *Nitrian Water*, this I ſet upon a ſand furnace, giving it fire by degrees, as ſoon as the water was warm the particles of the *Nitre* began to ſwim upon its ſurface in ſtragling and uneven numbers, theſe after a while united, and at laſt there aroſe Salt ſufficient to cover the whole ſuperficies of the water, I took then a thin glaſs and skim'd off this Ice, but could ſcarce take it all off before it was ſeconded by another, and thus the ſalt did riſe ſucceſſively in films as long as there was any water in the glaſs, theſe films had the colour and taſt of the Nitre which came from *Nitria*, and did like it ferment with an Acid. And theſe are they which by *Pliny* are called *Flos ſalis*, and if I miſtake not the ſame with that which *Herodotus* ſays they make their Mummy with. If therefore by the languiſhing heat of a digeſting furnace, the nitrous particles could ſeparate themſelves from the water,

water, and over that ſpread themſelves in an ice, it may be as probable, that by the greater heat of the Sun, the Nitre of *Latron* is ſeparated from the water after the ſame manner: And as in the evaporation of other mineral waters, when the water is not ſtrong enough to hold up the Salt, it is generally covered with a thin film; ſo I ſuppoſe in evaporation of the *Natron*, ſome parts of the water being flown away, the particles of the *Sal Marine* branch one into another, and ſo incruſtate upon the ſurface of the water.

In this *Hypotheſis* I was the further confirm'd, by this Experiment, I took ſome of the *Natron* and diſſolved it in water, and ſet it to evaporate, and I found that the Salt did not incruſtate upon the water till 3 parts of the water was evaporated, it did not therefore ſeem probable that the Nitre came all from the bottom to the top, and ſo condenſed by the heat of the Sun, but that they incruſtated when the ſaline particles brancht one into another, ſome of the aqueous parts being exhal'd.

The reaſon why its volatile Alkaly in evaporation does not fly quite away, is becauſe it is held there by the *Sal Marine*.

The next thing to be conſidered is its uſe in Phyſick: By *Pliny* it's commended in Ulcers, Inflammations, Palſey in the tongue, Conſumptions, Collick, Hemorhages, Purulent ears, and intermitting Fevers. By *Gallen* it's ſaid, *deſiccat, ac digerit, multo autem majus ejus ſpuma.*

By *Agricola* it's preſcribed in the ſame caſes, commended as a Cephalic. Of wonderful ſucceſs in the griping of the Guts, intermitting Fevers and the Leproſie. *Mathiolus* commends it in the ſame caſes.

By *Hippocrates* it is commended when the *Menſtrua* are obſtructed, and again (ſaith he) *purgat humores albos, convenit in abortionibus ubi puer haud exierit,* he likewiſe commends it in ſome kind of barrenneſs, and to this *Kir-*

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cher in his *Mundus ſubterraneus* alludes, when he ſays, *Nili aqua in potum redit non modo ſaluberrimum, ſed & fœcundandis mulieribus mire opportunum*, and *Petrus Giurius* a, gives us this memorable ſtory out of *Cæſius*, that when *Philadelphus* King of *Ægypt* married his Daughter *Berenice*, to *Antiochus* King of the Aſſyrians, he commanded her to drink of the water of *Nile*, that ſhe might make her Husband happy in a numerous offspring.

By the Teſtimony therefore of *Hippocrates* b, *Gallen* c, *Mathiolus* d, *Dioſcorides*, *Pliny* e, and *Agricola* f, it appears to have been of great uſe in Phyſick.

But here it is to be noted, that when Nitre by the afore mentioned Authors is preſcrib'd, that Nitre which is an ingredient of Gun-powder, is not to be underſtood.

Amongſt the Moderns we have this account of it, Monſieur *du Clos* is of the Opinion that moſt of the mineral Waters in *France* are impregnated with this ſort of Nitre, and that all their Cures are done by it g.

Molenbrochius affirms a tincture of *Aphronitrum* to be of wonderful efficacy in the Stone h: this I the rather credit, becauſe it's ſaid by *Juncken* in his *Medicus*, the Nitre of *Nitria* is of ſo piercing a ſpirit, that it doth not permit either Stone or Rock to be there about. And *Ten Rine* in his Meditations *de veteri medicina* affirms it to be of wonderful ſucceſs in the ſame diſtempers.

The next thing to be conſidered is its uſe in Agriculture, and in treating of this, I think it convenient to

(a) *Arcanum cidularum.* (b) *de natura & morbis mulierum.* (c) *de nitro.* (d) *comment. in dioſ.* (e) *nat hiſt.* (f) *de foſſil.* (g) *mineral waters of* France. (h) *de Arthrit.*

premiſe one *Phænomenon* which it afforded in evaporation. When the Salts had ſpread themſelves over the water in an Ice, thoſe thin plates after a while would break, and aſcend in perpendicular lines to the very top of the glaſs, I do therefore conjecture, that *Nitre* may be ſaid to fertilize the ground after this manner, its volatile particles being heated by ſome ſubterraneous fire, or elſe by the warmth of the Sun, they do quickly aſcend in the ſmall tubes of the Plant, and ſo by their elaſtick nature carry along with them or force before them, thoſe particles which as they differently convene together, conſtititute the different parts of the Plant.

But this conjecture will be made ſomething the more probable, by an Experiment in *Kircher* a; where he ſays if you take a wooden tube, and put into it Tartar, quick-Lime, Salt, and the Urine of a Wine drinker, reduced into one maſs, which is to be hardened in the Sun; and after that ſet it in a cold Cellar, by the help of *Salt-Petre* from the before mentioned Maſs, you will not without admiration ſee Flowers branch out of it; yea ſuch is the force of Nitre, that if in a Glaſs kept cloſe ſhut, you put the juices of ſome nitrous Herbs on the before mention'd Maſs, the Nitre contain'd within it being pregnant with Spirit, will force it ſelf through the very pores of the Glaſs.

Mr. *de la Cambre* ſays, Plants do grow in *Ægypt* in ſuch abundance, that they would choak one another, if they were not hindered by throwing ſand upon the fields, inſomuch that the Ægyptians muſt take as much

(b) *Mund. ſub. cap. de nitro.*

pains

pains to leſſen the fatneſs of their Land, as other Nations do to encreaſe the fatneſs of it.

In Mechanics we have this account of it: It's ſaid by *Pliny cap. de Vitri Inventione*, that a company of Merchants being thrown upon a ſhore where there were not any ſtones to be found, were forced to take great pieces of Ægyptian *Nitre* out of their ſhips, and make walls, upon which they hung their boyling Kettle, the *Nitre* being heated by the fire, mixt with the ſand, and ran into ſeveral ſtreams of glaſs, which afterwards hinted the way of making Glaſs. It is likewiſe of uſe in Dying, for *Pliny* and *Vitruvius* [a] affirm, that by the help of this, the true Azure is made, and that without this, there cannot be a true ſhadow.

In the laſt place I come to conſider wherein it differs frbm Salt Petre, and Sal Armoniac, it may be diſtinguiſhed from Salt Petre firſt by its fermenting: it will ferment with any Acid, but Salt Petre will not: I found that it would ferment with Vinegar as the old Commentators obſerve in their Comments upon *Jeremiah* and the *Proverbs*, but Salt Petre will not: which gave occaſion to ſome, in thoſe Texts, to alter the word Nitre.

Secondly, it may be diſtinguiſhed from Salt Petre in its taſte, for *Natron* hath a lixivial taſt, but the other not.

Thirdly, by the volatile Spirit which it affords: for from the one comes over a volatile *Alkaly*, but from the other a corroſive Acid.

Fourthly, the *Natron* affords a red clammy ſubſtance, inſipid, but the other not; this clammy ſubſtance (if

(a) *de Architectura. Lib. 7.*

I miſtake not) is that which by *Pliny* is called *ærugo Salis*, this it hath from the earth, and therefore it is again ſaid by *Pliny*, *ſunt ibi nitrariæ in quibus et rufum exit a colore terræ.*

Fifthly, like *Salt Petre* it will not Chryſtallize.

Sixthly, in the fire it makes no detonation. But in this it reſembles *Salt Petre*, as that by the flowers of Sulphur is made into a *Sal Prunellæ*, ſo this if you drop Spirit of Sulphur upon it, ſhoots into Pyramidal Salt, that is not by the taſt diſtinguiſhable from *Sal Prunellæ*, though its taſte before was lixivial.

From *Sal Armoniac* it may be diſtinguiſhed firſt by its colour, for the *Natron* is reddiſh, the other not. Secondly, by the texture of its parts, in *Sal Armoniac* the parts ſeem cloſe and firmly knit together, but the *Natron* is ſpongy and perforated. Thirdly, if mixt with *Sal Armoniac*, *Sal Armoniac* emits the ſame Spirit as it doth when mixt with quick lime.

But I think it comes much nearer to the nature of *Sal Armoniac*, then *Salt Petre*; firſt, becauſe it is compoſed of a Sea-ſalt, and an urinous Alkaly; ſecondly, like *Sal Armoniac*, when diſſolv'd in water, it makes it extremely cold: And as *Franciſcus Hernandez* ſays in his Hiſtory of *Mexico*, it produces the ſame effect when diſſolv'd in Wine; but I have not at preſent the convenience of trying this, the *Specimens* now being but ſmall.

I can-

I cannot therefore conclude with *Kircher* a, that the *Natron* is not ſpecifically diſtinct from Salt Petre; or with *Libavius* that it is a compoſition of Alum, Sea-ſalt, and white-Wine. And theſe are all the Obſervations which I have been able to make at preſent concerning this Mineral, if any more occur, you ſhall have an account of them, from

Your humble Servant.

C. L.

(a) *Mund. ſubterr. l. 6. ſect. ſecunda, cap. prim.*

Tuta