The ingenious Author propoſes, in the Sequel of this Work, to give an Account of new Plants only, or at leaſt ſuch as have not been well figured by others: If he proceeds with the ſame Exactneſs, as I don't doubt he will, the Work very well deſerves Encouragement; for of Plants thus figured and deſcribed, there can be no future Doubts.

Happy had it been for us, had the Antients left ſuch Types or Deſcriptions of thoſe they recommended as conſiderable for their Uſe in Medicine. This would have ſaved the Learned World much Labour and Study in an Enquiry, which 'tis to be feared, for want of ſuch Helps, will prove unſucceſsful.

III. *An Attempt to ſolve the Phænomenon of the Riſe of Vapours, Formation of Clouds and Deſcent of Rain. In a Letter from Dr.* J. T. Deſaguliers, *L. L. D. F. R. S. to Dr.* Rutty, *R. S. Secr.*

SIR,

THE Reaſon of my writing upon a Subject which has been ſo often treated of, is, that none of the Accounts hitherto given of this *Phænomenon* (at leaſt that I have met with) ſeem to me ſufficient to ſolve all the Circumſtances of it.

Dr. *Niewentyt* and ſome others ſay — That Particles of Fire ſeparated from the Sun-Beams, by adhering to Particles of Water, make up *Moleculæ*, or ſmall Bodies ſpecifically lighter than Air, which therefore, by hydroſtatical Laws, muſt riſe and form Clouds that remain ſuſpended when they are riſen up to ſuch an Height

Height that the Air about them is of the ſame ſpecifick Gravity with themſelves. ——

That Rain is produced by the Separation of the Particles of Fire from thoſe of Water, which laſt being then reſtored to their former ſpecifick Gravity, can no longer be ſuſtained by the Air, but muſt fall in Drops. See *Niewentyt's Religious Philoſopher*. Contemplation 19. From Sect. xiii. to Sect. xxv.

Now this is liable to ſeveral Objections, *Firſt*, It is built upon a Suppoſition that Fire is a particular Subſtance, or diſtinct Element, which has never yet been prov'd by convincing Experiments and ſufficient Obſervations; and which the Reverend Mr. *Hales* has in his late excellent Book of *Vegetable Staticks* ſhewn to be an ill grounded Opinion, making it very plain, that in Chymical Operations thoſe Bodies which had been thought to become heavier by Particles of Fire adhering to them, were only ſo by Adheſion of Particles of Air, *&c.* which he has ſhewn to be *abſorbed* in great Quantities, by ſome Bodies, whilſt it is *generated* (or reduced from a fixt to an elaſtick State) by others; nay, that it may be *abſorbed* and *generated* ſucceſſive by the ſame Body, under different Circumſtances.

Secondly, If we ſhould allow the above-mentioned Suppoſition, the Difficulty will ſtill remain about the Production of Rain by the Separation of the Fire from the Water; For Dr. *Niewentyt* aſcribes this Effect to two different Cauſes. *Firſt*, to Condenſation (*Sect.* xxiii.) Saying, "That when contrary Winds blow "againſt the ſame Cloud and drive the watery Par-"ticles together, the Fire that adhered to them gets "looſe, and they (becoming then ſpecifically heavier) "precipitate and fall down in Rain". Then in the very

very next *Sect.* he aſcribes it to Rarefaction, when he ſays, "That when a Wind blowing obliquely upwards "cauſes a Cloud to riſe into a thinner Air (*i. e.* ſpe-"cifically lighter than it ſelf) the Fire which by "ſticking to the Particles of Water rendered them light-"er, extricates it ſelf from them, and aſcending by its "Lightneſs, the Water will become too heavy, not "only to remain in this thin and light Air, but "even in a thicker and heavier near the Earth, and "ſo will be turned into a deſcending Dew, Miſt, or Rain, "or Snow, or the like, according as the watery Va-"pours are either rarefied or compreſſed".

The firſt of theſe Cauſes of Rain is contrary to Experience; for when two contrary Winds blow againſt each other over any Place of the Earth, the Barometer always riſes, and we have fair Weather. For then (as Dr. *Halley* ſays, in Philoſophical Tranſ. No. 183) the Air being accumulated above, becomes ſpecifically heavier about the Clouds, which (inſtead of falling into Rain, as Dr. *Niewentyt* ſuppoſes) aſcend up into ſuch a Part of the Atmoſphere, as has the Air of the ſame ſpecifick Gravity with themſelves.

If the falling of Rain might be attributed to the ſecond of theſe Cauſes, then every time a Cloud is encompaſſed with Air ſpecifically lighter than it ſelf (whether it be when by the blowing away ſome of the ſuperior Air, that which is about the Cloud becomes rarer as it is leſs compreſſed, or by the Cloud being driven upwards) Rain muſt neceſſarily follow; whereas one may often ſee the Clouds riſe and fall without Rain, even when the Barometer ſhews the Weight of the Air to be alter'd. For that happens only when by the great Diminution of the ſpecifick Gravity of the Air about the

the Cloud, it has a great Way to fall; in which Caſe, the Reſiſtance of the Air, which increaſes as the Square of the Velocity of the deſcending Cloud, cauſes the floating Particles of Water to come within the Power of each others Attraction, and form ſuch big Drops, as being ſpecifically heavier than any Air, muſt fall in Rain.

No gentle Deſcent of a Cloud, but only an accelerated Motion downwards, produces Rain.

N. B. *I don't mean that the quick Deſcent of a Cloud is the only Cauſe of Rain; becauſe the Shock from a Flaſh of Lightning, and the ſudden return of the Air, after the* Vacuum *made by the Flaſh, will condenſe the floating Vapour into Water; and alſo the ſame Cloud which in the free Air, might be carried horizontally without being turned into Rain, meeting with an high Hill in its Way, will be condenſed and fall in Drops; eſpecially if, in the Day-time, it be driven by the Wind out of the Sun-ſhine, againſt the ſhaded Side of the Mountain.*

Beſides all this, if Particles of Fire were joined with thoſe of Water to raiſe them up, thoſe igneous Particles muſt be at leaſt 1000 Times greater in Bulk than the watry ones; ſo that a Perſon, who at the Top of a Hill, has his Hands and Face in a Cloud, muſt feel a very ſenſible Warmth, by touching a much greater Surface of Fire than Water in the Cloud, and afterwards find the Rain produced from that Vapour ſenſibly colder; whereas the contrary is proved by our Senſes; the Tops of Hills, though in the Clouds, being much colder than the Rain at Bottom.

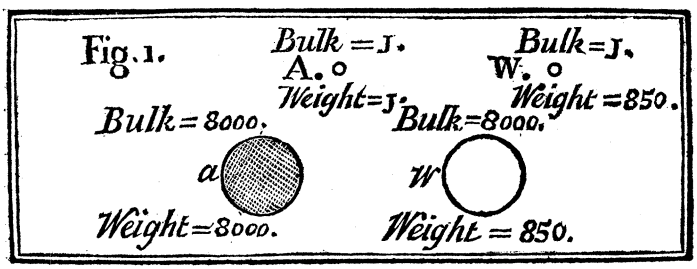
There is another Opinion concerning the Riſe of Vapours, namely, that tho' Water be ſpecifically heavier than Air, yet if its Surface be encreaſed by very much diminiſhing the Bulk of its Particles, when once raiſed, it cannot eaſily fall; becauſe the Weight of each Particle diminiſhes as the Cube Root of its Diameter, and the Surface to which the Air reſiſts, only as the Square Root of the ſaid Diameter: That we ſee this in the Duſt in Summer, and in Menſtruums that ſuſtain Metals diſſolved, which are ſpecifically heavier than the Menſtruums.

But this will not explain the *Phænomenon*; becauſe though the Encreaſe of Surface (the Weight remaining the ſame) will in a great Meaſure hinder (or rather retard) the Deſcent of ſmall Bodies moving in the Air, by reaſon of its great Reſiſtance to ſo large a Surface; it will for the ſame Reaſon alſo hinder the Aſcent. For the Riſe of Duſt is owing to the Motion of Animals Feet in it, or to the Wind: Whereas Vapours riſe in calm Weather, as well as windy; neither do they, like the Duſt, always fall to the Ground when the Wind ceaſes to blow.

The third Opinion, and which is moſt commonly received, is, that by the Action of the Sun on the Water, ſmall Particles of Water are formed into hollow Spherules filled with an *Aura*, or finer Air highly rarefied, ſo as to become ſpecifically lighter than common Air, and conſequently that they muſt riſe in it by hydroſtatical Laws. As for Example, If a Particle of Water, as it becomes a hollow Sphere, be only encreaſed ten Times in Diameter, its Bulk will be encreaſed a thouſand Times; therefore

fore it will then be ſpecifically lighter than common Water, whoſe ſpecifick Gravity is to that of Air, as 850 to 1; then if the Denſity of the *Aura*, or Spirit within the little Shell, be ſuppoſed 9 Times leſs than that of Air, or as 50 to 850, that ſpecifick Gravity of the Shell, and its Contents will be to that of Air, as 900 to 1000; therefore ſuch an aqueous Bubble muſt riſe till it comes to an Æquilibrium in Air, whoſe Denſity is to the Denſity of that in which it began to riſe, as 850 to 945 nearly. But it appears by Experiments, that Air rarefied by an Heat which makes a Retort red hot, is only encreaſed in Bulk, or dilated 3 Times; by the Heat of boiling Water only $\frac{10}{14}$ or near two Thirds; and by the Heat of the Humane Body (ſuch as will raiſe Vapours plentifully) only $\frac{10}{39}$ or about $\frac{1}{4}$. I own my Objection may be anſwered, by ſuppoſing the Spherule of Water to be more encreaſed in Diameter, as for Example 20 Times; becauſe then if it be filled with Air only $\frac{1}{4}$ rarer than common Air, it will be ſpecifically lighter, and capable of riſing to a conſiderable Height.

To give this Solution all its Force, let us expreſs it in Numbers. Let A and W (*Fig.* 1.) repreſent



a Particle of Air, and one of Water of equal Bulk, then will the Weight of A be to the Weight of W as 1 to 850, their Bulks being equal. If the Particle of Water be blown up into a Bubble (*w*) of 20 Times its Diameter, then will its Bulk be to its Weight, as 8000 to 850, whilſt a Sphere of Air (*a*) of the ſame Bigneſs, has its Weight as well as Bulk equal to 8000: Now if an Air or *Aura* $\frac{1}{4}$ rarer than common Air be ſuppoſed within the watry Bubble to keep it blown, it will be the ſame as if $\frac{1}{4}$ of the Air of (*a*) was carried into (*w*) and then the Weight of (*w*) would be encreaſed by the Number 6000; ſo that the Shell of Water being in Bulk 8000, would be in Weight $850 + 6000 = 6850$, whilſt an equal Bulk of Air weighed 8000, and conſequently the watry Bubble would riſe till it came to an Air, whoſe Denſity is to the Denſity of the Air next to the Surface of the exhaling Water as 6850 to 8000.

This is the ſtrongeſt Way of ſtating the Hypotheſis. But to ſupport it, the following Queries muſt be anſwered.

Query 1ſt, How comes the *Aura*, or Air in the Bubbles, to be ſpecifically lighter than the Air without them, ſince the Sun's Rays, which act upon the Water, are equally denſe all over its Surface?

Query 2d, If it could be poſſible for a rarer Air to be ſeparated from the denſer ambient Air, to blow up the Bubbles (as Bubbles of ſoaped Water are blown up by warm Air from the Lungs, whilſt the ambient Air is colder and denſer) what would hinder that cold Air by its greater Preſſure, from reducing the

the Bubbles to a leſs Bulk, and greater ſpecifick Gravity than the Air, eſpecially ſince Cold can be communicated through ſuch thin Shells, and the Tenacity of common Water is very ſmall when compared to that of ſoaped Water (whoſe Bubbles, notwithſtanding that Tenacity) are ſoon deſtroyed by the Preſſure of the outward Air, as the Air within them cools?

Query 3d, If we ſhould grant all the reſt of the Suppoſition, yet this Difficulty will remain. If Clouds are made up of hollow Shells of Water filled with Air, why do not thoſe Clouds always expand when the ambient Air is rarefied, and preſſes leſs than it did before, and alſo ſuffer a Condenſation, as the ambient Air is condenſed by the Accumulation of the ſuperiour Air?

If this Condenſation and Rarefaction ſhould happen to the Clouds, they would always continue at the ſame Height, contrary to Obſervation; and we ſhou'd never have any Rain.

From all this it follows, that the Condenſation and Rarefaction of the Vapours, which make Clouds, muſt depend upon another Principle than the Condenſation and Rarefaction of the Air: And that there is ſuch a Principle, I ſhall endeavour to ſhew.

LEMMA

LEMMA.

The Particles of all Fluids have a repellent Force.

FLUIDS are elaſtick or unelaſtick: The elaſtick Fluids have their Denſity proportionable to their Compreſſion, and Sir *Iſaac Newton* has demonſtrated (*Princip. Lib.* ii. *Sect.* v.) that they conſiſt of Parts that repel each other from their reſpective Centers. Unelaſtick Fluids, like Mercury, Water and other Liquors, are by Experiments found to be incompreſſible; for Water in the *Florentine Experiment* could not by any Force be compreſſed into leſs Room, but ooz'd like Dew through the Pores of the hollow golden Ball in which it was confined, when a Force was apply'd to preſs the Ball out of its ſpherical, into a leſs capacious Figure. Now this Property of Water and other Liquors muſt be intirely owing to the centrifugal Force of its Parts, and not its want of Vacuity; ſince Salts may be imbib'd by Water without encreaſing its Bulk, as appears by the Encreaſe of its ſpecifick Gravity. So Metals, which (ſingly) have a certain ſpecifick Gravity beyond which they cannot be condens'd, will yet receive each other in their Interſtices ſo as to make a Compound ſpecifically heavier than the heavieſt of them; as is experienced in the Mixture of Copper and Tin.

SCHO-

Scholium.

By encreaſing the repellent Force of the Particles, an unelaſtick or incompreſſible Fluid may become elaſtick, or a Solid (at leaſt a great Part of it) may be changed into an elaſtick Fluid; and, *vice versâ*, by diminiſhing the repellent Force, an elaſtick Fluid may be reduc'd to an unelaſtick Fluid, or to a Solid. That the Particles of Quickſilver, Water and other Liquors are likewiſe endued with an attractive Force, is evident from thoſe Subſtances running into Drops in an exhauſted Receiver, as well as in the Air, and likewiſe their adhering to other Bodies. The Attraction and Repulſion exert their Forces differently: The Attraction only acts upon the Particles, which are in Contact, or very near it; in which Caſe it overcomes the Repulſion ſo far, as to render that Fluid unelaſtick, which otherwiſe would be ſo; but it does not wholly deſtroy the Repulſion of the Parts of the Fluid, becauſe it is on Account of that Repulſion that the Fluid is then incompreſſible. When by Heat or Fermentation (or any other Cauſe, if there be any) the Particles are ſeparated from their Contact, the Repulſion grows ſtronger, and the Particles exert that Force at great Diſtances, ſo that the ſame Body ſhall be expanded into a very large Space by becoming fluid, and may ſometimes take up more than a Million of Times more Room than it did in a ſolid or incompreſſible Fluid. (See the *Queries* at the End of Sir *Iſaac Newton*'s Opticks.) Thus is Water by

by boiling, and leſs Degrees of Heat, changed into an elaſtick Vapour rare enough to riſe in Air, Oils and Quickſilver in Diſtillation made to riſe in a very rare Medium, ſuch as remains in the red-hot Retort, and ſulphureous Steams will riſe even in an exhauſted Receiver, as the Matter of the *Aurora Borealis* does in the thinner Part of our Atmoſphere. If Aqua-fortis be poured on Quickſilver, a reddiſh Fume will riſe much lighter than common Air; ſo alſo will Fumes riſe from Filings of Metals, from Vegetables when they ferment by Putrefaction; and (as the Reverend Mr. *Hales* has ſhewn) ſeveral ſolid Subſtances by diſtilling, as well as Fermentation, will *generate* permanent Air.

That Heat will add Elaſticity to Fluids is evident from numberleſs Experiments, eſpecially from Diſtilling and Chymiſtry: But what is needful to conſider here is only, that it acts more powerfully on Water than common Air; for the ſame Heat which rarefies Air only $\frac{2}{3}$ will rarefy Water very near 14000 times, changing it into Steam or Vapour as it boils it: And in Winter, that ſmall Degree of Heat, which in Reſpect to our Bodies appears cold, will raiſe a Steam or Vapour from Water at the ſame Time that it condenſes Air.

By a great many Obſervations made by Mr. *Henry Beighton*, F. R. S. and my ſelf, upon the Engine to raiſe Water by Fire, according to Mr. *Newcomen*'s Improvement of it; we found that the Water in boiling is expanded 14000 times to generate a Steam as ſtrong (*i. e.* as elaſtick) as common Air, which therefore muſt be near $16\frac{1}{2}$ times ſpecifically

cifically lighter. And that this Steam is not made of the Air extricated out of the Water is plain, becauſe it is condens'd again into Water by a Jet of cold Water ſpouting in it; and the little Quantity of Air that comes out of the injected Water muſt be diſcharged at every Stroke, otherwiſe the Engine will not work well. There is alſo another Experiment to confirm this.

EXPERIMENT.

ABCD is a pretty large Veſſel of Water, which muſt be ſet upon the Fire to boil. In this Veſſel muſt be ſuſpended the glaſs Bell E, made heavy enough to ſink in Water; but put in, in ſuch a Manner that it be filled with Water when upright, without any Bubbles of Air at its Crown within, the Crown being all under Water. As the Water boils, the Bell will by Degrees be emptied of its Water, being preſs'd down by the Steam which riſes above the Water in the Bell; but as that Steam has the Appearance of Air, in order to know whether it be Air or not, take the Veſſel off the Fire, and draw up the Bell by a String faſten'd to its Knob at Top, till only the Mouth remains under Water; then, as the Steam condenſes by the cold Air on the outſide of the Bell, the Water will riſe up into the Bell at F quite to the Top, without any Bubble above it, which ſhews that the Steam which kept out the Water was not Air.

N. B. *This Experiment ſucceeds beſt when the Water has been firſt purg'd of Air by boiling, and the Air-Pump.*

We know by ſeveral Experiments made on the Fire-Engine (in Captain *Savery*'s Way, where the

Steam is made to preſs immediately on the Water) that Steam will drive away Air, and that in Proportion to its Heat; though in the open Air it floats and riſes in it like Smoak.

Now if the Particles of Water turn'd into Steam or Vapour repel each other ſtrongly, and repel Air more than they repel each other; Aggregates of ſuch Particles made up of Vapour and Vacuity may riſe in Air of different Denſities, according to their own Denſity dependant on their Degree of Heat, without having Recourſe to imaginary Bubbles form'd in a Manner only ſuppoſed, and not proved, as we have already ſhewn. *I own indeed, that if the watry Particles had no repellent Force, they muſt precipitate in the ſame Manner that Duſt will do after it has been raiſed up; but we have too many Obſervations and Experiments to leave any Doubt of the Exiſtence of the repellent Force above-mentioned. Neither can I ſhew by any Experiment, how big the* Moleculæ *of Vapour muſt be which exclude Air from their Interſtices, and whether thoſe* Moleculæ *do vary in Proportion to the Degree of Heat by an Increaſe of repellent Force in each watry Particle, or by a farther Diviſion of the Particles into other Particles ſtill leſs; but in general we may reaſonably affirm, that the Rarity of the Vapour is proportionable to the Degree of its Heat, as it happens in other Fluids* (*See* Phil. Tranſact. *Numb.* 270.) *and that, though the different Degrees of the Air's Rarefaction are alſo proportionable to the Heat; the ſame Degree of Heat rarefies Vapour much more than Air.*

Now to ſhew, that what has been ſaid will account for the Riſe of Vapours and Formation of Clouds,

Clouds, we muſt only conſider; — whether that Degree of Heat, which is known to rarefy Water 14000 * Times, being compared with ſeveral of thoſe Degrees of Heat in Summer, Autumn and Winter, which are capable of raiſing Exhalations from Water or Ice; the Rarity of the Vapours (eſtimated by the Degree of Heat) will appear to be ſuch, that the Vapour will riſe high enough in Winter, and not too high in Summer, to agree with the known *Phænomena*.

That the Effects are adequate to the Cauſes in this Caſe, I think I can make out in the following Manner, viz.

The Heat of boiling Water, according to Sir *Iſaac Newton*'s Table (*Phil. Tranſact.* Num. 270) is 34, the mean Heat of Summer 5, the mean Heat of Spring or Autumn 3, and the leaſt Degree of Heat, at which Vapours riſe in Winter (*alias* the mean Heat of Winter) is 2. The Rarity of Vapour proportionable to theſe four Degrees of Heat, is 14000, 2058, 1235, and 823. The Rarity of Air is, in Summer 900, in Spring or Autumn 850, and in Winter 800, the Denſity of Water compared with the above-mentioned Denſities, being inverſely as *One* to the ſaid fore-mentioned four Numbers. The Heights above the Earth to which the Vapours will riſe, and at which they will be in *æquilibrio*, in an Air of the ſame Denſity with themſelves, will vary according to the Rarity of the Vapour depending on the Heat of the Sea-

* *As the Digreſſion wou'd be too long to mention here thoſe Obſervations on the* Fire-Engine, *which ſhew that the Vapour from boiling Water is expanded* 14000 *Times more than cold Water; I refer the Reader to the 6th* Section *of 25th* Contemplation *of* Niewentyt's Religious Philoſopher, *where he proves by an Experiment made with an Æolipile, that one Inch of Water produces* 13365 *Inches of Vapour; which, conſidering the great Allowances made againſt the Aſſertion, may well be call'd* 14000.

ſon. For the Vapour which is raiſed by the Winter's Heat, expreſſed by the Number 2, when the Air's Rarity is 800, will riſe to (and ſettle at) an Height of about the Sixth of a Mile, when the Barometer is above 30 Inches high. But if the Heat be greater then, the Vapours will riſe higher, and pretty much higher if the Sun ſhines, though in froſty Weather, the Barometer being then very high. If the Barometer falls, and thereby brings the Place of *Æquilibrium* (for Vapours raiſed by the Heat 2) nearer the Earth, then alſo will the Heat be encreaſed, the Vapour more rarefied, and conſequently the new Place of *Æquilibrium* ſufficiently high. It is to be obſerved, that in Winter, when the Heat is only equal to 2, the Air is denſeſt cloſe to the Earth, which has not any Heat ſufficient to rarefy it near the Ground, as happens in warm Weather; therefore the Vapour will riſe gradually in an Air whoſe Denſity decreaſes continually from the Earth upwards; neither will the Vapour be hindered of its full Riſe, by any Condenſation from a greater Cold of the ambient Air, the Air being then as cold next to the Ground where the Vapour begins to riſe, as it is at any Heighth from the Earth.

The Vapour which is raiſed by the Heat of Spring or Autumn expreſſed by Number 3, will riſe to the Height of $3\frac{1}{2}$ Miles, when the Barometer is at 30, and the Air's Rarity is 850. But then, as the Air is hotter nearer the Ground than at the Height of half a Mile or a Mile, the Vapour will condenſe as it riſes; and as the Air, when the Earth is heated, is rarer near the Ground than at ſome Height from it, the Place of *Æquilibrium* for Vapour will, upon theſe

theſe two Accounts, be brought much lower than otherwiſe it would be; as for Example, to the Height of about a Mile, which will agree with *Phænomena.*

In Summer, the two Cauſes above-mentioned encreaſing, the Vapour raiſed by the Heat 5 (whoſe Place of Æquilibrium would be $5\frac{1}{2}$ Miles high, if the Vapour after it began to riſe was not condenſed by cooling, and the Air was denſeſt cloſe to the Earth) will ſettle at the Height of about $1\frac{1}{2}$ or 2 Miles, which is alſo agreeable to *Phænomena.*

Laſtly, As the Denſity and Rarity of the Vapour is chiefly owing to its Degree of Heat, and in a ſmall Meaſure to the encreaſed or diminiſhed Preſſure of the circumambient Air, when it is not confined; and the Denſity and Rarity of the Air is chiefly owing to the increaſed or diminiſhed Preſſure, by the Accumulation or Exhauſtion of ſuperior Air, whilſt Heat and Cold alter its Denſity in a much leſs Proportion; the Clouds made of the Vapours above-mentioned, inſtead of conforming themſelves to the altered Denſity of the ambient Air, will riſe when it is condenſed, and ſink when it is rarefied; and alſo riſe or ſink (when the Preſſure of the Air is not altered, and its Denſity very little changed) by their own Dilatation, owing to Heat or Cold; as may be obſerved often, by ſeeing them change their Height conſiderably, whilſt the Barometer continues exactly at the ſame Degree, and the Thermometer's Liquor riſes or falls very little, and ſometimes not at all.

As for the Manner how Clouds are changed into Rain, I have hinted it in the Beginning of this Paper; but for farther Satisfaction, I refer the Reader

to

to Dr. *Halley*'s Account of it, in the *Philoſophical Tranſactions* (Numb. 183.) in which I entirely acquieſce, having always found it agreeable to the *Phænomena*.

If by publiſhing theſe Thoughts, I have explained the Riſe of Vapours, in a more ſatisfactory Way than has been done before; or if I have only given uſeful Hints to others more capable of doing it, I have my End.

P. S. Since I have, for Brevity ſake, only mentioned at what Heights from the Surface of the Earth, Vapours of different Denſities will come to an *Æquilibrium*, without giving a Reaſon for ſettling the Place of *Æquilibrium*, at thoſe Heights; I think proper to give the Method here by which they are to be found, *viz.* As the Vapours will ſettle and riſe where the Air is of the ſame Denſity with themſelves; it is only required to find the Denſity of the Air at any Diſtance from the Earth, at ſeveral Heights of the Barometer, which may be deduced from Dr. *Halley*'s two Tables, *Philoſoph. Tranſact.* Num. 386. (the Firſt ſhewing the Altitude to given Heights of the Mercury, and the Second the Heights of the Mercury at given Altitudes) and knowing the Degree of Heat by the Thermometer, becauſe the Denſity of the Vapour depends upon the Degree of Heat of the Seaſon; provided that proper Allowances be made for the great Rarefaction of the Air near the Earth in hot and dry Weather, and the Condenſation of the Vapours in their Riſe, by reaſon of the Air being colder at a little Height above the Earth than juſt at the Surface of it.

IV. *An Account of ſome Obſervations relating to* Natural Hiſtory, *made in a Journey to the* Peak *in* Derbyſhire, *by Mr.* J. Martyn, *F. R. S.*

THE *Peak* in *Derbyſhire*, having hitherto been deſcribed in ſcarce any other Light, than as a Place compoſed of Wonders; I was not a little deſirous to make ſome Enquiry into the Nature of a Place generally eſteemed one of the moſt Surprizing of our own Country.

In my Way thither, I took Notice of the following Plants, which I have not obſerved to be common