moſt brittle, break in the Mortar, and paſs the Sieve firſt. And nothing is more common in ſuch things than to put at once into the Mortar two or three times the quantity of what preſent Uſe calls for; which perhaps is only a Doſe juſt then to be made up, or enough to fill a ſmall Glaſs, which ſtands to be in readineſs: whereby the firſt Patients are overdoſed, and the latter by having only the woody and fibrous Part of the Ingredient, are cheated in their Expectations.

Trituration has a great Share in ſome Inſtances, in raiſing or depreſſing the Efficacy of what comes under its Management. For in grinding, all thoſe Bodies whoſe Efficacy conſiſts much in the peculiar Shape and Points of their component Parts, the more and finer they are broke, the leſs will they operate: Thus may *Calomel* be render'd much gentler, and made capable of being given in much larger Quantities, only by long rubbing in a Glaſs Mortar: for the continual Triture has the ſame Effect upon it, as repeated Sublimation, which is only breaking of the ſaline *Spicula* more and more, until it becomes almoſt plain Mercury. But in reſinous Subſtances, particularly thoſe which are purgative, as *Jalap*, *Scammony*, &c. the finer the Pouder they are reduc'd into, the greater is likely to be their Efficacy: as the Senſe which the Stomach and Bowels have of them, is in proportion to their Contacts: therefore the more the ſame Quantity is divided, the further will it diffuſe itſelf, and vellicate the Fibres; that is, in other Words, it will work the more.

SECT. III.

Of Calcination.

THIS is ſuch a Management of Bodies by Fire, as renders them reducible to Pouder, and is for that reaſon term'd *Chymical Pulverization*. This Operation is moſt concern'd in the Chymical Pharmacy, and is ſeldom perform'd without *Melting* or *Fuſion*; being chiefly employ'd about *Salts* and *Metals*: it will be therefore convenient to underſtand how it is brought about, that ſuch Bodies are melted or fuſed, which is much the ſame thing; or how from *Solids* they are render'd *Fluids*. To which purpoſe it is neceſſary to recollect, from what has been laid down in the Introduction, ſome Thoughts concerning *Solidity* and *Fluidity*.

The Solidity, Hardneſs, or Force, by which the Parts of any Body reſiſt Separation, ariſes from the *mutual Coheſion* of its component Parts; which *Coheſion* is but a neceſſary Conſequence of that *attractive Power* reſiding in all Matter. Now the *attractive Force*, as it is ſtrongeſt at the Point of Contact, is the Cauſe that the *Coheſion* of all Bodies is in proportion to the Number of Points they touch one another in: ſo that thoſe Particles which have leaſt Solidity in proportion to their Surfaces, altho they attract the leaſt at a diſtance; yet when they touch, they cohere the moſt ſtrongly. But, for the contrary reaſon, where the *Coheſion* is ſmall, as in

in spherical Bodies, whose Superficies can only touch in a Point, their Particles easily give way to every Impulse, and whenever they are set in motion, whether by Nature or Art, Fluidity takes place; and how this may be effected by Fire, 'tis not difficult to conceive. Whilst the Particles of Fire, by their Activity and Force, insinuate themselves into the Substance to be melted, they so divide and break it, that there is a much less Contact of Parts, and of course a weaker *Cohesion*. And this *Cohesion* may still, by a Continuance of the same Cause, and by further diminishing the Degree of Contact, be so far weaken'd, as to render it insufficient to keep the component Parts close, or prevent them from rolling over one another, that is, turning the Body into a Fluid.

From the *Rarefaction*, which is remarkable in the Fusion of these Substances, it is evident that these Parts may be, and actually are divided and separated from one another by Fire. For unless the Fire gain'd admission between their component Parts, so far as to force them a greater distance from one another, and thereby lessen their Contacts; there could be no Reason assign'd for their expanding themselves into a larger compass. For Experience teaches, that a Plate of Iron, by being made red-hot, not only increases in Bulk, but in Length. The same is observable in calcining Copper.

From this Difference of *Cohesion* proceeds all that Variety we observe in the Fusion of Bodies: For such as have least Contact of Parts, soonest give way to the Fire; and some will melt away by the Warmth of a Vapour only, when others which have a stronger Contact, are not to be separated but with Difficulty. Upon this account *Vegetables* very easily disunite *Minerals* slower, and *Metals* slowest of all. And of the last, those wherein the Contact of Parts is least, as in *Lead* and *Tin*, most readily melt; but those which are more compact, as *Gold* and *Silver*, are not to be dissolv'd but by a violent Heat.

Now if the Force of Cohesion was proportional to the Quantity of Matter, or to the Weight of the Body, we might from *Statics* account for all the Variety which occurs in Fusion; for by knowing the specific Gravity of a Body, we should then know what Force is requir'd to melt it. But because the same Quantity of Matter may be so variously dispos'd, that in one Body there shall be a much greater Contact than in another; tho at the same time, the Gravity be equal, or even less; therefore the Force of Cohesion cannot be estimated by Gravity: which is also confirm'd by Experience. For *Lead*, altho more ponderous than all other Metals except *Gold*, yet in the Fire is more easily melted than any other. So that it necessarily follows, that in this Metal there must be a less Cohesion, or Contact of Parts, how much soever it may exceed others in the Quantity of its Matter.

Bodies, after Fusion, return again into a solid Mass, upon their Removal from the Fire, and the Cessation of the Motion, which the Fire produced; because their Particles are brought nearer to one another by their attractive Force, and so compell'd to unite. Such as consist of homogeneous and unalterable Parts, as *Wax*, *Gums*, and the purer *Metals*, recover their pristine Form: For when the same Texture of Parts remains in the whole Body, it must of course reassume the same Appearance, when the separating Power ceases to act. But other Bodies, whose

whose Parts, with respect to Density and Surface, are extremely different from one another, some being carry'd off by the Force of the Heat, and others chang'd as to Figure or Position, must be forc'd to appear in another Form: For they cannot recover their original Phases, unless every Particle could reinstate itself in that very Situation it had before; which may be hinder'd infinite Ways, as may easily be experienc'd in Heterogeneous Bodies, such as *Vegetables*, and all *Minerals*, as likewise the baser sort of *Metals*. Thus every *Plant* is turn'd to *Ashes*; and *Vitriol*, when all its Moisture is dry'd away, becomes *Chalcanthum*; and *Clay*, by the Heat of the Furnace, hardens into Tiles and Bricks.

Therefore the Difference which is observ'd, even in *Homogeneous* Bodies, after Liquefaction, is no way to be accounted for, but from the Changeableness of *Surface* in its Parts: For those Bodies, whose Parts constantly retain the same Surfaces, never lose their Form; but others, by having the Surfaces of their Parts alter'd, acquire a different Texture, and put on another Appearance.

Fluidity being in this manner explain'd, *Calcination* may, without Difficulty, be understood; which, in many Instances, is only the Effect of a longer Liquefaction. For when the Fusion is longer continu'd, not only the more subtile Particles of the Body itself fly off, but the Particles of the Fire likewise insinuate themselves in such Multitudes, and are so dispers'd and blended throughout all its Substance, that the Fluidity, which was first caus'd by the Fire, can no longer subsist. From this Union arises a third Kind of Body, which being very porous and brittle, is easily reduc'd to *Pouder*: for the Fire having penetrated every where into the Pores of the Body, the Particles are both kept from mutual Contact, and divided into minute Atoms; so that they are easily reduced to the finest Pouder.

From the foregoing 'tis manifest, that not only the Parts of the Body calcin'd are much broken and rarify'd, but that the very Increase of the Weight itself proceeds from the Fire. The Gravity of crude *Lead*, if compared to *Water*, is as $11\frac{1}{2}$ to 1; but that of *calcin'd Lead* is as 9 to 1. So the Proportion of *calcin'd Copper* to *Water*, is but $5\frac{5}{11}$; but that of crude is $8\frac{1}{2}$. The Proportion of *White Lead* to *Lead* itself comes out still less, *i. e.* subtriple. But four Ounces of *Regulus* of *Antimony*, if put in Fusion for an hour and half, will gain two Drams and a half; tho' in the mean time a multitude of *Effluvia* go off in Vapour. Hence it appears, that the absolute Gravity is increas'd indeed by Calcination, but the Specific is lessen'd: The Reason of which is this, That the Particles of the Body, divided by the Fire, and separated from mutual Contact, are diffused into a larger Bulk. But the Particles of Fire, which are much lighter than the calcin'd Body, being every where mix'd with it, and dispers'd thro' its Pores, lessen the specific, and increase absolute Gravity.

But however the Particles of Bodies are divided and separated by Calcination, so as to lose their antient Appearance; yet many *Metals*, and some *Minerals*, whose Parts are mostly Homogeneous, don't seem to lose their Nature with their Form. For *Gold*, *Silver*, and *Quicksilver*, cannot be so destroy'd by all the *Calcining* imaginable, but that they may with very little trouble be reviv'd. So out of *Salt* of

Tin, the *Tin* it ſelf may be again extracted; nay, the *Calx* of *Lead*, the moſt impure of all Metals, returns with eaſe into its original Form. Thus too, not only the *Regulus*, but the very Subſtance of *Antimony*, may be drawn both from the *Calx* and *Glaſs* of *Antimony*. So that Calcination is but *imperfectly* perform'd in ſuch Bodies; for a great many Particles ſeem to be ſo little chang'd and deſtroy'd, that as ſoon as ever they are let looſe from this artificial Combination, they re-aſſume their proper and natural Figure. Neither ſhould we omit taking notice of what is of the greateſt moment in Calcination; That thoſe very Particles, whoſe attractive Force is ſtrongeſt, and which contribute moſt to the Coheſion of Bodies, fly off, and evaporate during Calcination: So that if a great Quantity of ſuch Particles ſhould evaporate, another Body of a very different Form may ſucceed. For in melting *Lead*, we ſee the Fumes riſe in ſuch a prodigious Cloud, that at length they leave nothing behind but the *Calx*, which has no manner of Reſemblance to that Metal: On the other hand, if *Gold* and *Silver* be calcin'd after the common Method, they ſtill retain their antient Form, becauſe ſcarce any of the Particles paſs off in Vapour. And indeed the Corpuſcles, which exhale in a calcining Fire, are ſuch as have the largeſt Surface, and leaſt Gravity: Therefore *Quickſilver*, whoſe Particles we know are form'd in a quite contrary manner, is with the greateſt Difficulty reduced into a Calx.

But nothing can more confirm the Account we have given of *Calcination*, than the Arguments which are drawn from the Operation it ſelf. For in order to its ſucceeding well, we many times ſtir the Body that is to be calcin'd with a *Spatula*, or elſe mix it with ſomething elſe. The Deſign of both theſe Methods is to make the Particles cohere leſs together, and not only to yield more eaſily to the Fire, but become more convenient for their intended Uſes.

Moſt hitherto laid down has been with relation to Chymiſtry; for the other Pharmacy is employ'd very little in this part, unleſs we reckon into it the burning of Plants to Aſhes, in order to obtain their fixed Salts; an Account of which particular Operation may more properly be prefix'd to that Head, when it comes in courſe in the Body of the Work.

To *Calcination* belongs *Vitrification*; which Word is properly apply'd to thoſe Bodies that are pellucid like Glaſs, after the Calcination is over; to perform which, a longer and more vehement Fire is required. Therefore in the making of *Glaſs* of *Antimony*, a previous Calcination is neceſſary. From hence proceeds the homogeneous Texture, which is as eſſential a Qualification in pellucid Bodies, as a rectilineal Poſition of Pores. For by the Application of *Fire*, the heterogeneous and more volatile Corpuſcles are diſſipated: which, by the infinite number of Refractions they make, very much weaken, and almoſt extinguiſh the Rays of Light: Thoſe, in the mean-time, which partake of the ſame Nature, *i. e.* thoſe which are *denſe* and *fix'd*, being left behind, unite cloſely together; ſo that there being a like Conformation of Parts on every ſide, which way ſoever you expoſe it, this calcin'd Matter equally attracts and tranſmits the Rays of Light. Thus by long Fuſion, which throws off the lighter and more droſſy Particles, *common Glaſs* is made.

SECT.