The Eighteenth Book Of Natural Magick

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The Proeme

Many miracles worth relating and to be contemplated do offer themselves when I begin to describe heavy and light. And these things may be applied to very necessary and profitable uses, and if any man shall more deeply consider these things, he may invent many new things. That may be employed for very profitable ends. Next after these follow wind instruments, that are almost from the same reason.

Chapter I

"That heavy things do not descend in the same degree of gravity, nor light things ascend."

efore I shall come to what I intend to demonstrate, I must premise some things necessary, and set down some actions, without the knowledge whereof, we can make no proof, nor demonstration. I call that heavy that descends to the center, and I say it is so much the heavier the sooner it descents, contrarily, that is light that ascends from the center, and the lighter that ascends soonest. I say that bodies yield one to the other, and do not penetrate one the other, as Wine and water, and other Liquors. Moreover, this action must be premised, that there is no body that is heavy in its own kind, as water in the element of water, or air in air. Also Vacuum is so abhorred by nature, that the world would sooner be pulled asunder than any Vacuity can be admitted. And from this repugnancy of Vacuum proceeds almost the cause of all wonderful things, which it may be I shall show in a book on this subject. It is the force of Vacuum that makes heavy things ascend, and light things descend contrary to the rule of nature, so necessary it is that there can be nothing in the world without a body. Therefore these things being premised, I shall descend to something. And first, a most heavy body shut up in a vessel, whose mouth is turned downwards into some Liquor that is heavier, or of the same kind. I say it will not descend. Let the vessel turned with the mouth downwards, be A B filled with water, the mouth of it beneath must be put into a broad mouthed vessel C D full of water, be it with the same Liquor, or with another that is heavier. I say the water will not descend out of the vessel A B. For should the water contained in the vessel A B descend, it must needs be heavier than the water contained in the broad mouthed vessel C D, which I said was of the same kind or heavier. If then it should fall down it would be against the first action. The same would fall out if both vessels were filled with Wine or water. For if the water contained in the vessel A B, should descend into the place of C D, there would remain Vacuity in A being there is no place for the air to come in. And that were against the second axiom. Wherefore by reason of Vacuum, and because the body is no heavier, it falls not into the bowl beneath. But should one make a hole in the bottom of the vessel A, that the air might come in, no doubt the water would not fall down into the basin. Also, if the vessel A B were filled with any light Liquor, and the broad basin with one that is heavier, they would not stir from their places. Let therefore the vessel A B be filled with Wine, and the mouth of it turned downwards into a basin full of water. I say both Liquors will keep their places, and will not mingle. For should the Wine descend, either Vacuum must needs be in the body A, or a heavy body must ascend out of the vessel C D, which would be against the nature of Gravity. And the second Axiom, namely, that heavy should ascend, and light descend. Wherefore they will not remove from their places. Hence comes that which is often done by great drinkers and gluttons, who pour by drops into a cupful of water, so much Wine as will fill the cup, they come so close together, that only a line parts those Liquors. And those that would sooner cool their Wine, they dip a Vial full of Wine into a vessel full of water, with the mouth turned downward, and hold it down under the water. For when the water touches the surface of the Wine, they cannot mingle, and the Wine grows sooner cool. Though it is necessary that the Vial should be lifted up to the surface of the water, and suddenly turned about, poured forth and drank. Then fill them again, and set in the bottle as before. From this advantage I complain of those, who first drink water, then pour in Wine, for Wine being the lighter, and water the heavier, they can hardly mingle. Wherefore some drink at first the strongest Wine, then mingled, and last of all, water. At great men's tables they first bring Wine in a glass, then they pour in water, that he water by its weight may mingle with the Wine, and get to the bottom, and taste equally. Theophrastus bids men

first pour in Wine, then water.

Chapter II

"How we may by drinking, make sport with those that sit at the table with us."

When friends drink together, if we would by such a merry deceit delude the guests that are ignorant of the cause hereof, we may provoke them to drink with such a cup. Let there be a great cup made like a tunnel. Let the mouth be broad above, and beneath narrow pyramidally. And let it be joined to a Glass ball, by a narrow mouth. First pour in water, till the whole ball is filled. Then put in Wine by degrees, which by reason of the narrowness of the mouth will not mingle, and the water is heavy, and the Wine lighter. He that drinks first, shall drink the Wine. Then give it your friend to drink, and he shall drink nothing but water. But if your friend shall challenge you to drink thus with him, and will have you drink first. Fill the ball of the cup with Wine, and pour water upon it, and stay a while. Hold him in discourse. For the water will sink down by the narrow mouth, and the Wine by degrees will ascend as much, and you shall see the Wine come up through the middle of the water, and the water descend through the middle of the Wine, and sink to the bottom. So they change their places. When you know that the water is gone down, and the Wine come up, then drink. For you shall drink the Wine, and your friend shall drink the water. Hence it is, that to great inconvenience of those that drink it. When we plunge our Wine into a well in vessels of earth, or Brass, ill stopped to cool it, the water being the heavier comes in at the least chink, and forces out the Wine, so in a little time the vessel is full of water, and the Wine is gone. That there is not the least taste of Wine in it. Wherefore stop the mouth very close.

Chapter III

"How to part Wine from water it is mingled with."

From these I shall easily show two things, that a heavy body shut up in a Glass vessel, having the mouth of it put within a lighter liquid body, they will mutually give place. The lighter will ascend the heavier will descend. And that without any hindrance one of the other, which I shall demonstrate from the following principals. Let the glass be turned downwards, and full of water, be, A B, the water is heavier then the Wine. Let the mouth of it B, be put into the vessel C D, that is full of Wine. These are bodies that will mutually yield one to the other as I have shown. I say the water will descend into the vessel C D, and the Wine will ascend into the vessel A B, where the water was before. For the water, because it was contained in the vessel A B, it being heavy, presses the Wine in the vessel C D, that is lighter. And because there is no body between them, the water descends on one side into the vessel C D, and the Wine ascends on the other side of the vessel into A B. now if the Wine be red, that you may see the difference of their colors, you shall see the Wine ascend through the middle of the water, as far as the bottom of the upper vessel that is put downward into the other, and the water to descend hastily to the bottom of the vessel C D. And one descends as low as the other rises high. And if the Liquors cannot be seen distinguished, yet one goes without any hindrance of the other. And without mingling, into its own place. And it will be a pleasant sight to behold the Wine going up, and the water falling down. And when they rest, they will be so well parted, that not the least Wine can remain with the water, nor water with the Wine. Wherefore, if you put into a Hogshead full of Wine, a long necked glass full of water, in a short time the vessel turned downwards will be full of Wine, and the water will go down into the Hogshead. By this any man may easily Conjecture,

"How to part water from Wine,"

Because often country people and Vintagers use deceit, and bring Wine mingled with water, to be sold to the merchant. We may easily prevent their craft by this art. Let there be underneath a vessel filled with Wine, that is mixed with water, and we should separate the water from the Wine. But first there must be a vessel that can receive all the Wine, that is mingled in the other vessel. And if we know not the quantity, we must Conjecture at it, how much it may be, of something less. Then fill the said vessel with water, and set it with the mouth downwards on the other vessel, that is full of Wine and water. And let the upper part of the vessel turned downwards, touch the upper part of the lower Liquor, that so air may enter. For then the water will presently descend into the vessel underneath, and the lighter part of the mingled Liquor will ascend, and the water will sink down. And if it be all Wine, it will all ascend. no Wine will stay with the water. If anything stay behind, you must know that so much mater was mingled with the Wine, which may easily be known by the smell and taste, if you do it as it should be done. Then take a vessel that will hold more of the same Liquor and put it into a vessel underneath, till it takes it all in. Whence by the proportion of the Wine ascended, and of the water, any man my know easily how much water is mingled with the Wine. But for convenience, let the Vial that shall hold the water be of a round belly, and the hole not very great, and let the vessel under, that contains the Wine, have a narrow mouth, that the upper round mouth may the better join with the undermost, and no air come in. But because it happens often, that the upper ball, when it has drank in all the Wine, the Wine will not fill it. And we would part the water from the Wine. Take therefore the round glass in your hand, and turn it about with the mouth upwards, then will the Wine presently turn about and come uppermost, which may by a tongue laid in, be all called forth. Be careful to see when the Wine is all drawn out, remove the tongue, and the water will remain pure.

Chapter IV

"How otherwise you may part water from Wine."

I can do this another way, not by Levity and Gravity, as I said, but by thinness and thickness. For water is the thinnest of all Liquors, because it is simple, but Wine being colored, and color comes from the mixture of the Elements, it is more Corpulent. Wherefore to part Wine from water, we must provide a matter that is full of holes, and make a vessel thereof, into which the Wine poured with the water, may drain forth. For the water will drain forth through the pores of the matter, that is opened by a mingled and Corpulent body. And though many kinds of wood be fit, yet Ivy is the best, because it is full of pores and chinks. Wherefore if you make a vessel of Ivy wood that is green, and pour into it Wine mingled with water, the water will in short drain out. Yet I see that all the Ancients and modern writers thought the contrary. Yet both reason and experience are against them. For Gato says, if you would know whether there be water put into your Wine, make a vessel of Ivy, put your Wine you think is mixed with water, into it. If there be any water, the Wine will run forth, and the water stay behind, for an Ivy vessel will hold no Wine. And Pliny from him. The Ivy is said to be wonderful for the proof of Wine. If a vessel be made of Ivy wood, the wine will run forth, and the water will stay behind, if any were mingled with it. Whereupon both of them are to noted for a twofold error, because they say it comes from the wonderful faculty of the Ivy. Whereas every porous wood can do the same. Again, he says that the wine will run forth, and the water will stay behind, whereas it is the contrary. But Democritus thought what was truest and more probable, who used not an Ivy vessel but one full of holes. Says he, they pour it into a new earthen pot not yet seasoned, and hang it up for two days. The pot, says he, will leak, if any water be mingled with it. Democritus used another art for the same purpose. Some stop the mouth of the vessel with a new Sponge dipped in Oil, in incline it, and let it run forth. If there be water in it, only the water will run forth. Which experiment also he uses that hinders that the Liquor cannot run forth so easily. Africanus adds another reason. Put liquid Alom into a vessel of Wine. Then stop the mouth with a Sponge dipped in Oil, and incline it, and let it run forth. But nothing but the water will run out. For the Alom binds the Liquors, that they drain forth very slowly.

Chapter V

"Another way to part a light body mingled with a heavy."

I have another art to separate a light body from a heavy, or Wine from water, or by another way. Make a Linen Tongue, or of Bombast, and dip into the vessel, where Wine is mingled with water. And let the Tongue swim above without the Liquor, and ascend above it. And so hang pendulous out of the vessel. For the lighter Liquor will ascend by the Tongue, and drop on the outside. But when the lighter ascends, it attracts the heavy also. Wherefore, when you see the color change, take the vessel away, for the water runs forth. It is evident that the Wine being lighter, will always ascend to the top of the vessel, and run forth by the Tongue. Though all Vintners say the contrary. That the water will run forth by the Tongue, and that the Wine will stay within.

Chapter VI

"How light is mingled in heavy, or heavy in light."

We can easily know whether any light matter is mingled with heavy, or any heavy matter with light. And I will expound the manner out of Archimedes his book, concerning things that swim above water. The cause whereof is, that if wood, stone, or any heavy metal, be equal in weight to the same quantity of water, the utmost surfaces of the body will be equal with the surfaces of the water. If it weigh heavier, it will sink to the bottom. If it be lighter, the lighter it is then the water, so much of it will swim above the water. Since therefore this is true, and Wine is heavier then water, one and the same thing will sink more in Wine, than in water, and in thicker water the less. Wherefore vessels are more drowned in rivers, then in the sea with it. For sea is thicker and more heavy, by reason of its Salt mingled with it. As also we have it in Alexander. If therefore you would know,

"Whether water be mingled with Wine."

Put the Wine you suspect to be mingled with water, into some vessel, and put an Apple or Pear into it. If the Apple sink, the Wine is pure. But if it floats, the Wine has water mingled with it, because water is thicker than Wine. Which Democritus says is contrary and false. He says it is necessary sometimes to commit the care of the Wine of new Wine to stewards and servants. Also the merchant has the like reason to try, whether his Wine be pure. They use to cast an Apple into the vessel, but wild Pears are the best. Others cast in a Locust. Others a Grasshopper. And if they swim, it is pure Wine. But if they sink, it is mingled with water. But if you seek to know,

"If new Wine have any water mingled with it."

It will be the contrary for the contrary reason. For Wine that is pure and sincere is thin, but new Wine at first is thick, seculent, gross, clammy, because the Feces are not yet sunk down. But in time it will grow clear and thin. Wherefore if you put Apples or Pears into new Wine, and the new Wine be most pure, the Apples will float above it. But if there be water mixed with it, the Apples will sink to the bottom. For freeze water is thinner than new Wine, and lighter, it causes the Apple to sink, which is excellent well described by Sotion, and very curiously. He says, that we may know whether new Wine be mingled with water, cast wild Pears, that is green ones, into new Wine. And if there be any water, they will sink to the bottom. For when you fill the vessel with new Wine, if you cast in Services or Pears they will swim. The more water you put into it, the more will the Apple sink. But we shall add this for an addition.

"When new Wine is mingled with water, to know which part is the best, the upper or lower part."

The country people use after the pressing forth of Wine, when the clusters are pressed forth, to cast in a certain quantity of water. And so they make drink for laborers in the country. This new Wine they divide. The country man has half, and the landlord has the other half. The question is which part is the best, the first, or the last, that runs forth of the press. But if you well remember what I said before, the Wine being the lightest will come uppermost, and the water being heaviest, will always sink to the bottom. Wherefore the first that comes forth is the Wine, that which remains, and is pressed from the clusters, is watery. When water is cast on the clusters, it goes into the inmost parts of the Grapes, and draws forth the Wine that is in them, and so they mingle.. But being lighter, it chooses the upper place, therefore the upper part is best, because it contains most Wine. But if you turn the Cock beneath, the water will first run forth, and the Wine will last.

Chapter VII

"Other ways how to part Wine from water."

There are other ways to do it, as by Distilling. For in Distilling the lightest will ascend first, then the heaviest, when the fire is not too strong. And that is but reason. Wherefore that the Liquor may ascend, it must first be attenuated into thin vapors, and become lighter. Therefore Wine being thinner than water, if it be put in a Still in Balneo, the lightest vapor of the Wine will ascend by degrees, and fall into the Receiver. You shall observe the Aqua vita that Distills into the vessel, and by the quantity of that, you may judge of the proportion of water mingled with the Wine. Also more, that when the lightest part of the Wine is ascended, the heavy Feces remain, as water, or as part of the Wine. Often in our Distillations, when Aqua vita was Distilled in Balneo, by chance the vessel broke that contained the Aqua vita, and mingled with the water in the kettle. I put the mingled Liquor into a glass vessel, and putting a soft fire to it, first came forth the pure Aqua vita, simple without any water. The water stayed to the bottom, and kept not so much as the smell of the Aqua vita. By the veins running in the cup, I knew the water ascended. I will not omit (though it be for another reason) for pleasure and ingenuity to show,

"The manner to part water from Wine,"

That by this means we may know how much water is mingled in the vessel. Take the quantity of the Wine, and put it into a Glass Vial, and put the Vial into very cold water. That all this is in the Vial may freeze, as I have shown. If the Wine be sincere and pure, it will be the harder to freeze, and longer. If it has much water, it will freeze the sooner. When Wine is frozen, break the Vial upon a dish. The ice must melt by degrees. First the Wine, because that is hotter. Then the water will remain frozen. Part the Wine from it, for it will be longer thawing. By proportion of this, you may know what part of water was put into the vessel.

Chapter VIII

"How the levity in the water and the air, is different, and what cunning may be wrought thereby."

Now I will speak of heavy and light, otherwise than I spoke before. Namely, how it is in the air, and how in the water, and what speculation or profit may rise from thence. And first how we may know whether a metal be pure, or mingled with other

metals, as Gold and Silver, as in Gilded cups, or else in monies. Where Silver or Gold is mingled with Brass, and what is their several weights. Which speculation is useful not only for Bankers, but also for Smiths, when they desire to try metals in Fixing of Silver, or other operations, which I will attempt to declare plainly. But first I will see whether the Ancients speak anything hereof. Vitruvius says Archimedes did write of this. For when Hiero purposed to off a golden Crown to the Gods in the temple, he put it to the Goldsmith by weight. He made the work curiously, and maintained it for good to the King, and by weight it seemed to be just. But afterwards it was said, that he had stolen part of the Gold, and made up the Crown with Silver to the full weight. Hiero enraged at this, had Archimedes to consider of it. He then by chance coming into a bath, when he had descended into it, he observed that as much of his body as went into the bath, so much water ran over the bath. When he considered the reason of it, he leaped forth for joy, running home and crying Eureka, Eureka, that is, I have found it, I have found it. Then they say he made to lumps of equal weight with the Crown, one of Gold, the other of Silver. Then he filled a large vessel to the very brims with water, and he put in the lump of Silver. The bigness of that thrust into the water, made the water run over. Wherefore taking out the lump, what flowed over he put in again, having measured a fixed part. And he found what certain quantity of water answered to the quantity of the Silver. Then he put in the lump of Gold into the full vessel, and taking that forth, by the same reason he found that not so much water ran forth, but so much less of the body of the Gold was less than the same weight in Silver. Then he filled the vessel with water, and put in the Crown, and he found that more water ran forth by reason of the Crown, than for the mass of Gold of the same weight, and from thence because more water run over by reason of the Crown, than for the Gold lump, he reasoned there must be a mixture in the Crown. This was the Greek's invention, that is worthy of praise. But the operation is difficult. For in things of small quantity the theft cannot be discerned, nor can this reason appear so clear to the eye, where the absolute fashion of the vessel was wanting. Now a way is invented how for all money, be it never so small, we can tell presently, and we want not many instruments, that we may cry, we have oversounded Supereureka, Supereureka, we have gone beyond Archimedes his Eureka. The way is,

"To know any part of Silver mingled with Gold."

Take a perfect Balance, and put in one Scale of any metal. In the other as much of the same metal, but the purest of its kind. And when the Scales hang even in the air, put them into a vessel full of water, and let them down under water about half a foot. Then will it be a strange wonder, for the Balances that hang equal in the air, will change their nature in the water, and will be unequal. For the impure metal will be uppermost, and the pure will sink to the bottom. The reason is, because pure Gold compared, with that kind, is heavier than all impure Gold, because pure Gold takes less place. Wherefore it will weigh heavier by the former reason. If then we would know how much Silver is in the Gold, put as much pure Gold in the other Scale, as will make the Balances equal under the waters. When they are equal take them up, and the weight you added under water, will be the weight of the mixture. If you would know how much Gold is upon a vessel Gilded. Put the cup in one Scale, and as much pure Silver in the other, that the Scales may hang equal in the air. Then put them under the water and the vessel will sink down. Put into the other Scale as much pure Gold, as will make them equal under water. Draw them forth, and that is the weight of the Gilt of the plate. You shall do the same for Silver, Brass, Iron, white or black Lead. But would you know whether in money, Brass be mingled with Silver, or coin be adulterated with Copper. Put the money into one Scale, and as much of the finest Silver into the other. Balance them equal. Then up them under the water. The money will go down. Add as much Brass as will make the Scales equal, then take them forth. And it will be the weight of the mixture. Now will I set the weights of metals, how much they weigh more in the waters, then in the air, whereby without any other experiments we may know mixtures. An Iron ball that weighs nineteen ounces in the air, will weigh fifteen in the water. Whence it is that proportion of Iron in the Air to the same in the waters, is fifteen to nineteen. A Lead bullet of the same magnitude, weights 31 ounces in the air, in the water but 27. A Marble bullet little less for bulk, weighs 7 in the air, and 5 in the water. Copper weighs 16 in the air, and 12 in the waters. Silver weighs in the air 127, in the waters 113. Brass in the air weighs 65 Carats, and one Grain, in the waters 50 Carats and two Grains. Crown Gold in the air weighs 66 Grains, in the waters 62. Gold called Zechini in the air weights 17 carats, under water 16 Carats. Turkish Ducat Gold weighs in the air 34, under water 32. Common French Crown Gold weighs in the air 67, under waters 60. Common Crown Gold of Hungary that is old,in the air weighs 17, in the water 16. Crown Gold of Tartary weighs 16 in the air, and 14 under water.