

The Seventh Book Of Natural Magick

"Marbodeus"

(On Loadstone)

This stone does reconcile the man and wife,

And her recall that from her husband goes.

If one would know her leads a whorish life,

Under her head, when that she sleeps, it shows.

For she that's chaste, will presently embrace

Her husband while she sleeps, but a whore

Falls out o'th'bed, as thrown out with disgrace,

With stink o'th'stone, which shows this, and much more.

The Proeme

We pass from jewels to stones: The chief whereof, and the most admirable is the Loadstone, and in it the majesty of Nature does most appear. And I undertake this work the more willingly, because the Ancients left little or nothing of this in writing to posterity. In a few days, not to say hours, when I sought one experiment, others offered themselves, that I collected almost two hundred of principal note; So wonderful is God in all his works. But what wiser and more learned men might find out, let all men judge. I knew at Venice, R.M. Paulus, the Venetian, that was busied in the same study. He was Provincial of the Order of Servants, but now a most worthy advocate, from whom I not only confess, that I gained something, but I glory in it, because of all the men I ever saw, I never knew any man more learned, or more ingenious, having obtained the whole body of learning; and is not only the splendor and ornament of Venice or Italy, but of the whole world. I shall begin from the most known experiments, and pass to higher matters, that it may not repent any man of his great study and accurate diligence therein. By these, the longitude of the world may be found out, that is of no small moment for sailors, and wherein the greatest wits have been employed. And to a friend that is at a far distance from us, and safe shut up in prison, we may relate our minds, which I doubt not may be done by two Mariner's Compasses, having the alphabet written about them. Upon this depends the principles of perpetual motion, and more admirable things, which I shall here let pass. If the Ancients left anything of it, I shall put that in by the way. I shall mark some false reports of some men, not to detest their pains and industry, but lest any man should follow them in an error, and so errors should be perpetual thereby. I shall begin with the name.

Chapter I

"What is the Name of this Stone, the kind of it, and the Country where it grows."

Lato in lone writes, that Empedocles called this stone "Magnes", but Lucretius from the country of Magnesia.

"The Greeks do call it Magnes from the place,

For that the Magnets Land it does embrace."

And the same Plato says, some call it Heraclius. Theophrastus in his book of Stones calls Herculeum, because he found it about the city Heraclea. Others think it denominated from Hercules. For as he conquered and subdued all beasts, and men, so this stone conquers Iron, which conquers all things. Nicander thinks the stone so called, and so does Pliny from him, from one Magnes, a Shepard. For it is reported that he found it by his hobnailed shoes, and his shepherds Crook that it stuck to, when he fed his flocks in Ida, where he was a Shepard. But I think it is called Maganes, as you should say Magnus, only one letter changed. Others call it Siderites from "", that in Greek signifies Iron, and the Latine call it Magnes, Heraclius, and Siderites. Hesychius makes the stone Siderites to be different from Heraclius, for he says, one has an Iron color, and the other a Silver color. Also, Pliny from Sotacus makes five kinds of it. The Ethiopian, the Magnesian for Magnesia near Macedonia, as the way lies to the Lake Boebis, on the right hand, the third in Echium of Boeotia, the fourth about Alexandria at Troaderum, the fifth in Magnesia of Asia. The first difference is, whether it be male or female, the next in color. For those that are found in Macedonia and Magnesia, are red and black, but the Boeotian is more red then black. That which is found in Troas is black, and of the female kind, and has no force therefore. But the worst sort is found in Magnesia, of Asia. It is white, and attracts not Iron, and is like a Pumice stone. It is certain, that the more blue they are, the better they are. The Ethiopian is highly commended, and it costs the weight in Silver. It is found in Ethiopia at Zimirum, for so is the sandy country called. It is a token of an Ethiopic stone, if it will draw another Loadstone to it. There is a mountain in Ethiopia, not far off, that produces a stone called Theamedes, that drives away all Iron from it. Dioscorides describes it thus. The best Loadstone is that which easily draws Iron, of a bluish color, thick, and not very weighty. Pisanrensis makes three sorts of them, one that draws Iron, another flesh, and another that draws and repels Iron, very ignorantly, for the fleshy Loadstone is different from this, and one and the same stone draws and drives Iron from it. Marbodeus says, it grows among the Proglodites and Indians. Olaus Magnus reports, that there are mountains of it in the North, and they draw so forcibly, that they have ships made fast by great spikes of Wood, lest they should draw out the Iron nails as the ships that pass between these rocks of Loadstone . There is an island between Corsica and Italy, called Ilva, commonly Elba, where a Loadstone may be cut forth, but it has no Virtue. It is found in Cantabria in Spain, Bohemia, and many other places.

Chapter II

"The Natural reason of the Loadstones attraction."

Because some have written whole books, of the reason of the Loadstones attracting of Iron, lest I should become tedious, which I purpose not to be, I think fit to pass over other means opinions, especially, because they depend only upon words and vain cavils, that philosophers cannot receive

them. And I shall set down my own, founded upon some experiments. Yet I shall not pass by the opinion of Anaxagoras, set down by Aristotle in his Book De Anima, who by a similitude calls it a living stone, and that therefore it draws Iron, and for some other peculiar forces, which might be properly said to proceed from the soul, as you shall see. Epicurus would fain give a reason for it, as Galen and Lucretius report. For, say they, the Atoms that flew out of the Iron, and meet in the Loadstone in one figure, so that they easily embrace one the other. These, therefore, when they light upon both the concretes of the stone and Iron, and then fly back into the middle, by the way they are turned between themselves, and do withal draw the Iron with them. Galen inveighs against this, for he cannot believe, as he says, that the small atoms that fly from the stone, can be complicated with the like atoms that come from the Iron, and that their embracing can draw such a heavy weight. Moreover, if you put another Iron to that which hangs, that will fasten also, and another to that, and so a third and fourth. And the atoms that result from the stone, when they meet with the Iron, they fly back, and are the cause that the Iron hangs. And it is not possible that those atoms should penetrate the Iron, and through the empty pores should rebound unto the former atoms, and embrace others, whereas he saw five Iron instruments hang one by the other. And if the atoms be diffused straight forward through the Iron, why then do other Iron nails stick, fastened but on the sides? For the Virtue of it is spread every way. Wherefore if a very little Loadstone should touch many small bodies of Iron, and these others, and those others again, and the Loadstone must fill them all, that small stone would even be consumed into atoms. But I think the Loadstone, is a mixture of stone and Iron, as an Iron stone, or a stone of Iron. Yet do not think the stone is so changed into Iron, as to lose its own nature, nor that the Iron is so drowned in the stone, but it preserves itself, and while one labors to get the victory of the other, the attraction is made by the combat between them. In that body, there is more of the stone, then of Iron, and therefore the Iron, that it may not be subdued by the stone, desires the force and company of Iron, that being not able to resist alone, it may be able by more help to defend itself. For all creatures defend their being. Wherefore, that it may enjoy friendly help, and not lose its own perfection, it willingly draws Iron to it, or Iron comes willingly to that. The Loadstone draws not stones, because it wants them not, for there is stone enough in the body of it, and if one Loadstone draw another, it is not for the stone, but for the Iron that is in it. What I said depends on these arguments. The pits of Loadstone are where the veins of Iron are. The are described by Galen, and such as deal in minerals, and in the confines of them both, of the stone and the Iron they grow, and the Loadstones are seen, wherein there is more stone, and others in which there is more Iron.. In Germany a Loadstone is dug forth, out of which they draw the best Iron, and the Loadstone, while it lies in the filings of Iron, will get more strength, and if it be smeared or neglected, it will lose its forces. I often saw with great delight a Loadstone wrapt up in burning coals, that sent forth a blue flame, that smelt of Brimstone and Iron, and that being dissipated, it lost its quality of its soul that was gone, namely its attractive Virtue. It is the stink of Iron and Brimstone, as such who destroy Iron by reducing it to a Calx, or use other chemical operations, can easily try. And I thought that the same soul, put into another body, must necessarily obtain the same faculty.

Chapter III

"That the Loadstone has two opposite Poles, the North and South, and how they may be known."

Because the effects of the Loadstone are many and diverse, I shall begin to distinguish from the effects of it, that the readers may receive more benefit and direction. The effects of the Loadstone are of the stone only, or of the Iron touched with the stone, or of them both, the Iron and the stone.

The simple effects of the stone, are to draw the stone, to respect the poles of the world, and such like. Also they are mixed and compounded. We say therefore first, that the stone has two points, that stand opposite one to the other, be it in a great or small stone, which we call the poles. One of them is directed to the North, and other to the South. For if the stone be at liberty, and hangs that it may play, without any impediments from its weight, one part turns freely to the North, and other to the South. The way to try it is thus; Take a little piece of Cork, or Fennel-giant, or some other light Wood, and make it like a boat, that it may serve to bear up the weight of the stone. Put the stone into this vessel, that it may be equi-distant from the bottom. Put the boat into a vessel of water, that it may move here and there, and find no impediment; Let it so alone, and the boat will never rest, until the point of the stone stand full North, and the opposite point full South. When the boat stands still, turn it about twice or thrice with your finger, and so it will come again to rest, and return to the same posture, and this shall make you more certain of the North and South Poles of it. There are many more ways to prove it, for letting it hang equally, as in the Mariners Compass, for where it can move of itself freely, it still directs to the same points. And you may do the same if you hang it by a small thread. Hence we may easily learn,

"To know which Loadstone is the more perfect."

Which a man may easily do by the former trial, and find out what Loadstone is void of Virtue, or most forcible. For that Loadstone that does soonest bring about the boat to the points, and having found the north pole, stands still, is certainly the most forcible stone. But that which slowly works, and comes softly about to its place, and stops often, is more weak and feeble. Also we may be certified another way. For that which can turn about the greater piece of wood, or boat, not slowly, but quickly, is the best stone. And though there be more ways to try it, yet let these suffice at present. We shall speak of the rest in other places.

Chapter IV

"The force of the stone is sent by a right line from North to South, through the length of it."

But the two points we speak of, are the end of the right line, running through the middle of the stone from North to South. If any man break the stone, and breaks this line, those ends of the division will presently be of another property and Virtue, and will be enemies one to the other. Which is a great wonder. For these two points, when they were joined together, had the same force of turning to the pole. But now being parted asunder, one will turn to the North, and other to the South, keeping the same posture and position they had in the mine where they were bred. and the same happens in the least bits that are seen in the greatest Loadstone.

For example: Let the rock of Loadstone be ABCD, and let the line from North to South be AB. If we shall cut the stone AB out of the rock, the very line AB in the stone will represent the polar line from North to South. But if we break the stone broadways, every little piece will keep its line. Cut the Stone AB broadways, as CF, there will be two stones, ACD, and EFB. I say, the stones cut through the line CD, each of them will have its poles out of the world. In the stone AGD, the North pole will be A, the South G. In the stone EFB, the North will be H the south B, and that is beyond all admiration, that the points GH will the stone was but one, were but one, as being agreed together, they had the same forces, but when the stone is divided, each part will hold its Virtue, and be quite contrary and at enmity. For G always turns to the South. And the same will fall out, if you divide AG and HB into many small pieces, and if you afterwards join all these pieces together as they were, their mutual

discord of Nature will be presently reconciled. Wherefore Cardanus said false, that the Loadstone draws where it has but a thin cover, and more in one part then another. For it attracts only from one certain point, as it had its position before in the mines.

Chapter V

"That the Polar Line in the Loadstone is not stable, but movable."

But the like wonder of Nature cannot but be admired among many that God has made, and therefore I would have no man ignorant thereof. This Polar line spoken of, is not always certain in the same place, nor does it stand always firm, but changes, and takes the contrary positions. But this is constant in it, that it always runs through the middle of the stone, like a King that has always his court or fort in the midst of his country. For consisting in the center from where the extreme parts are as it were the Circumference, it can easily send its forces to all parts, and defend itself. But an example shall clear this.

Let the stone be AEFC, and let the line AC running through the length of it, be the Polar line we speak of, wherein the force of it resides, which runs from the North to the South Pole. I say, if you divide the stone in two pieces by the line AC, that one piece may be AED, the other BCF, if they be taken asunder, that the force of it does not reside in the extreme part of the line AD or EXTREME, but being divided in the middle, the force is received in the middle of each stone, and in the stone AED, it will be GH, and in BCF, it will be IL. Which cannot be spoken without admiration, that in a dead stone there should be a living Virtue to move itself. Who is there, unless he try it, that will believe these things? For as the line that stretches from North to South was in the prime, so if you divide the stone into a thousand parts, that force is sent into all those parts, each of them holding its own line in the middle of it. So if we shall divide the part AED into other parts, and shall part the smallest of them, what part so ever is parted from its confines, it will have that same lively force running long-ways through the middle of it. And so it will be, if you divide the stone into the smallest sand. But the greater wonder is, that if you join all the parts together again as they were at first, they will all have the same force united, and that will retire into the middle of the stone.

Chapter VI

"That the force of North and South is vigorous in the points."

But is more wonderful? Though the force retreats to the middle of the stone, yet it does not send itself forth by the middle, but by the extreme part of the stone, and lies still in the middle, as if it were asleep, but it is awake in the end, and there it comes forth. But if a man break the stone, he shall see it more perfectly. I shall give an example for such that are curious, to search out the Virtue of the Loadstone ...

Let the Loadstone be AB, and A the North pole, B the South. I say that in AB the end of the stone, the

force is greater, and in the middle of the line ILN, it is more weak and drowsy, unless there be any Virtue unknown in the right and left side CD. But the nearer it is to the North or South, the more it augments, but the farther off it is, the more it faints. Break the stone in C and G, wherein there lay a Virtue unperceived, but it will appear when the stone is broken and shows its properties, and one point shall show forth the North, the other the South. And if these things seem superfluous, yet are they necessary, as the grounds of what I must say.

Chapter VII

"That by the touching of other stones, those points will not change their forces."

And because I said that the Loadstone does not always hold its forces equal, but that one stone is more powerful in operation than another, for some are faint and weak, I shall put the first question, whether by rubbing and touching the weaker stones with the stronger, those forces will be changed, or stay as they were, as, if a Loadstone is sluggish in pointing out the pole, whether in a stronger stone rubbed with the North point upon the North point of the weaker, can help it at all; or if we shall rub the South point of the other on the North point of this, whether the North point rubbed on will be gone and become the South Point, or continue in its former Virtue? Where we have not reason to direct us, experience shall prove it. For let a Loadstone be of what forces and properties it may be, by rubbing it against a Loadstone of less Virtue, it will never lose anything, but continues immutable, and being left at liberty in its boat, it will turn voluntarily to its own pole, and decline the contrary part. And though we cannot find the cause of it, yet it seems not against reason; I say, that in stones of the same kind, the greater stones have the greatest forces; and one Loadstone is rubbed against another, it will leave certain hairs, which are but the bruised small parts of the stone, that stick like hairs, and these are they that lend force to Iron and other things to attract, and to turn to the pole; but if the stone that is rubbed and receives it be greater than those hairs, it can never be that the greater Virtue should be conquered by the less, always the stones being of the same kind, since the hairs have as it were no proportion to the magnitude of it. And as the hairs to the stones magnitude are insensible, so it is impossible that they can wrest the force of it to the contrary pole.

Chapter VIII

"That a Loadstone will draw a Loadstone, and drive it from it."

I shall speak of the other operation of it, which is of its attracting and repelling. This is both admirable, and delightful to behold with our eyes, and to consider in our mind, that the part of one Loadstone should so carefully search out another, allure and attract, to enjoy its company, and to foster it in its bosom, and again, another should be such an enemy to it, that they are at mutual discord, so that putting their contrary ends together, the one will be so contrary to the other, and have as it were the force of it, that it will turn the contrary way. Namely, the North part of the one

does not indifferently draw any part of every other stone, but a distinct and certain part, nor does it drive every part from it, but that part it naturally abhors, and cannot endure, as being contrary unto it. The North part of the one will draw the South part of the other, and drive away from it the North part of the same, and the South part of this is not an enemy to the North part of the other, but to the South part of it. The same will appear better by an example...

Let there be two stones ACD, and EBF. In the first stone let A be the North pole, and the point G the South, in the stone EFB let the North part be H, and the South B. I say, if you put the South part G, of the CAD, to the South part B, of the stone EFB, it will presently drive it from it, and the same will happen if you put the North pole A to the North pole G. Again, if you show the North point A to the South point H, or the South point B to the North point A, as being mutually agreed it will draw the part to it that is not against it. The reason of it I know; for since that the South part G, had formerly been fast to the North part H, when the parts are divided they always seek to unite again, to preserve the same body, as philosophers say. But if the South point G had been fast with the South point B of another stone, B flies off presently, and departs from it, or if you show the North point A, to the North point H, the same will come to pass, for they refuse one the other, because they did not so stand in their Mine. Here I shall confute the error of Pliny and of his followers, who think that no other Loadstone has this Virtue but the stone of Ethiopia, but it is common to all Loadstones. Also, it is a sign says he, of the Ethiopian Stone, because that will draw another whole Loadstone to it. Also Cardanus falsely affirms that one Loadstone will not draw another, but it will draw it, because the Iron is concealed in it that it had first drank in. In brief, the poles that are unlike, will join together, by reason of the similitude of their substance, and likeness of inclination, but the poles that are the same, by a contrary inclination are at enmity. That is, the North point seeks the South point, and South the North point, so shall the South and North points reject South and North points. Yet we must tell you by the way, that when we try the stones, let them not be both great and vast stones, that being hindered by their weights cannot perform their office. But let one be great, and the other small, or both small, that they may be mutually repulsed or drawn on. The trial is easy, if they be hung by a thread, or put into their boats, or if they play equally balanced upon the Needle.

Chapter IX

"A sport of the Loadstone."

I will not pass by a merry conceit of the Loadstone, that I have often made my friends sport with, for the good of those that are curious in the search of the reasons of things. How in a short time two kinds of sands mingled, and laid on a heap, may be parted on from the other very suddenly. For the standers by, that cannot find the reason for it will think it impossible. The trick is this; pound a Loadstone into very fine sand, and put some white sand, or some other sand together with it, and mingle them, and make a heap of them. For if you put a Loadstone to it, either uncovered, or covered with linen (that bystanders may not know it) presently the sand of the Loadstone, as in league with it, will run like small hairs joined together, and will stick fast to the stone, which you may brush off and lay aside, then come again, and what is behind will run to the stone, till you have drawn it all out, and it will cause no little wonder, that when the Loadstone comes to the heap, the sands that were mingled should be parted asunder. But the more easily to powder the Loadstone, do thus. Put the Loadstone into an Iron Mortar, lay a blanket or some other soft thing upon it, for it will thus yield to hand-strokes, and presently crumble, if not, you must beat hard on the bottom of

the Mortar, and batter the Pestle. Also the same thing befalls us in a certain sand that is brought to us out of an Iron mine from Porchys, for it has the color and shining that Iron has, and by the proximation of the Loadstone, it is soon parted from the other to the admiration of those that are present. It may be this experiment was made, because the Ancients report that the Loadstone will draw Iron, sand, oil, and all things.

Chapter X

"The greater the Loadstone is, the greater is the force of it."

And you must know, that the bigger Loadstone will cast forth its force at a farther distance, and brandish it, and attract the opposite Loadstone with more violence, and draw it to it, and that in the same sort of stone, as if a Loadstone be a pound weight, and another Loadstone be a good distance from it, it will presently leap, and meet the other that draws it. If we cut off half that stone, the force of it will decay, and be dull as if it were dead, and the vigor of it is taken away by the proportion of the part taken from it. If any man will not believe it, let a stone be brought for trial. For a part being taken away, part of the Virtue is lost also. Join the part taken away as it was, and the force will be restored, and become more lively, and will be as powerful as before, that it will leap at a Loadstone that meets it at a great distance, and presently embrace it. This argument confirms it, that the greater the stone is, the greater force it has, even in the same sort of stones. For I have seen diverse Loadstones, brought from diverse parts of the world, to have diverse properties. I saw in Rome, a Loadstone weighting an ounce, that drew two ounces of Iron, and held it so fast as it drew, that it could scarce be pulled from it. I have seen others of forty pound weight, that were so feeble, that they would scarce stir an ounce. But that I may the more oblige the curiosity of students in this matter, I shall teach in the following chapters, how the Virtue of the stone may be tried and equally balanced.....

Chapter XI

"That the force of this stone will pass into other stones, that sometimes you may see as it were a rope of stones."

The stone with us is commended for another property; for when it has taken hold of another stone, it not only holds that fast, but it sends into the body of it an efflux ion of its forces. And that having got more forces, draws another, and gives it the like faculty. The third made to partake of the same Virtue, draws others that are near or far off, and casts forth and brandishes the same Virtue. And this draws another. And so, by a reciprocal ejaculation, by the same force it is held, by the same it holds others. And from each of them to the other, are their darts flying as it were endowed with the Virtue of them. And if you lift them up on high, they seem to hang in links like a chain, that they will not easily be drawn one from the other, that we must wonder exceedingly, how that internal and invisible

force can run from one to the other, and pass through them. And the more Virtue it has, to the more it does communicate it. Yet I thought fit to forewarn you that you fail not in your trial, that the stones must stick the one to the other by the parts that agree, and not by contrary parts. For so would not one impart his Virtues to another, but by the meeting with an opposite part, would be held back, and cease from doing its office. Namely, that the North point of the one, must stick to the South point of the other, and the North point to the North point is contrary and the faculty will faint and decay at the presence of its adversary. Nor yet will we omit to remember those that are curious to try this, that the stones must successively be proportion able, that the great one must draw a less, and a little one must draw one less then itself. For so they will hang the faster, and not be so easily pulled asunder.

Chapter XII

"That in the Loadstone that hairiness is contused"

Hence comes that hairiness of little hairs, that we mentioned before, that sticks so fast to the stone, that it can hardly be pulled off. For when one is rubbed against the other, or is beaten off with a light blow of the Hammer, those small pieces being rubbed one against another, do not fall to the earth by their own weight, but are held up on the force of the stone. And that one may stick fast to the other, turning its friendly countenance to it, it can by no other means commodiously fasten to its sympathizing part, nor be joined with it, but like a hair or small thread. And if you rub one stone long against another, that heap of sand will so augment, that it will appear all hairy, or like the down on a man's chin, or as it were beset round with a heap of pricks. Nor is this to be passed without admiration, that if any man puts another Loadstone to it, or near it, that is greater then it, and more powerful. They will appear presently to turn about, and to direct their friendly parts to the like parts in the stone that is put near them, and to strive to come to it. And if they cannot do it, for want of strength, they will fall to the ground.

Chapter XIII

"The attractive part is more violent then the part that drives off."

We must tell the reader of another thing beforehand, that having laid the foundation of what we shall say, we may proceed to greater matters. The part that attracts, draws more vehemently, and that which drives away, does it more faintly. Namely, the part opposite to it. For if the South part of the stone, sticks to the North part of the other, it will draw at greater distance and more force. But contrarily, if you turn the disagreeing part together, namely, the South parts to the South and the

North parts to the North parts, the natural force is made dull, and as though it were feeble and weak. It loses its force, that it cannot so well perform its office. And if they are not very near, the force is stopped, and can do very little. If any man desires to try, let him hang them up with threads, or balance them on a pin, or put them in boats. And he shall find their readiness to draw, and their feebleness and sluggishness to drive off from them.

Chapter XIV

"The contrary parts of the Stones are contrary one to another."

The parts we speak of, if they are joined friendly together, they will as it were, enter a league, and help one the other, and will gain more force and Virtue. But if they be contrary, they are at such opposition by their Nature, and such secret hatred there is between them, that being put together by their disagreeing points, as if their adversary were present, they will cease from all their attraction and lose all their force. As, if you have Loadstones in your hands, that have the opposite parts united, the North and South together. If another stone be put to them, neither of these stones will move or get the victory, for they neither draw to, nor drive from, especially, if both their forces be equal. But if one be stronger than another, the stone that is put to it, will move and stir, and will either come forward or go backward. But if you take up his contrary companion, he will either be drawn after, or will fly from it willingly. For it will either go along with the part it agrees with, or will go from that part it is contrary to. By which reason you may know, that one hinders the other. We may also by another experiment, be made more certain of the same thing. If you draw one Loadstone with another, and let it hang in the air. If to the place where they join, you apply the contrary force of another Loadstone. By this meeting with their enemy, both their forces will fail and faint. And if the same be of a great force, the stone that drew will let the other go, and falls from it. And also, not without mirth and admiration, you shall see a chain of many pieces of Loadstones hanging together. And if you apply the contrary side to the third or fourth stone, the chain is presently broken, and the part falls off, and will not hang fast. But the other parts, whither the force of it comes not, will yet stick fast together in a link, unless you put the end of the contrary part to them.

Chapter XV

"How to know the Polar points in the Loadstone."

We may know by another and more certain way than that I set down before, which are the vertical points in the Loadstone, which turn to the North, which to the South. And especially, that point that sends forth the attractive Virtue, will be discovered. Thus, that point that most vehemently draws unto it the South point of another stone, and sticks fast to it, that is the North point, and that point the North part of another stone willingly join with, is the South point. The same also may be known by the driving off. The point that drives off from it, and refuses the North part of the stone put against it, is the North point. And the South point, that drives from it the South point. And he that would have the true pole more exactly demonstrated, let him do thus. Put a little bit of a Loadstone, not much greater or lesser than a Millet seed, to the Loadstone. And if presently draw it at a distance, and when it is drawn, it sticks fast and is hardly taken from it, it is an argument of the true end whence

that force proceeds. You may also draw about a little bit about that point, to see if it will draw weakly or strongly, and whether it will part from that place of itself, or unwillingly. Briefly, that point that draws with most force, and will hardly let loose what it has attracted, it the true point of attraction. Giving you to understand,

"That the Pole sends its force to the Circumference."

I have known it so, as from the center to the Circumference. And as the light of a candle is spread every way, and enlightens the chamber. And the farther it is off from it, the weaker it shines, and at too great a distance is lost. And nearer it is, the more clearly it illuminates. So the force flies froth that point; and the nearer it is, the more forcibly it attracts; and the further off, the more faintly. And it is set too far off, it vanishes quite, and does nothing. Wherefore for that we shall say of it, and mark it for, we shall call the length of its forces the Compass of its Virtues.

Chapter XVI

"That the force of drawing and driving off, can be hindered by no hindrance."

But this is above all wonder, that you can never wonder so much as you should, that the force of the stone for attraction and repelling, can be included in no bounds, can be hindered by nothing, or held back. But it will penetrate invisibly. And will move and stir those stones that are sympathizing with it, if they be put to it, and will exercise its forces, as if there were nothing between. But this must be within the compass of its Virtue. For if you hang some Loadstone fitly upon a table of Wood, stone, or metal, or lying equally balanced, and you shall put your Loadstone under the table, and stir it there, the Virtue of it will pass from this body like a spirit penetrating the solid table, and move the stone above it, and stir it as it self is moved. As this moves, so moves that. And when this rests, that does the same. But if the table be made of Loadstone or Iron, the Virtue is hindered, and can do nothing. We shall show the reasons of it in their proper places. Of so many strange miracles in Nature, there in none more wonderful then this.

Chapter XVII

"How to make an Army of Sand to fight before you."

And it is pleasant as wonderful, that I have shown to my friends, who beheld on a plain table an army of sand divided into the right and left wings, fighting, to the wonder of the spectators. And many that were ignorant of the business, thought it was done by the help of the devil. I pounded a Loadstone into powder, some very small, some something gross. And I made some of little bits, that they might better represent troops or horse, or companies of foot. And so I set my army here and there. The wings were on the right and left, and the main body was in the middle, accompanied with troops of horse. Under a smooth table I put a very principal Loadstone with my hand. When this was put there, the left wing marched, and on the right hand, with another stone, the right wing marched. When they drew near together, and were more near the Loadstone, the sands trembled. And by

degrees, they seemed like those that take up their spears. And when the Loadstone was laid down, they laid down their spears, as if they were ready to fight, and did threaten to kill and slay. And the better the Loadstone was, the higher would these hairs stretch forth themselves. And as I moved my hands little and little, so the army marched on, and showed the form of a battle. And you might see them sometimes retreat, sometimes march forward. Sometimes to conquer, and sometimes to be conquered. Sometimes to lift up their spears, and lay them down again, as the Loadstone was put near to them, or farther off. And the more force there was to send forth in every way. But this is the greater wonder, because what is done on a plain board, may be done hanging in the air. That you may see them like the Antipodes in battle. For stretching out a paper, or setting a table aloft, the Loadstones moved above the table, will do the same thing we speak of, and show it to the spectators. But if one that is ingenious do the business, he will do more and greater feats then we can write of.

Chapter XVIII

"The Situation makes the Virtues of the Stone contrary."

It cannot want wonder, as it does reason, that the position should show the Virtues contrary to all that we have said. For the stone put above the table will do nothing, and another thing if is put under the table. For if you sit the stone by equally poising it to make it move freely, or put it into a boat, and put a stone above it. It will attract it, or reject it, as we said before. But if you put it under the stone, it will work contrarily, for that part the drew above. That is, if you place the stone above and beneath in a perpendicular. By which experiments, one may see clearly, that the situation will work contrary operations, and change the forces of it by turns. Wherefore in the operations of it, you must chiefly mark the position, if you put the Loadstone above or beneath.

Chapter XIX

"How the attractive force of the Loadstone may be weighed."

We can also measure that attracting or expelling Virtue of the Loadstone, or poise it in a balance. Which will be of no small consequence in the following considerations. And especially, for a perpetual motion, and to make Iron hang pendulous in the air, when the true and certain attractive Virtue is found out from the Circumference to the center. The art is this. Put a piece of a Loadstone into a balance, and the other scale as much weight of some other matter, that the scale may hang equal. Then we apply a piece of Iron lying on a table, that it may stick fast by their friendly points, you shall by degrees cast some sand into the other scale, and that so long, till the scale and Iron part. So by weighing the weight of the sand, we have the Virtue of the Loadstone we sought to find. We may also put the Iron into the scale, and lay the Loadstone on the table.

Chapter XX

"Of the mutual attraction, and driving off of the Loadstone and Iron."

Now are we come to the other part of our treaty, wherein we will discourse of the mutual union of Loadstones, and of their differences one with the other. The effects whereof are so known, that they are in the mouths of all men, nor will any man almost say that he know them not. The operation is this. Because there is such a natural concord and sympathy between the Iron and the Loadstone, as if they had made a League. That when the Loadstone comes near the Iron, the Iron presently stirs, and runs to meet it, to be embraced by the Loadstone. And that embraces it so fast, that with tossing of it up and down, you can scarce part them. And the Loadstone runs as fast to the Iron, as is as much in love with that, and unity with it. For neither of them will refuse to be drawn. But the weaker still runs willingly to meet the other. That you may believe this, you shall try it thus. either hang them both by a thread, or put them in boats, or balance them on the Needle. Pliny speaking of this, says, for what is more wonderful? Or wherein is Nature more wanton? What is more sluggish than a cold stone? Yet Nature has given this both sense and hands. What is more powerful than hard Iron? Yet it yields and submits. For the Loadstone draws it. And that matter that conquers all things, runs after I know not what. And as it comes near, it stops, and lays fast hold, and stays constantly to be embraced. Lucretius, seeking the cause of this effect,

"How it should be that Loadstone Iron draws."

And Orpheus in his verses relates, that Iron is drawn by the Loadstone, as a bride after the bridegroom, to be embraced. And the Iron is do desirous to join with it as her husband, and is so solicitous to meet the Loadstone. When it is hindered by its weight, yet it will stand on end, as it held up its hands to beg of the stone, and flattering of it, as if it were impatient that it cannot come at it by reason of its large size. And shows that it is not content with its condition. But if it once kissed the Loadstone, as if the desire were satisfied, it then is at rest. And the are so mutually in love, that if one cannot come to the other, it will hang pendulous in the air. Wherefore Albertus very ignorantly told Frederick the Emperor, that a friend of his showed a Loadstone, that did not attract Iron, but was attracted by it. Since the lighter of these two will stir, when the heavier approaches near it.

Chapter XXI

"The Iron and Loadstone are in greater amity, then the Loadstone is with the Loadstone."

The exceeding love of the Iron with the Loadstone, is greater and more effectual and far stronger, then that of the Loadstone with the Loadstone. and this is easily proved. For lay on a table, pieces of Iron, and Loadstone of the same weight. And let another Loadstone be brought near. When it comes to a fit distance, the Iron will presently stir, and runs toward the Loadstone and embraces it. And it is proven better thus. Let a Loadstone embrace a Loadstone, and be set softly near the Iron. When the force of its Circumference comes to the Iron, the Loadstone will presently let fall the Loadstone, and lay hold on the Iron. But let Iron and that be joined, no Loadstone can ever take them asunder to stick there.

Chapter XXII

"The Loadstone does not draw on all parts, but a certain points."

Yet we must not think that the Loadstone draws the Iron with every part, but at a set and certain point. Which is to be searched out, with great reason, care and diligence. You shall find it thus. Either hang up the Iron, or balance it on a table, that it may presently leap to be embraced from them. Then carry your Loadstone round about it. And when you see the Iron tremble, and run toward the Loadstone, touching it, that is the very point of attraction, and the beams of its Virtue are sent round about them from that point. Wherefore the farther from that point the Iron is, the more faintly and weakly will it move. For the more forcible Virtue nests in the center, as in its Throne.

Chapter XXIII

"That the same Loadstone that draws, does on the contrary point drive off the Iron."

That no man might be deceived, thinking the Loadstone that draws Iron, to be different from that stone that drives it off. I tell him of it beforehand, and I shall by experiments dissipate this cloud. Pliny says, the Loadstone that draws Iron to it, is not the same with which drives Iron from it. And again, in the same Ethiopia, there is a mountain that produces the stone Theamedes, that drives off Iron and rejects it. Pliny not knowing this, erred exceedingly, thinking that they were two stones that had these contrary operations. Whereas it is but one and the same stone, that by sympathy and similitude, draws the willing Iron to it. But with the opposite part, by antipathy of natures, it drives it off. and you may be easily assured of this. For let Iron be balanced equally, and let one end of the Loadstone draw it, if you turn the other end to it, it will fly back, and turn to the contrary part. These points run in a right line through the middle of the stone. Yet observe this, that the Iron which is drawn by one point of the Loadstone, or is within the compass of its Virtue for a while, obtains presently this Virtue. That what is drawn by the one end of it, will be driven off by the other. You shall know these differences of attraction more clearly by the following experiment.

Chapter XXIV

"How Iron will be made leap upon a table, no Loadstone being seen."

By reason of this consent and discord of the Loadstone, I use to make pretty sport to make my friends merry. For casting the Iron on the table, and not putting any Loadstone near it, that the spectators can see, the Iron will seem to move itself. Which is very pleasant to behold. I do it thus. Divide a Needle in the middle. Cast one half of it upon the table, but first rub the head of it with one end of the Loadstone. Put your hand with the Loadstone privately under the table, and there where

the head of the Needle, the Loadstone will stick, and the Needle will presently stand upright. And standing so, to the wonder of the beholders, will walk over the table, and follow the motion of the hand that guides it. When it has gone thus a while, presently turn the stone upside down, and put the contrary part of the Loadstone to the Needle. And (which is strange) the Needle will turn about. And if it went on the head before, it will now go on the point. And draw your hand which way you will, the Needle will follow it. And if you turn the stone three or four times, putting sometimes the South point, sometime the North point of the stone to it, the Needle will turn as often, and sometimes stand on the head, sometimes on the point upright, or walk so as you please. And sometime it will go with that part it stood upon, some in a more strange manner. For if you put the two pieces of a Needle upon a paper or stone, I can so place two stone, that one of the Needles shall go upon the head, the other upon the point. And sometimes one shall turn, then both at once, or they shall dance orderly, and move when any music is played on. And this is a pretty sight to show your friends, that cannot but admire it.

Chapter XXV

"That the virtue of the Loadstone, is sent through the pieces of Iron."

The Virtue that is imparted to the Iron, by the Loadstone, does not stay in the Iron, but is sent from one to another. For if you draw a Steel Needle by the touch of the Loadstone, and put another Needle to the end of that Needle, that part will draw the Needle, and hold it hanging in the air. And if you apply another Needle to that, it will do the same. You may do this with as many Needles, as the force of the Loadstone can reach unto. But when it grows faint, the Needle will let the other Needle fall, as not having strength enough to bear its weight. And thus you may hang a great many Needles in a chain in the air. Plato knew this Virtue, for he speaks of it in *Ione*. Which stone, not only draws Iron rings, but infuses Virtue into the rings as the stone does. Whence sometimes you shall see a long concatenation of Iron rings, and all the Virtues of them is attracted from that stone. Lucretius knew it also.

A stone there is that men admire much,

That makes rings hang in chains by touch.

Sometimes five or six links will be

Fast joined together, and agree.

All this virtue from the Stone arises,

Such force it has ---

Pliny speaking of the same Virtue, says, only this matter receives strength from another stone, and holds it a long time. Laying hold of another Iron, that sometimes you shall see a chain of rings, which the ignorant vulgar call live Iron. Galen. You may see in the Loadstone, that when it touches Iron, it will stick to it, without any bands. And if that was first touched, touch another, that will stick as the first does, and likewise a third to the second. Augustine de civitate Dei, speaking of this wonder, said, We know the Loadstone will wonderfully draw Iron, which when I first saw, I trembled at exceedingly. For I saw an Iron ring drawn by the stone, that hung in the air by it, that

communicated the same force to others. For another ring put to the first, made that hang also. And as the first ring hung by the stone, so the second ring hung by the first ring. In the same manner was there a third and fourth ring applied, and fastened. And so their rings hung together by the outsides, not fastened inwardly like to a chain of rings. Who would not admire at the Virtue of this stone? That was not only within it, but ran through so many rings, that hung by it, and held them fast with invisible bands. But the greater the Virtue of the Loadstone is, the more rings it will hang up. I hung ten Needles with a stone of a pound weight. But he that would draw many Needles, let him rub the heads only against the Loadstone, and they will all hold the heads by their points.

Chapter XXVI

"The Loadstone within the sphere of its virtue, sends it forth without touching."

And the Loadstone does not only impart its Virtue to the Iron, by touching it, but, which is wonderful, within the compass of its Virtue, it will impart Virtue to the Iron. If it be present, to draw another Iron. For if you put your Loadstone so near to the Iron, that it may have it only within the Circumference of its Virtue, and you put another Iron near to that Iron, it will draw it to it. And if another touches that which is drawn, it will draw that also. That you shall see a long chain of rings or needles, hanging in the air. But when they hang thus together, if you remove the Loadstone a little farther off, the last ring will fall. And if you remove it farther, the next will fall, until they all fall off. Whence it is clear, that without touching, it can impart its Virtue to the Iron.

Chapter XXVII

"How the Loadstone can hang up Iron in the air."

I have a long time endeavored much to make Iron hang in the air, and not touch the Loadstone, nor yet tied beneath it. And now I think it almost impossible to be done. Pliny says it. Dinocrates the Architect began to vault the Temple of Arsinoe with Loadstone, that therein her image of Iron might seem to hang in the air. Both he and Ptolemy died, who commanded this to be made for his sister. So that what he began, he did not finish. The Greeks say, that in the Temple of Serapis, that is vaulted at Alexandria, there was a Loadstone set, that held a statue of Brass in the air, for it had a piece of Iron in the head of it. But that is false, that Mahomet's chest hangs by the roof of the Temple. Petrus Pellgrinus says, he showed in another work how that it might be done. But that work is not to be found. Why I think it extreme hard, I shall say afterwards. But I say it may be done, because I have now done it, to hold it fast by an invisible band, to hang in the air. Only so, that it be bound with a small thread beneath, that it may not rise higher. And then striving to catch hold of the stone above, it will hang in the air, and tremble and wag itself.

Chapter XXVIII

"The forces of the Loadstone cannot be hindered, by a wall or table coming between."

As I said before of the Loadstone, the Virtue of that and Iron, can be hindered by no body coming between. But it will do its office. For while the Loadstone is moved under a table of Wood, stone, or any metal, except Iron. The Needle in the Mariners Compass will move above, as if there were no body between them. St. August ne Lib. de civitate Dei, knew this experiment. But that is much more wonderful that I have heard. That if one holds a Loadstone under a piece of Silver, and puts a piece of Iron above the Silver, as he moves his hand underneath that holds the stone, so the Iron moves above. And the Silver being in the middle, and suffering nothing, running so swiftly up and down, that the stone was pulled from the hand of the man, and took hold of the Iron.

Chapter XXIX

"How a man of Wood may row a little boat; and some other merry conceits."

The fraud here is notable. For women shall see a man of Wood rowing, al little boat well waxed, in a large vessel full of water, and they can counterfeit hereby as impostors do divination by water. The fraud is thus began. The vessel is filled with water, a little ship of Wax is put into it, or else of Wood. In the middle sits a little man of Wood, fastened through the middle with a Hogs Bristle, so equal balanced, that with every light motion he may easily stir himself. Let him have oars in his hands, and under his feet a piece of Iron. Let the Alphabet be made on the brim of the vessel, round about. Wherefore a woman coming to enquire of some doubtful matter, the little man of Wood, as it he would give a true answer, will row to those letters that may signify the answer. For he that holds the Loadstone in his hand, under the table, can draw the boat which way he will, and so will answer by joining these letters together. Or put a boy of Cork into a glass Viol, with a broad mouth, that turns himself about the needle equally balanced. And about the Glass vessel, make the Alphabet, that the man turning round about may give the answers. But I made my friends wonder exceedingly to see,

"A paper goes up a wall, and comes down of itself."

For I glued a piece of Iron on the backside of the paper, and I gave my friends to hold to the wall. But behind stood a boy with a Loadstone, and the paper that was left there, stood still. My friend commanded it to go up two foot. The boy that heard what was commanded, moved the Loadstone against it, to that place. And the paper moved thither also, and so downwards, or sideways. They that knew not the reason were astonished at it. But, which exceeds all, when he moved the Loadstone over his head, by an arch of wood, it drew the paper after it. Whereupon the paper hung over out heads and moved. But all that saw it, believed the Devil was the cause of it.

Chapter XXX

"A Loadstone on a plate of Iron, will not stir Iron."

We said that there is nothing coming between, can hinder the force of Iron, but Iron only. So that if you lay a needle on a plate of Iron, and shall bring your Loadstone to it, above or beneath, it has no Virtue to attract it, or do its office. And the reason is easy. For it stands to reason, that if Iron lie upon Iron, they are the same body, as a part is of the whole. And when the plate of Iron, or piece, is larger and too heavy for the Loadstone to draw, it moves not. So that if you put the filings of Iron on a plate of Iron, and with your hand underneath, you carry the Loadstone, the filings will not stir, but stand still upon the plate. Nor if Iron or a Loadstone be upon a table of Iron, will they come to the stone that is put to them, but will lie as if they were asleep, and void of all Virtue, or changed in their Natures. Also, if you put flat Iron to a Loadstone, if on the other side Iron is equally balanced, it will not stir, nor move to meet it. As if all the force of the Loadstone were hindered by it. Lucretius says, that it will happen so, not when Iron, but brass is between them. But I rather think he wrote so of hearsay, then by his sight, if we understand his meaning,

Pieces of Iron I have seen,

When only Brass was put between

Them and the Loadstone, to recoil.

Brass in the middle made this broil.

Chapter XXXI

"The position of the Iron, will change the forces."

What the Loadstone can do, the Iron touched by the Loadstone, will do the same. I said, that the Loadstone equally balanced, by putting the fourth part of the Loadstone above, it will draw the North part and the North part will drive off the North part. But on the lower part, the Nature being changed, that which drew before, drives off now, and that which drove off, draws to it. The same I judge of Iron touched with the Loadstone. For Iron in the Mariners Compass touched with the Loadstone, that part of the Loadstone that draws and drives off in the upper part, being put under, expels what it drew before, and draws what it expelled. I would not omit, that among its admirable properties, the position should cause such alteration. Whence we may conjecture, that as the stone has a Pole Arctic and Antarctic. So it has an East and West part, and its upper and Nether part, as the heavens have. And therefore it is reasonable, that whereas the North and inferior part from above, drew the South and inferior part of the Iron. Now the position being changed, the upper part of the stone will draw the Nether part of the Iron.

Chapter XXXII

"That the Iron rubbed with the northern point of the Loadstone, will turn to the South, and with the South point to the North."

I come to the third part, that is, to the Iron touched with the Loadstone, and they are all wonderful. I say then, that when we know the North point of the stone, and we have rubbed one end of the Iron with it, if it is equally balanced, or hung by a thread, or lies freely in a boat, it will turn of itself to the South. And that stands with reason. For the Loadstone imparts its force to the Iron. For it is the natural force of the Loadstone, that being balanced equally, it should turn its North point to the North, and its South point to the South. But when it is rubbed on the Iron, the upper part of the Loadstone is fastened to the Iron, but the lower part that is near to it is freed. Wherefore, if you rub the Iron with the North part, which fastens to the Iron, and touches its external surfaces, it will be northern that seems to be southern, and this South part will turn freely to the North. But contrarily, if you rub the South point against the Iron, the South point is fastened to the Iron, and the North point is let loose that turns to the north. Wherefore Cardanus speaks false, that the Iron touched by the he South point will turn South. For we see the contrary. Yet the Iron must be touched with one point, either the North or the South point. For if one part bends northward, the other will tend southward. By the use whereof, so large seas are sailed over, that being the conductor. Our ancestors sailed, by seeing the sun by day, and the stars by night. For in the middle of the Sea, as they wandered, they could no otherwise see the coasts of the world. But we cannot only discover what coast we are in, but we can avoid the rocks under the waters. And in cloudy days and dark nights, we can at all times know the poles of the world. Flavius says, an Italian found it out first, whose name was Amalphus, born in our Campania. But he knew not the Mariners Card, but stuck the Needle in a reed, or a piece of wood, cross over. And he put the Needles into a vessel full of water, that they might float freely. Then carrying about the Loadstone, the Needles would follow it. Which being taken away, as a certain natural motion, the points of the Needles would turn to the north pole. And having found that, would stand still. Wherefore, knowing the place before they steered their course to it. Now the Mariners Compass is made, and a Needle touched with the Loadstone, is so fitted to it, that by discovering the pole by it, all another parts of the heavens are known. There is mad a Rundle, with a Latin navel upon a point of the same metal, that it may run roundly freely. Whereupon, by the touching only of one end, the Needle not alone partakes of the Virtues of it, but of the other end also, whether it will or not. For if you rub the Needle with the north point of the stone presently that part will turn to the South, and the opposite part to the North. And one Virtue cannot be imparted without the other. So the Needle touched by the South point of the stone, will turn to the north, and the other part to the South. So that the part of the Needle that is touched, receives a contrary force, from that the stone has.

Chapter XXXIII

"That Iron touched by the Loadstone, will impart that force to other Iron."

Iron touched by the Loadstone, by that touch receives the Virtue of the Loadstone, that it will do

almost as much by attracting, and effecting, and turning it self to the pole. So the Iron hanging freely, touches with the South point of the Loadstone, will turn freely to the North. If you apply the South part of the stone to the same, it will turn to the south presently. But if you touch another Iron with the Iron that was touched, that will turn to the South. And do but point at it with the said point of the Iron, it will turn to the North. And this force is not only sent into the second Iron but to a third and fourth, as the force of the Loadstone is. For if it is a strong stone, it will send its Virtue through eight or ten Needles.

Chapter XXXIV

"The virtue received in the Iron, is weakened by on that is stronger."

Yet this I must tell you, that the Virtue received by the Iron, is not fixed and certain, but is taken off by a stronger that takes it from it. As an Iron touched by a weak northern point of the Loadstone. If you rub the same part of the Iron with a South point of a stronger Loadstone, it will vanish, and that former force of turning itself to the south, is taken away, and it takes a southern Virtue, and will turn to the north without resistance. But if the Loadstones be of equal force, they are so astonished and blunted, that they will neither receive both, nor either.

Chapter XXXV

"How a stone the South or North point discerned."

Among those ways I have shown before, I shall set down this also. And perchance this is the best, how to know the northern and southern points. Let the Loadstone be turned round, by the wheel of the Jewelers, and polished. Then make a slender Iron, as long as the axletree of that round ball, and lay that upon the stone. For it will turn itself upon that line, that points just North and South. Mark the line upon the stone, with some delible paint. Do the same on the other side of the stone. And where it rests upon the ball, draw the same line. Do the same the third and fourth time, upon the middle of it. And where those lines do cross one the other and meet, those are the Polar points. We may also find it out thus. Break a small Needle, and put the smallest piece upon the same ball, and stir it. For when it comes to just northern point, the Needles will stand upright, that will make bystanders admire. And will stand perpendicularly upon it. And till it does rise thus, be not weary of moving it up and down. For when you have found it, you will be glad of it.

Chapter XXXVI

"How to rub the Iron Needle of the Mariners Compass."

I know that some are troubled how to rub the Needle in the Compass with the Loadstone, that it may get force to turn itself to the North Pole. It must be done thus. When you have found the points in the stone, as I said before. Strike the points lightly with a hammer, and the plates will be full of stiff hairs. Upon which if you rub and Iron Needle, it will presently get Virtue to turn itself to the Poles. Yet observe this, that if you would have your Needle turn to the North, you must rub it on the South point. But if to the South, rub it with the North part. For when it is equally balanced, it will turn to these points in the heavens. But that it may do it more forcibly, and do its office more exactly, I shall lay down some rules fit to instruct you. If you strike both ends of the stone with the hammer, that hairs may appear on both parts, that you touch the Needle at both ends, for so the Needle will sooner do its office. Moreover, you must observe very carefully, that when the Iron rubbed against the Loadstone, has received these hairs, that you touch it with no other Iron or Loadstone, but keep it far distant from them, and lock it up in a box. For by touching of others the Iron will grow dull, and lose its Virtue, that it will never pint out the parts of the heaven perfectly. For the Iron coming within the compass of the Virtue of another Loadstone, will receive that, as we said. So the Needle must be proportion able to the stone. For from a little Loadstone, a great Iron will not receive much Virtue, nor show the pole. Also, a little piece of Iron cannot receive much Virtue. For it consumes by the great force of the Loadstone. Moreover, the point that shows the Pole, must not be sharp, but flat a little, that it may receive those Virtues of the Loadstone exactly, and hold them. For in a very sharp point, scarce any Virtue will abide. Iron, the purer it is, the better will it hold the Virtue. For it will hardly take upon foul and rusty Iron. Wherefore Mariners make it of pure Steel. For Steel is made of the best Iron. If you observe this, Iron once rubbed, will hold the Virtue a hundred years. And will certainly, without failing point exactly at the poles in the heavens, for so long time.

Chapter XXXVII

"Of the divers uses of Mariners Compasses."

And the Needle touched, does not only show the Poles for the Mariners use, but almost it serves for infinite uses. As all men know that it is daily spoken of everywhere. I shall speak of some of the chief. The use of the Loadstone upon the Needle, is well known in Sun-dials. For when the Needle stands still over the line that is made form North to South, we are so directed by it, to know the hours by the shadow falling from the Gnomon. Also, those that work in mines use the Needle, to find the veins of the metals, which way they run. For in caves underground, in that posture the Needle stands that is touched with the Loadstone, they know the veins of the metals run on the side of the heavens. Also, it does serve very much for those that describe platforms of buildings, cities, countries, while the situation of the corners are taken and described upon the paper. We use it also in making passages, for to bring water under ground, in digging pits, in making mines and trenches, wherewith they use, with great skill, to blow up forts, castles, rocks, walls, by putting Gunpowder

into them, and stopping all places of vent. The Compass guides them how to go on. Lastly, how to level the discharging of the Canon, both by night and day, it is of singular Virtue, and for many other uses, too tedious to relate here.

Chapter XXXVIII

"How the Longitude of the world, may be found out by help of the Loadstone."

I will not omit, that among the principal uses of the Loadstone, by the help of it the Longitude of the world may be found out. Which notable work has employed the wits of the most knowing men. It has been observed a long time by our men, that the Needle touched with the Loadstone, will not always rest upon the Meridian line, but sometimes till decline nine degrees from it to the east. Nor will it hold the same posture in all places. But in diverse places, it had divers Declinations. But this error seems to follow this order, that the nearer it is to the east, the more it will decline from the Meridian line, toward the east. And nearer it comes to the west, the point of the Needle will decline the more to the west. For finding the Meridian line, as Ptolomy and other Geometricians teach how, and setting up a point on it, that the Steel Needle may turn freely upon the top of it. In Italy it declines toward the east nine degrees, of which there is ninety in a quadrant of a circle. As it is observed in Sun-dials that are brought out of Germany, and it is so described. Moreover, many famous travelers report, that among the Fortunate Islands, one is called the Azores, where the Needle set in the Compass, will rest directly upon the Meridian line, without any variation at all. Also, they that sail to the West Indies observe, that the point of the Needle will decline to the West. Therefore, laying down these for true maxims, we may easily know the Longitude of the world. For if we make a very great Compass, about five foot in diameter, and divide the degrees and minutes, into seconds and thirds, etc. And sailing under the Equator, we do observe the chief motions of the Needle. And the Declinations of it. And shall accommodate the same to the proportion of our voyage. We shall easily know the Longitude and Latitude in dark nights, and the greatest tempests may be certainly discovered. Wherefore it is false that Cardanus says, that the Needle in the Compass declines from the Meridian line, because it inclines to the Pole Star in the Little Bears tail. Whereas, the Needle declines nine degrees, and the Polar Inclination is not so much.

Chapter XXXIX

"If the Mariners Needle stand still, and the Loadstone move, or contrarily, they will move contrary ways."

If the Loadstone lies on the table, and you put the North point of the Mariners Needle to the South point of the stone, and shall carry it round about by the right hand, the Needle will draw to the left. But moving the box to the left hand, the Needle will run to the right. And it will go so far, until it stands in the middle between those two opposite points. The same will be seen in a Sun-dial, if that stand, and the Loadstone be carried about. For if you decline to the right hand, the Needle will follow

the same part. And likewise, if you turn to the left. Hence it is apparent, that the Needle in the Compass is drawn by the North Pole. For those that sail to the East, have it turned toward the East, and so contrarily to the West, it will move to the same point of the Heaven. And if the Loadstone be turned about, the Iron will turn about also, as a pair of Compasses about the center.

Chapter XL

"The Loadstone imparts a contrary force to the Needle."

Now I will speak of the Needle touched with the Loadstone, and of the wonderful operations of it. The first is, that when the Iron is touched by the northern point of the Loadstone, and equally balanced, if you put that part to it from which it received its force. It will not endure it, but drives it from it, and draws to it the contrary and opposite part. Namely, the southern part. The reason whereof, I set down before. The same falls out if you touch the Needle with the South part of the Loadstone. For if you presently put the same to it, it will resist it, and draw to it the North point. hence the parts that are alike, are at enmity, and rejected as adversaries. And the parts that are unlike do agree as friends. Whence it is apparent, that the Loadstone imparts to Iron a contrary force from what the end itself is. And the Steel receives the force of that point of the Loadstone which it touches not. And I prove it thus. Take two Needles, and put them in boats, or hang them by threads. That being touched with the Loadstone, they may move freely. They are contrary one to the other, and they will join in the parts that were touched with contrary ends of the Loadstone, and will not endure the ends that are alike.

Chapter XLI

"Two Needles touched by the Loadstone, obtain contrary Forces."

I will relate a strange thing, yet not far from reason. If you touch two Needles with a Loadstone together, and set them on the same point of it. The other parts that hang on the Loadstone, will abhor and fly one from the other. And if you force them together with your hands, so soon as you let them alone, they will presently return to their posture, and depart as far as they can from one another. The reason is this. That if two Needles stick fast to one northern point of the Loadstone, with their points. You must imagine, that they did receive a southern virtue. And because they are of the same similitude, they will not endure one the other. And because they are fastened to the Loadstone, they cannot get off being compelled by a greater force. But the opposite points of the Needle, because they are both alike northerly, they must needs abhor one the other. And when they are free, one will part from the other. And when they are so hanging on, if you put to them the southern part of another Loadstone, they will presently let go their hold, and go as far off as they can, that sometimes they are pulled off from the Loadstone, being forced by an invisible vapor.

Chapter XLII

"That the force of the Iron that draws, will drive off Iron by diversity of Situations."

That, as I said of the Loadstone alone, is true of the Iron that is touched with it. For if you put a Needle touched with a Loadstone by a boat, swimming in the water, or hung by a thread, or turning on a point equally balanced. If you put upon this a Needle touched with a Loadstone, it will draw it. And that part that attracted the Iron above, will put underneath, drive it away. And the part that drives off above, will draw to it, put underneath. Where you may observe, that the position will work contrary operations.

Chapter XLIII

"The Needle touched by the Loadstone on one part, does not always receive Virtue on both parts."

If the Needle is touched at one end by the Loadstone, it receives Virtue at that end. And at the other end, the contrary is true. But that must not be understood absolutely, but of that Needle that is of a proportion able length. For if it is too long, the Virtue will not come to the other end. But would we know how far the Virtue is come, we must know how far reached the Circumference of the Virtue as I said. Therefore if the Circumference of it is a foot, the force will go a foot-long into the Needle. If we would try this. Touch a long Needle three foot long with a Loadstone at one end. If it touches the Iron at the other end, the Iron touched will not move from its place. But if you touch it a foot or two long, namely, as far as the Circumference of the Loadstones Virtue will reach, and then touch the Needle, it will presently move and be drawn by it.

Chapter XLIV

"The Needle touched in the middle by the Loadstone, sends forth its Force at both ends."

If the Needle is somewhat too long, and we rub it with the stone in the middle of it, the forces of the stones part are diffused to both ends of it. But very obscurely. For you shall not know which is the end. But if you touch it something farther from the middle, the nearer part will receive the forces of the part that touched it, be it the northerly or southerly part.

Chapter XLV

"An Iron Ring touched by a Loadstone, will receive both Virtues."

But if we rub an Iron ring on the one side with a Loadstone, then the part that is touched, will receive the Virtue of the part of the Loadstone that touched it. And the opposite part will receive the

contrary. And therefore the middle of the Iron ring will be capable but of half the force of it, as if it were straight. But if we make a pin round as a ring. And the part jointed together with a joint, be rubbed with a Loadstone. And being rubbed, be stretched straight again, the ends shall receive the same Virtue, be it northern or southern. But by degrees that force will grow feeble. And in a short item become northerly, and the other southerly, or will receive more Virtue then it first had. May be when it was touched farther from the end. But if you would, that these a chain of Iron should hang in the air, as we may of Loadstones. For then, if the rings are laid in order upon a table, that they may one touch the other, thought they do not fasten, put the Loadstone to them, and not only the first will be drawn, but the next, and the third, that they will hang like links of rings. And not only will it be so, if the Loadstone touches the first, that the rest will follow. But if the Loadstone be but near, it will do the same without touching them.

Chapter XLVI

"An Iron plate touched in the middle, will diffuse forces to both ends."

What I said of a long Needle, I say also of an Iron bar. For if you touch it in the middle, the beams of it are spread like the beams of the Sun, or light of a Candle, from the center to the Circumference, and extreme parts. But if we touch an Iron Mortar, being the force is feeble, where it is touched about the surfaces, some Virtue may be perceived. But it is very weak in the extreme parts.

Chapter XLVII

"How filings of Iron may receive force."

If you wrap up filings of Iron in a paper, as Druggists do, like a Pyramis. And put a Loadstone near it. All the filings together will receive the same force, as a long piece of Iron does. But if you stir the filings, and put them into an open paper, that force is lost, and confounded, and can do nothing. As if it had never been touched, by reason of so many pieces.

Chapter XLVIII

"Whether Garlic can hinder the Virtues of the Loadstone."

Now I shall pass on to other properties of the Loadstone. And first, whether the Loadstones attraction can be in any way hindered. Plutarch says, that Garlic is at great enmity with the Loadstone. And such antipathy and hatred there is between these insensible creatures, that if the Loadstone be smeared with Garlic, it will drive away Iron from it. Ptolomy confirms the same. That the Loadstone will not draw Iron, if it be anointed with Garlic. As Amber will no more draw straws, and other light things to it, if they are first steeped in oil. It is a common opinion among Seamen, that Onions and Garlic are at odds with the Loadstone. And Steersmen, and such as tend the Mariners Card are forbidden to eat Onions or Garlic, lest they make the Index of the Poles drunk. But when I tried all these things, I found them to be false. For not only breathing and belching upon the Loadstone after eating Garlic, did not stop its Virtues. But when it was all anointed over with the juice of Garlic, it did perform its office as well as if it had never been touched with it. And I could observe almost not the least difference, lest I should seem to make void the endeavors of the Ancients. And again, when I inquired of Mariners, whether it were so, that they were forbid to eat Onions and Garlic for that reason. They said, they were old wives fables, and things ridiculous. And that Seamen would sooner lose their lives, then abstain from eating Onions and Garlic.

Chapter XLIX

"How a Loadstone astonished may be brought to itself again."

If a Loadstone be drunk, and does not do its office, not as we said, by being breathed on by Garlic. But rather by reason of some other parts of the Loadstone that has touched it, so that the Virtue of it is decayed and gone. We shall restore it to its former Virtue, by covering it over with the filings of Iron many days. Until, by the vapors or company of the Iron, it can perform its office as it should.

Chapter L

"How to augment the Loadstones Virtues."

There are many learned men that have attempted to augment the Loadstones Virtue. And that diverse ways, that having obtained more forces, it might serve for very great uses. Alexander Aphrodisous in the beginning of his Problems, inquires wherefore the Loadstone only draws Iron. And is fed or helped by the filings of Iron. And the more it is fed, the better it will be. And therefore it is confirmed by Iron. But when I would try that, I took a Loadstone of a certain weight and I buried it in a heap of Iron filings, that I knew how much they weighed. And when I had left it there many months, I found my stone to be heavier, and the Iron filings lighter. But the difference was so small, that in one pound I could find no sensible declination. The stone being great, and the filings many. So that I am doubtful of the truth. Paracelsus, being skilled in distillation, tried to do it another way. For, says he, if any man shall quench often in Oil of Iron, a Loadstone red hot, it will by degrees recover force, and augment so much, that it will easily pull a nail forth that is fast in a wall. Which conceit pleased me well. And thereupon I made the stone red hot, and quenched it often in Oil of

Iron. But it was so far from getting more strength, that it lost what it had. And fearing I had not done it right, I tried it often. So I found the falseness of the operation. And I warn others of it also. For a Loadstone made red into in the fire, will lose all its virtue, as I shall show afterwards.

Chapter LI

"That the Loadstone may lose its Virtue."

I found out, that this is the only true way, among many that are set down by writers, by heaping fire coals upon the Loadstone. For once made red hot, it presently loses all its Virtue. And a vapor flies from it that is bluish black, or Brimstone like. Smelling strong, as coals do. And when that flame and vapor ceases to exhale, if you take it out of the fire, all the force of it is breathed forth. And I always thought, that that was the Soul of it, and the cause of its attraction of Iron. When as Iron is made of Brimstone not perfect. As I read in Geber and other writers that treat of metals. Which is the cause that it runs so swiftly to the Loadstone, and desires so much to be embraced by it. And when the that vapor is gone from the stone, it loses all its virtue. And then it is but dead carcass, and it is in vain to endeavor to revive it.

Chapter LII

"How the Iron touched with the Loadstone loses its force."

The same way the Loadstone does, the Iron loses its force also. For though it has been excellently well touched by the Loadstone, if you heat it red hot in the fire, it will lose its forces. And the reason is, because that part of the Loadstone that cleaves to the Iron, loses its forces in the fire. And therefore the Iron deprived of that, loses the force also. Wherefore in the Mariners Compass, or in other uses, when the Iron is stupefied by the touch of other things. And has not its due forces to free it from this imperfection, we put it into the fire. Hence we find the error of many men, who when they put the Needle into the Compass, they first make it red hot. And then they rub it with the Loadstone, supposing it will by that means, take in the Loadstones virtue the more. But they do not only by contraries, but they so make void the Loadstones Virtues, that it cannot do its office, but that force is driven out of the Iron by the fire. And it is just as it was before it was touched with the Loadstone. Wherefore, as often as that force is driven away with the fire, we may touch it again, and give it the same force.

Chapter LIII

"It is false, that the Diamond does hinder Loadstones Virtue."

We have shown that it was a false report, that the Loadstone anointed with Garlic, loses its virtues. But it is more false, that it loses its Virtue by the presence of the Diamond. For, say some, there is so much discord between the qualities of the Loadstone and the Diamond, and they are so hateful one against the other, and secret enemies, that if the Diamond be put to the Loadstone, it presently faints and loses all its forces. Pliny. The Loadstone so disagrees with the Diamond, that if Iron is laid by it, it will not let the Loadstone draw it. And if the Loadstone does attract it, it will snatch it away again from it. St. Augustine. I will say what I have read of the Loadstone. How that if the Diamond be by it, it will not draw Iron. And if it does, when it comes near the Diamond, it will let it fall. Marbodeus of the Loadstone:

All Loadstones by their virtue Iron draw;

But of the Diamond it stands in awe:

Taking the Iron from't by Natures Law.

I tried this often, and found it false. And that there is no truth in it. But there are many Smatterers and ignorant fellows, that would not try to reconcile the ancient writers, and excuse these lies. Not seeing what damage they bring to the commonwealth of learning. For the new writers, building on their ground, thinking them true, add to them, and invent, and draw other experiments from them, that are falser then the principles they insisted on. The blind leads the blind, and both fall into the pit. Truth must be searched, loved and professed by all men. Nor must any man's authority, old or new, hold us from it. But to return from whence those Reconcilers idleness drew me. I took a piece of Loadstone to try by. It was hardly four grains in weight. I fastened the filings of Iron very fast to it. Then I put the Diamond that was three or four times bigger then them both. But that would not make the Loadstone forsake the Iron. Then I took off the filings of Iron from the Loadstone, and set them at a just distance, and it drew the filings to it, though the Diamond were by it. I say this, lest they should think I failed in the trial, and to have taken a Loadstone of twenty or thirty pounds weight, and fastened an ounce of Iron to it, and then to have taken a very small Diamond, and put it to them to make trial with.

Chapter LIV

"Goats blood does not free the Loadstone from the enchantment of the Diamond."

I said, that from false principles, are drawn most false conclusions. Also I said, that it is related that the juice of Garlic smeared on the Loadstone, will take away its attraction of Iron. And, that when the Diamond is by, it will not draw Iron, or will let it fall. But because (say some) Goat blood will break the

Diamond, if the Loadstone is anointed with Goat blood, it will recover. Castianus in Geoponic. Grac. The Loadstone draws Iron to it, and again drives it away from it, if it is anointed with Garlic. But that the force is almost lost may be restored, it must be washed in Goat blood. Rhennius the interpreter of Dionysius,

'Gainst which, nor fire, nor steel ever won;

Goats blood if warm, can break the Diamond:

Nor strokes o' th' Hammer can consume this Stone,

Which from the Loadstone does the Iron take,

That it would still embrace it, let alone:

Diamonds, Loadstone virtues empty make.

Marbodeus of the same.

A Diamond is mighty hard: a Stone

That on the Anvil never can be broke;

Nor steel, nor fire hurt it, yet 'tis known,

It crumbles in Goats blood, if laid to soak.

Since therefore there is an antipathy between the Diamond and the Loadstone. And there is great antipathy between the Diamond and Goat blood, as there is sympathy between Goat blood and the Loadstone. We are from this argument proceeded thus far, that when the virtue of the Loadstone is grown dull, either by the presence of the Loadstone, or stink of Garlic, if it is washed in Goat blood it will then recover its former force, and be made more strong. But I have tried that all reports are false. For the Diamond is not so hard as men say it is. For it will yield to steel, and to a moderate fire. Nor does it grow soft in Goat blood, or Camel blood, or Asses blood. And our Jewelers count all these relations false and ridiculous. Nor is the Virtue of the Loadstone, being lost, recovered by Goat blood. I have said so much, to let men see what false conclusions are drawn from false principles.

Chapter LV

"The Iron touched with a Diamond will turn to the North."

But this is most true, that I found out by chance when I made trial, whether the Diamond had any forces to weaken the Loadstone's Virtue, as I said. For if you rub a Steel Needle on a Diamond, and then put it into a boat, or thrust it through a Reed, or hang it up by a thread, it will presently turn to the North. Almost as well as if it had been touched with the Loadstone. But something more faintly.

And, what is worth noting, the contrary part will turn the Iron to the South. And when I had tried this in many Steel Needles, and put them all into the water. I found, that they all stood equidistant, pointing to the North. And if they that write, that the Loadstone is weakened by the presence of the Diamond, had written thus, that had said more the truth. For a Needle rubbed on a Diamond, and stuck in Straw, and put in the water, that it may turn freely, being turned with your finger, with it stands still, it will turn North, and point exactly.

Chapter LVI

"The Forces and remedies of the Loadstone."

Our ancestors invented many things, by reason of this admirable attractive operation of the Loadstone, and found out many remedies that are worth observing. From this drawing quality that it allures Iron to it, and that they mutually attract the one the other. They did attribute unto it an understanding of venerious actions. And that they are one in love with the other. And when they turn their backs, they hate one the other, and drive one the other off. And that they contain in them also the principles of hatred. Marbodeus.

This Stone doth reconcile the man and wife,

And her recal that from her husband goes.

If one ould know here leads a whorish life,

Under her head, when that she sleeps, it shows.

For she that's chast, will presently imbrace

Her husband while she sleeps. But a whore

Falls out o'th'bed, as thrown out with disgrace,

With stink o'th'stone, which shows this, and much more.

And for this cause, our ancestors to signify as much, did often engrave the picture of Venus upon the Loadstone. Hence Claudian writes,

The Loadstone Venus oft-times represents

I remember also, that many of the Ancients reported, that if the Loadstone were beaten into powder, and were strewn into burning coals, about the corners of the house, that the smoke might fly up. And those that are in the house, will presently run out for fear the house will fall. And frightened with

these Phantasms, would run forsaking all their houses. And thus thieves may steal all their goods. Marbodeus.

If that a Thief can creep into a House

That's full of wealth, and treasure has good store,

Let him on burning Coles, before he rouse the people,

Strew the Loadstone dust all over,

That so the Smoke may at each corner rise,

And that will make the people wake, and think

The house will fall, and run out with great cries,

Then may he take away their Gold and chink.

The reason is, because the Loadstone is Melancholic, as you may conjecture by the color of it. The fumes whereof, rising into the brain, will cause those that are asleep to have Melancholic Phantasms presented unto them. And coals will do the like. The weight Davic, with Serpents fat, and juice of metals, given one to drink, will make him mad, and make him run out of his house, country and nation. And this it does by exaggeration of black Melancholy. Or it will make people Lunatic and Melancholic if they do but hold in their mouths. And by its drawing out of Iron, physicians think it will help well to draw an arrowhead out of ones body.

But we use the Loadstone in making Glass. Pliny. After Glass was found out, it is a very cunning invention, men were not content to mingle Nitre. But the began to add Loadstone thereunto, because it is supposed, that it will attract the Liquor of the Glass itself, and into Iron also. Hence it is, that in making Glass, we add a little piece of Loadstone to it, for the singular Virtue is confirmed by our times, as well as former times. It is thought to attract into itself the Liquor of the Glass, as it draws Iron to it. And being attracted, it purges it. And from green or yellowish Glass, it makes it white. But the fire afterwards consumes the Loadstone. Out of Agricola. We read also, that a Loadstone laid to ones head, will take away all the pains. Galen says, it has purging faculties. And therefore it is given to drink for the Dropsies. And it will draw forth all the water of the belly. Lastly, I shall not pass by the error of Hadrian, concerning the Loadstone. For he says, that the Iron by its weight makes the Loadstone never the heavier. For the Naturalists report, that if a great Loadstone were weighted in a scale and after that, should draw both together, so the weight of the Iron is as it were consumed by the Loadstone and hindered by it from any effect or motion, which I find to be false. It is like that jest in Aristophanes, of a Clown that rode upon an Ass, and carried his Coulter at his back, that he might not load the Ass too much.