conclusion will be the same. The undulations at cer­tain distances are disturbed by forces directed towards the body, and at a greater distance the disturbing forces tend *from* the body.

But the same alternations of attraction and repulsion may be observed between the particles of common matter. If we take a piece of very flat and well-polished glass, such as is made for the horizon-glasses of a good Hadley’s quad­rant, and if we wrap round it a fibre of silk as it comes from the cocoon, taking care that the fibre shall nowhere cross another, and then press this pretty hard on such another piece of glass, it will lift it up and keep it suspended. The particles therefore of the one do most certainly attract those of the other, and this at a distance equal to the thickness of the silk fibre. This is nearly the limit ; and it sometimes requires a considerable pressure to produce the effect. The pressure is effectual only by compressing the silk fibre, and thus diminishing the distance between the glass plates. This adhesion cannot be attributed to the pressure of the atmosphere, because there is nothing to hinder the air from insinuating itself between the plates, since they are separated by the silk. Besides, the experi­ment succeeds equally well under the receiver of an air- pump. This most valuable experiment was first made by Huygens, who reported it to the Royal Society. It is narrated in the Philosophical Transactions, No. 86.

Here, then, is an attraction acting, like gravity, at a dis­tance. But take away the silk fibre, and try to make the glasses touch each other, and we shall find a very great force necessary. By Newton’s experiments it appears, that unless the prismatic colours begin to appear between the glasses, they are at least 1/890th of an inch asunder or more. Now we know that a very considerable force is necessary for producing these colours, and that the more we press the glasses together the more rings of colours appear. It also appears from Newton’s measures, that the difference of distance between the glasses where each of these colours appears is about the 89,000th part of an inch. We know further, that when we have produced the last appearance of a greasy or pearly colour, and then augment the pres­sure, making it about 1000 pounds on the square inch, all colours vanish, and the two pieces of glass seem to make one transparent undistinguishable mass. They appear now to have no air between them, or to be in mathematical contact. But another fact shows this conclusion to be premature. The same circles of colours appear in the top of a soap-bubble ; and as it grows thinner at top, there appears an unreflecting spot in the middle. We have the greatest probability therefore that the perfect transparency in the middle of the two glasses does not arise from their being in contact, but because the thickness of air be­tween them is too small in that place for the reflection of light. Nay, Newton expressly found no reflection where the thickness was 2/5ths or more of the 1/89000th part of an inch.

All this while the glasses are strongly repelling each other, for great pressure is necessary for continuing the appearance of those colours, and they vanish in succession as the pressure is diminished. This vanishing of the co­lours is a proof that the glasses are moving off from each other, or repelling each other. But we can put an end to this repulsion by very strong pressure, and at the same time sliding the glasses on each other. We do not pretend to account for this effect of the sliding motion ; but the fact is, that by so doing, the glasses will cohere with very great force, so that we shall break them by any attempt to pull them asunder. It commonly happens (at least it did so with us), that in this sliding compression of two smooth flat plates of glass, they scratch and mutually destroy each other’s surface. It is also worth remarking, that different kinds of glass exhibit different properties in this respect. Flint glass will attract even though a silk fibre lies double between them, and they much more readily cohere by this sliding pressure.

Here, then, are two distances at which the plates of glass attract each other ; namely, when the silk fibre is inter­posed, and when they are forced together with this sliding motion. And in any intermediate situation they repel each other. We see the same thing in other solid bodies. Two pieces of lead, made perfectly clean, may be made to cohere by grinding them together in the same manner. It is in this way that pretty ornaments of silver are united to iron. The piece is scraped clean, and a small bit of silver like a fish scale is laid on. The die which is to strike it into a flower or other ornament is then set on it, and we give it a smart blow, which forces the metals into contact as firm as if they were soldered together. It some­times happens that the die adheres to the coin so that they cannot be separated : and it is found that this frequently happens when the engraving is such that the raised figure is not completely surrounded with a smooth flat ground. The probable cause of this is curious. When the coin has a flat surface all around, this is produced by the most pro­minent part of the die. This applies to the meta), and completely confines the air which filled the hollow of the die. As the pressure goes on, the metal is squeezed up into the hollow of the die ; but there is still air compressed between them, which cannot escape by any passage. It is therefore prodigiously condensed, and exerts an elasti­city proportioned to the condensation. This serves to separate the die from the metal when the stroke is over. The hollow part of the die has not touched the metal all the while, and we may say that the impression was made by air. If this air escape by any engraving reaching through the border, they cohere inseparably.

We have admitted that the glass plates are in contact when they adhere thus firmly. But we are not certain of this : for if we take these cohering glasses, and touch them with water, it quickly insinuates itself between them. Yet they still cohere, but can now be pretty easily sepa­rated.

It is owing to this repulsion, exerted through its proper sphere, that certain powders swim on the surface of water, and are wetted with great difficulty. Certain insects can run about on the surface of water. They have brushy- feet, which occupy a considerable surface, and if their steps be viewed with a magnifying glass, the surface of the water is seen depressed all around, resembling the footsteps of a man walking on feather beds. This is owing to a repulsion between the brush and the water. A common fly cannot walk in this manner on water. Its feet are wetted, because they attract the water instead of repelling it. A steel needle, slightly greased, will lie on the surface of water, make an impression as a great bar would make on a feather bed ; and its weight is less than that of the displaced water. A dew-drop lies on the leaves of plants without touching them mathematically, as is plain from the extreme brilliancy of the reflection at the posterior surface ; nay, it may be some­times observed that the drops of rain lie on the surface of water, and roll about on it like balls on a table. Yet all these substances can be wetted ; that is, water can be ap­plied to them at such distances that they attract it

What we lately remarked of water insinuating itself be­tween the glass plates without altogether destroying their cohesion, shows that this cohesion is not the same that ob­tains between the particles of one of the plates ; that is, the two plates are not in the state of one continued mass. It is highly probable, therefore, that between these two states there is an intermediate state of repulsion, nay, perhaps, many such, alternated with attractive states.

A piece of ice is elastic, for it rebounds and rings. Its particles, therefore, when compressed, resile; and when