sertation on the elastic curve, relates some experiments of his own, which seem to deviate considerably from it ; but on close examination they do not. The finest experiments are those of Coulomb, published in some late volumes of the Memoirs of the Academy of Paris, He suspended balls by wires, and observed their motions of oscillation, which he found accurately corresponding with this law.

This we shall find to be a very important fact in the doc­trine of the strength of bodies, and we desire the reader to make it familiar to his mind. If we apply to this our man­ner of expressing these forces by perpendicular ordinates C*c*, D*d* (fig. 1), we must take other situations E, F, of the particle B, and draw E*e*, F*f*; and we must have *Od* : F*f*= BD : BF, or C*c* : E*e* = BC : BE. In such a sup­position F*d*ZB*ce* must be a straight line. But we shall have abundant evidence by and by that this cannot be strictly true, and that the line Bee, which limits the ordinates ex­pressing the attractive forces, becomes concave towards the line ABE, and that the part B*df* is convex towards it. All that can be safely concluded from the experiments hitherto made is, that to *a certain extent* the forces, both attractive and repulsive, are *sensibly* proportional to the dilatations and compressions. For,

5. It is universally observed, that when the dilatations have proceeded a certain length, a less addition of force is sufficient to increase the dilatation in the same degree. This is always observed when the body has been so far stretched that it takes a set, and does not completely re­cover its form. The like may be generally observed in compressions. Most persons will recollect, that in violently stretching an elastic cord, it becomes suddenly weaker, or more easily stretched. But these phenomena do not posi­tively prove a diminution of the corpuscular force acting on one particle : it more probably arises from the disunion of some particles whose action contributed to the whole or sensible effect. And in compressions we may suppose something of the same kind ; for when we compress a body in one direction, it commonly bulges out in another ; and in cases of very violent action some particles may be dis­united, whose transverse action had formerly balanced *part* of the compressing force. For the reader will see on reflec­tion, that since the compression in one direction causes the body to bulge out in the transverse direction, and since this bulging out is in opposition to the transverse forces of attraction, it must employ some part of the compressing force. And the common appearances are in perfect uni­formity with this conception of things. When we press a bit of dryish clay, it swells out and cracks transversely. When a pillar of wood is overloaded, it swells out, and small crevices appear in the direction of the fibres. After this it will not bear half of the load. This the carpenters call *crippling ;* and a knowledge of the circumstances which modify it is of great importance, and enables us to under­stand some very paradoxical appearances, as will be shown by and by.

This partial disuniting of particles formerly cohering, is, we imagine, the chief reason why the totality of the forces which really oppose an external strain does not increase in the proportion of the extensions and compressions. But sufficient evidence will also be given that the forces which would connect one particle with one other particle do not augment in the accurate proportion of the change of dis­tance ; that in extensions they increase more slowly, and in compressions more rapidly.

But there is another cause of this deviation perhaps equally effectual with the former. Most bodies manifest some degree of ductility. Now what is this ? The fact is, that the parts have taken a new arrangement, in which they again cohere. Therefore, in the passage to this new ar­rangement, the sensible forces, which are the joint result of many corpuscular threes, begin to respect this new arrange­

ment instead of the former. This must change the simple law of corpuscular force, characterisic of the particular species of matter under examination. It does not require much reflection to convince us that the possible arrange­ments which the particles of a body may acquire, without appearing to change their nature, must be more numerous according as the particles are of a more complex constitu­tion ; and it is reasonable to suppose that the constitution even of the most simple kind of matter that we are ac­quainted with is exceedingly complex. Our microscopes show us animals so minute, that a heap of them must ap­pear to the naked eye an uniform mass with a grain finer than that of the finest marble or razor hone ; and yet each of these has not only limbs, but bones, muscular fibres, blood-vessels, fibres, and a blood consisting in all probabi­lity of globules organized and complex like our own. The imagination is here lost in wonder ; and nothing is left us but to adore inconceivable art and wisdom, and to exult in the thought that we are the only spectators of this beauti­ful scene who can derive pleasure from the view. But let us proceed to observe,

6. That the forces which connect the particles of tan­gible bodies change by a change of distance, not only in degree, but also in kind. The particle B (fig. 1) is attract­ed by A when in the situation Cor E. It is repelled by it when at D or F. It is not affected by it when in the situa­tion B. The reader is requested carefully to remark, that this is not an inference founded on the authority of our mathematical figure. The figure is an expression (to as­sist the imagination) of facts in nature. It requires no force to keep the particles of a body in their quiescent situations : but if they be separated by stretching the body, they en­deavour (pardon the figurative expression) to come together again. If they be brought nearer by compression, they endeavour to recede. This endeavour is manifested by the necessity of employing force to maintain the extension or condensation ; and we represent this by the different posi­tion of our lines. But this is not all : the particle B, which is repelled by A when in the situation F or D, is neutral when at B, and is attracted when at C or E, may be placed at such a distance AG from A greater than AB that it shall be again repelled, or at such a distance AH that it shall be again attracted ; and these alterations may be repeated again and again. This is curious and important, and re­quires something more than a bare assertion for its proof.

In the article Optics we mentioned the most curious and valuable observations of Sir Isaac Newton, by which it appears that light is thus alternately attracted and repelled by bodies. The rings of colour which appear between the object-glasses of long telescopes showed, that in the small interval of 1/1000th of an inch, there are at least an hundred such changes observable, and that it is highly probable that these alternations extend to a much greater distance. At one of these distances the light actually con­verges towards the solid matter of the glass, which we express shortly by saying that it is attracted by it, and that at the next distance it declines from the glass, or is repelled by it. The same thing is more simply inferred from the phenomena of light passing by the edges of knives and other opaque bodies. We refer the reader to the experiments themselves, the detail being too long for this place ; and we request him to consider them minutely and attentively, and to form distinct notions of the infer­ences drawn from them. And we desire it to be remark­ed, that although Newton, in his discussion, always con­siders light as a set of corpuscles moving in free space, and obeying the actions of external forces like any oilier mat­ter, the particular conclusion in which we are just now in­terested does not at all depend on this notion of the nature of light. Should we, with Descartes or Huygens, suppose light to be the undulation of an elastic medium, the