of Mr. Robins and of the Chevalier Borda, on the oblique impulsions of air, are perfectly conformable (as far as they go) to those of the academicians on water. The oblique impulsions of the wind are therefore much more efficacious for pressing the ship in the direction of her course than the theory allows us to suppose ; and the progress of a ship ply­ing to windward is much greater, both because the oblique impulses of the wind are more effective, and because the leeway is much smaller, than we suppose. Were not this the case, it would be impossible for a square-rigged ship to get to windward. The impulse on her sails, when close hauled, would be so trifling, that she would not have a third part of the velocity which we see her acquire : and this trifling velocity would be wasted in leeway ; for we have seen that the diminution of the oblique impulses of the water is accompanied by an increase of leeway. But we see that in the great obliquities the impulsions continue to be very considerable, and that even an incidence of six de­grees gives an impulse as great as the theory allows to an incidence of 40°. We may therefore, on all occasions, keep the yards more square ; and the loss which we sustain by the diminution of the very oblique impulse will be more than compensated by its more favourable direction with re­spect to the ship’s keel. Let us take an example of this. Suppose the wind about two points before the beam, mak­ing an angle of 68° with the keel. The theory assigns 43° for the inclination of the wind to the sail, and 15° for the trim of the sail. The perpendicular impulse being suppos­ed 1000, the theoretical impulse for 45° is 465. This re­duced in the proportion of radius to the sine of 25°, gives the impulse in the direction of the course only 197.

But if we ease off the lee-braces till the yard makes an angle of 50° with the keel, and allows the wind an inci­dence of no more than 18°, we have the experimented im­pulse 414, which, when reduced in the proportion of radius to the sine of 50°, gives an effective impulse 317. In like manner, the trim 56°, with the incidence 12°, gives an ef­fective impulse 337 ; and the trim of 62°, with the incidence only 6°, gives 353.

Hence it would at first sight appear that the angle DCB of 62° and WCD of 6° would be better for holding a course within six points of the wind than any more oblique posi­tion of the sails ; but it will only give a greater initial im­pulse. As the ship accelerates, the wind apparently comes ahead, and we must continue to brace up as a ship freshens her way. It is not unusual for her to acquire half or two- thirds of the velocity of the wind ; in which case the wind comes apparently ahead more than two points, when the yards must be braced up to 35°, and thus allows an impulse no greater than about 7°. Now, this is very frequently ob­served in good ships, which, in a brisk gale and smooth water, will go five or six knots close-hauled, the ship’s head six points from the wind, and the sails no more than just full, but ready to shiver by the smallest luff. All this would be impossible by the usual theory ; and in this respect these experiments of the French Academy give a fine illustration of the seaman’s practice. They account for what we should otherwise be much puzzled to explain ; and the great progress which is made by a ship close-haul­ed being perfectly agreeable to what we should expect from the law of oblique impulsions, deducible from these so often-mentioned experiments, while it is totally incom­patible with the common theory, should make us abandon the theory without hesitation, and strenuously set about the establishment of another, founded entirely on experiments, hor this purpose the experiments should be made on the oblique impulsions of air, on as great a scale as possible, and in as great a variety of circumstances, so as to furnish a series of impulsions for all angles of obliquity. We have hut four or five experiments on this subject, viz., two by Mr. Robins, and two or three by the Chevalier Borda.

Having thus gotten a series of impulsions, it is very prac­ticable to raise on this foundation a practical institute, and to give a table of the velocities of a ship suited to every angle of inclination and of trim; for nothing is more cer­tain than the resolution of the impulse perpendicular to the sail into a force in the direction of the keel, and a lateral force.

We are also disposed to think that experiments might be made on a model very nicely rigged with sails, and trimmed in every different degree, which would point out the mean direction of the impulse on the sails, and the comparative force of these impulses on different directions of the wind. The method would be very similar to that tor examining the impulse of the water on the hull. If this can also be as­certained experimentally, the intelligent reader will easily see that the whole motion of a ship under sail may be de­termined for every case. Tables may then be constructed by calculation, or by graphical operations, which will give the velocities of a ship in every different course, and cor­responding to every trim of sail. And let it be here ob­served, that the trim of the sail is not to be estimated in degrees of inclination of the yards ; because, as we have al­ready remarked, we cannot observe nor adjust the lateen sails in this way. But, in making the experiments for as­certaining the impulse, the exact position of the tacks and sheets of the sails are to be noted ; and this combination of adjustments is to pass by the name of a certain trim. Thus that trim of all the sails may be called 40, whose direction is experimentally found equivalent to a flat surface trimmed to the obliquity 40°.

Having done this, we may construct a figure for each trim similar to fig. 8, where, instead of a circle, we shall have a curve COM'F', whose chords CF', c *f,* &c. *are* proportional to the velocities in these courses ; and by means of this curve we can find the point *m',* which is most remote from any line CM from which we wish to with­draw : and thus we may solve all the principal problems of the art.

We hope that it will not be accounted presumption in us to expect more improvement from a theory founded on ju­dicious experiments only, than from a theory of the im­pulse of fluids, which is found so inconsistent with obser­vation, and of whose fallacy all its authors, from Newton to D’Alembert, entertained strong suspicions. Again, we beg leave to recommend this view of the subject to the at­tention of the Society for the Improvement of Naval Ar­chitecture. Should these patriotic gentlemen entertain a favourable opinion of the plan, and honour us with their, correspondence, we will cheerfully impart to them our no­tions of the way in which both these trains of experiments may be prosecuted with success, and results obtained in which we may confide ; and we content ourselves at pre­sent with offering to the public these hints, which are not the speculations of a man of mere science, but of one who, with a competent knowledge of the laws of mechanical na­ture, has the experience of several years service in the royal navy, where the art of working ships was a favourite ob­ject of his scientific attention.

With those observations we conclude our discussion of the first part of the seaman’s task, and now proceed to consider the means that are employed to prevent or to produce any deviations from the uniform rectilineal course which has been selected.

Here the ship is be considered as a body in free space, convertible round her centre of inertia. For whatever may be the point round which she turns, this motion may al­ways be considered as compounded of a rotation round an axis passing through her centre of gravity or inertia. She is impelled by the wind and by the water acting on many sur­faces differently inclined to each other, and the impulse on each is perpendicular to the surface. In order therefore that she may continue steadily in one course, it is not only