principles on which the most essential properties of ships depend ; and it may now be said that the principal diffi­culties of these are surmounted, and are familiar to the in­structed naval architect. These are alone sufficient to in­sure the attainment of a certain and considerable degree of excellency in a ship, to give it a preponderance of any pe­culiar property, to discover the causes of any bad quality, and to obviate its tendency by an appropriate remedy. In fact, they are enough, quoting from an article in an Ame­rican Review, to “ direct and limit the variations that may safely be made in the models at present in use, and guide us in the draught of new ones, suited to those changes in the force and magnitude of the several rates of vessels, which are continually making in the strife between the na­tions of the civilized world.” Should the science of naval architecture never make further progress than it is thus de­scribed as having attained, it is evident that it is so far per­fect as to be available for, and capable of being made to keep pace with, the wants of mankind. It may be objected, that the American writer assumes too high a standard, and that, so far from changes in the rate and magnitude of ships being made with the certainty attributed, each deviation from the beaten track seems but an isolated, baseless, and aim­less venture, instead of forming one step in the progress of improvement. But, in justice to naval architecture, it should be remembered that the American spoke of the existing knowledge, and of the application of that knowledge in France, and in countries where its importance is recognised and its principles are known and cultivated, not in England, where its very claim to the rank of a science has been derided.

The elements which may be classed in the second divi­sion, as those of which the solution resolves itself into a dependence on laws of nature which are as yet imperfect­ly developed, consist almost entirely of such as are depen­dent, in a greater or less degree, on a knowledge of the na­ture and laws of elastic and non-elastic fluids. This is a sub­ject which has hitherto baffled alike the researches of the mathematician and the experimentalist ; but, from the ana­logy of discoveries in other sciences, we may safely assert, that even its difficulties must be eventually surmounted by the patience and labour of the inductive philosopher. We are possibly on the eve of an important era, in so far as the laws of the resistances of fluids are involved. The re­searches of Mr Russel will apparently do much towards un­ravelling their mysteries, perhaps more than has as yet result­ed from the labour of all preceding ages. Not that the per­fect solution of these problems is really of such vital im­portance to the progress of improvement in naval architec­ture as it is often asserted to be, and which the apparent intimate connection of that science with the knowledge of fluids and of their laws would appear to sanction. Of those elements of naval construction which seem wholly to de­pend on such knowledge, some are restricted by considera­tions which are adverse to its application ; and although it may be a desideratum in the determination of certain of the elements, the difficulties which arise from the want of it only require to be fully known and understood, to be, if not absolutely theoretically removed, at least, from the col­lection of facts, from experiment, and from analogy, so far overcome as to leave nothing to be desired on the score of practical utility. The form of a ship’s body need not necessarily remain imperfect because the curve of the so­lid of least resistance is unknown, since enough has result­ed from the consideration of the nature of that solid to prove that, however it might probably be applicable to the naviga­tion of smooth waters, the perfect solution of the problem of its form could only be generally desirable to the naval archi­tect, as contributing to the theoretic perfection of the science, and would add but little to its practical utility in its appli­cation to vessels which must encounter the tremendous powers of the elements in the open seas. Experience has proved, that a ship constructed with the bow and of the form which are recognised as at least nearly approximating to the solid of least resistance, would be unable to withstand the violence of the shocks of the motion of pitching, and of the waves ; or, could she do so, would necessarily lose, by the additional resistance resulting from increased immersion, every advantage which might otherwise be anticipated. Neither can the exact position of the greatest section be a question of theoretic niceties, when the great capacity and the adjustments of form necessary to the exigencies of mo­dern warfare and the advanced state of navigation are con­sidered, which not only require a ship to be effective in all the *materiel,* and for all the purposes of war, when first from the hands of the builder, but to be equally so after long pe­riods have elapsed and extended seas have been navigated. On the other hand, the comparative fulness of the fore and after bodies, the positions, rakes, and proportions of the masts, the adjustment and the shape of the sails, the bracing of the yards, and many other questions intimately connected with the resistance of fluids, may, and will eventually, be correctly determined by comparison, experiment, and in­duction, guided by the knowledge of those principles of science which are involved in them ; and, without such know­ledge to enable us to test and to establish the correctness of the conclusions which may be drawn, both experiment and comparison must be as useless in this, as, under similar cir­cumstances, they would prove to any other branch of art. It has been most wisely said, that there are more false facts in the world than false theories. The reason is evident ; the correctness of a fact is totally dependent on the compe­tency of the observer ; and how very few, even among those whose minds have been trained to habits of thought, are competent to the task of discriminating fact from fallacy. If there be few among such men, how much fewer in pro­portion must that number be among men of uncultivated minds, who can be capable either of observing facts, or of forming correct conclusions from those which they may have casually observed ; and to such, almost without ex­ception, has been confided the task of establishing the facts, and drawing the conclusions, upon which to found the theo­ry of ships, as far as the development of that theory has been attempted in England.

A most unphilosophic mode of reasoning is very general­ly applied to the question of the application of the exact sciences to naval architecture ; and because chance on some few occasions, inductions from a tedious experience of fail­ures on others, but far more frequently the results of ob­servations on ships built by men of science, may have pro­duced good ships, the question is often hastily decided, and the conclusion assumed, that since ships possessing more than an average of good qualities have been produced with­out abstract scientific study, therefore the exact sciences cannot be available to the advancement of naval architec­ture ; the fact being placed quite out of the consideration, that the results of observations on ships designed by men of science are really the results of science, and that if the observations were made by persons competent to the task, these results would be onward steps in the progress of im­provement.

The time certainly has not yet arrived when the naval architect can effect with precision and confidence the syn­thetical composition of a perfect ship ; but we have already asserted that he may, by the application of principles al­ready established, proceed in the full confidence of produ­cing one with a preponderance of good qualities.

The mistake is in the assumption that the theory of ships is already perfected, instead of merely being capable of being perfected by a rigid analysis of facts which daily experi­ence would elicit were the abstract sciences applied to the task of analysing, collating, and registering them. It should always be remembered, that generally in every science a