

SOCIETY FOR THE IMPROVEMENT OF NAVAL ARCHITECTURE

BICENTENARY

BY

D. K. BROWN, MENG, CENG, FRINA, RCNC
(*Consultant Naval Architect and Historian*)

ABSTRACT

Two hundred years ago the Society for the Improvement of Naval Architecture was formed to improve British warship design. Though it had a short life, its membership was influential and many developments in teaching and in the formation of learned societies can be traced back to it.

Introduction

Towards the end of the 18th century a bookseller named Sewell, who often visited naval ports, became convinced of the superiority of French warship design and believed that this superiority was due to their more scientific approach to naval architecture. He took two positive actions himself to remedy the problems as he perceived them. Firstly he made available the covers of a magazine which he published, *The European Magazine*, for articles on naval architecture (and reprinted the best of them in book form in 1800 (FIG. 1)). Also, on 14th April 1791, he called a meeting at the Crown and Anchor in the Strand of those interested in the 'Improvement of Naval Architecture'. The resulting Society did not have a very long life but it was most influential and the RCNC, the RINA and most British Schools of Naval Architecture trace their ancestry back to the Society as, possibly, may this *Journal*.

A
 COLLECTION
 OF
 PAPERS
 ON
 NAVAL ARCHITECTURE ;

ORIGINALLY COMMUNICATED THROUGH THE CHANNEL OF
THE WRAPPER

OF
The European Magazine ;

IN WHICH PUBLICATION,
 THE FURTHER COMMUNICATIONS ON THIS SUBJECT
 WILL BE CONTINUED.

IN THREE PARTS.

London:

Printed by Bunney & Gold, Shoe-lane, Fleet-street,
 For J. SEWELL, No. 32, CORNHILL.

1800.

FIG. 1—THE TITLE PAGE OF THE COLLECTED PAPERS ON NAVAL ARCHITECTURE
 REPRINTED FROM 'THE EUROPEAN MAGAZINE' (ACTUAL SIZE)

French Science

In 1681 Jean Baptiste Colbert, Minister of Marine to Louis XIV, summoned many of the leading scientists of France to a conference in Paris where the problems of warship design were outlined to them and their help invited in finding solutions. The Académie des Sciences encouraged these studies by offering prizes for the best papers submitted on naval architecture. By the end of the 17th century papers had been published on the theory of sails, manoeuvring, etc. In 1697 Paul Hoste, Professor of Mathematics at the Royal Seminary at Toulon, wrote that unless the fundamentals of naval construction were fully understood, design would continue to be a process of trial and error.

During the 18th century many books were published in France and elsewhere on naval architecture. The most famous is Bouguer's *Traité du Navire, de sa construction, et de ses mouvemens* (1746), but there were other important works from Euler, Don Juan and Chapman. The state of naval architecture at the end of the century was summarized in Chapman's works. Many of these books and papers were translated and published in England, usually quite quickly. The only British contribution to theory, but a most valuable one, was that by George Atwood on the stability of ships at large angles of heel, presented in two papers to the Royal Society in 1796 and 1798, though it would be some 75 years before Barnes reduced his work to usable form.

Sewell and others believed that British designers were ignorant and reactionary in ignoring this work but this common verdict needs re-examination. The French work on metacentric stability was valid and useful but their hydrodynamics was totally fallacious—about as relevant as the phlogiston theory of combustion. There was no significant French contribution to structural design which had to wait for the British work of Snodgrass and Seppings. Captured French ships in RN service required far more refit work than British-built ships. Even the 'evidence' for the superiority of French designs is dubious, to say the least, and is probably based on unreliable accounts by both naval officers and naval architects endeavouring to enhance the reputation of their profession or themselves.

The Society

Be this as it may, the belief that British ships were inferior was generally held and a distinguished body assembled at the Crown and Anchor in 1791. By June, the Duke of Clarence, himself a naval officer and later King William IV, had agreed to become President of the Society, and the membership included the Earl of Stanhope (a naval innovator of note), Lord Mulgrave (First Lord), Sir Joseph Banks (President of the Royal Society), Admiral Sir Charles Middleton (a former Comptroller, later Lord Barham), Sir Charles Knowles (a hydrodynamicist), etc. The Vice-President was Captain Sir John Warren, distinguished both for his intellect and his fighting record. By the next year some 270 had paid their subscription of two guineas.

The principal object of the Society was stated to be 'the improvement of naval architecture in all its branches'. The Society intended to offer awards of up to £100 for work on the theory of floating bodies and their resistance to motion, and to obtain plans of various ships and calculate their capacity, position of the centre of gravity, tonnage, etc. and the Society also intended to carry out its own experimental work.

The collected papers of the Society were published by Sewell in 1800 and it can be seen how well they lived up to their aim of studying all branches of the subject. The first paper was by an anonymous naval officer (possibly Warren) entitled 'Remarks on forms and proportion'. As well as general

comparisons of British and foreign ships, it discussed problems of stability and described how De Romme had measured the metacentric height of the *Scipio* in 1779 by running out the guns on one side only and then moving the crew across to the low side. Finding the stability inadequate, De Romme had the ship girdled, adding a foot each side to the beam.

This author then describes how he carried out three similar inclining experiments, moving 14 guns, each weighing three tons, through three feet and measuring the heel. From this he was able to deduce the metacentric height (TABLE I).

TABLE I—Stabilities determined in the 1790s

Ship	Displacement tons	Metacentric Height ft
<i>Formidable</i>	3150	3.42
<i>Barfleur</i>	3360	3.77
<i>Bombay Castle</i>	2700	4.47

He found that the *Bombay Castle* was stiff enough, perhaps even a little too much, whilst the other two needed more ballast to improve their stability. The full theory of the inclining experiment was given by Chapman, the Swedish naval architect, in the same volume.

A lengthy paper by Gabriel Snodgrass, Surveyor to the East India Company, later brought into the Admiralty as a director of ship repair, gives his views on the strength of wooden ships, whilst Attwood's classic work was republished. There was a paper on the use of iron beam knees and a note on the trials of *The Kent Ambi-Navigator*, the Earl of Stanhope's unsuccessful attempt at a steam powered warship. More practical articles covered the curing of beef, stowage of drinking water and life-saving, whilst Clerk's well-known book on tactics was reviewed.

Beaufoy's Work

The most famous work of the Society was the series of model tests on the stability and resistance of various forms carried out by Colonel Beaufoy, a member of council. Between 1793 and 1798 he completed some 1700 successful runs in Greenland Dock, London. The models were up to 42 feet long, pulled by a falling weight through a run of 160 feet (FIG. 2). The results were

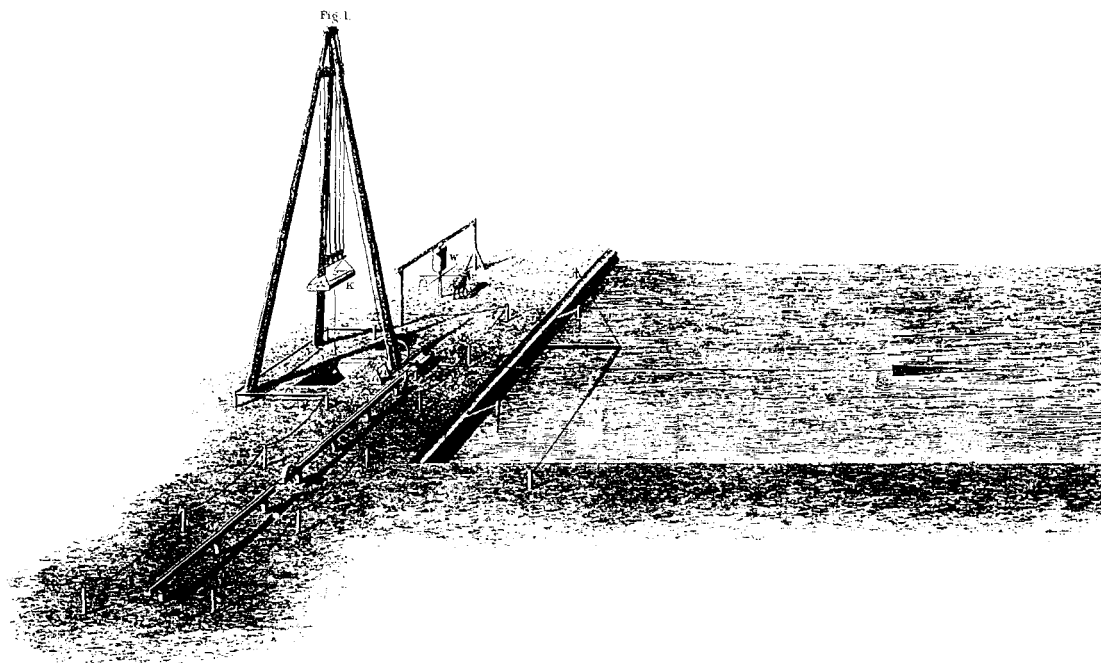


FIG. 2—ONE OF BEAUFOY'S EXPERIMENTS ON MODEL HULL RESISTANCE IN THE 1790s

published in 1800 and, in more detail, in 1834. It is clear from a recent analysis by Dr Tom Wright that Beaufoy's work was accurate and that he was close to a solution to the problem of estimating resistance of full-size ships, finally solved by William Froude some seventy years later. In particular, he appreciated the importance of friction, neglected by most previous workers, using a breakdown proposed by the Earl of Stanhope:

- Friction along the side of the ship.
- The algebraic sum of the pressure at bow and stern.

The End of the Society and its Legacy

The Society seems to have ceased to function from about 1799 but it had a lasting effect on the progress of warship design in Great Britain. In particular, Lord Barham had come to believe in the need for a better-educated class of naval constructors within the Admiralty service. He had probably noticed that few, if any, Admiralty naval architects belonged to the Society.

The School of Naval Architecture

As a result of the general belief in the inferiority of British design, Lord Barham on becoming First Lord set up a Commission 'to enquire into and revise the civil affairs of the Admiralty'. This commission produced a voluminous series of reports between 1803 and 1808 in which they expressed their concern over the low standard of education of Dockyard officers and their fears that this standard might fall even further.

As a result, a School of Naval Architecture was set up in Portsmouth in 1811, initially in what is now the Dockyard Officers' Mess and later in a new building across the square. The School produced many outstanding graduates who were to dominate warship design and contribute to merchant shipbuilding in the middle of the century. Opposition by vested interests led to the decay of the School and it was closed by the reactionary First Lord, Sir James Graham, in 1832.

Before this, in 1827, Morgan, Creuze and Chatfield issued the first volume of *Papers on Naval Architecture*, not to be confused with the 1800 book of similar title. For four years they edited volumes dealing with all aspects of naval architecture and ship construction and with tactics, weapons, etc. Translations of foreign papers and reviews of books were also included. These papers may be seen as an early form of learned Society transactions and even as the predecessor of this *Journal*.

It is, however, interesting to note that Morgan dismissed Sewell's Society as 'amateurs'. Though he admitted that a few of the papers were valuable, he dismissed others as 'totally devoid of scientific knowledge' and saw Beaufoy's work as inferior to that of the Académie des Sciences. Though there is an element of truth in his comments, similar criticism could be levelled at his own *Papers on Naval Architecture*. There was undoubtedly considerable ill feeling between the Society and the Admiralty constructors.

A second School was opened in 1848 and, like the first, produced some brilliant men before it was closed by the same Sir James Graham when he returned to office. The intellectual stimulus of The Great Exhibition and the exciting developments in ships such as *Warrior*, Froude's early work on rolling, etc., led to the formation of the Institution of Naval Architects in 1860 and to the Royal School of Naval Architecture and Marine Engineering at South Kensington in 1864. In 1872 a new journal, *Naval Science*, began publication but though it contained a great deal of fascinating material, very similar to that of the *Journal of Naval Engineering*, it ceased after four years.

In 1873 the School moved to the new RN College at Greenwich and from then the line of descent to the RCNC and the Dagger Course is clear. It seems clear that Sewell's Society was the seed, nurtured by Lord Barham's School.