

THE LIFE AND WORKS OF BEAUTEMPS-BEAUPRE

by Ingénieur Hydrographe Général L. DAMIANI

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A century ago, on 16th March 1854, in a modest dwelling at Number 54 of the rue des Saints-Pères in Paris, there died at the age of eighty-eight Charles-François Beautemps-Beaupré, *Ingénieur hydrographe en Chef*, Member of the Institute and Bureau of Longitudes, Grand-Officer of the Legion of Honour. For a bare six years the eminent scientist had been enjoying a rest he unquestionably richly deserved, for his retirement had not occurred until 15th September 1848, when he was eighty-two. His period of active service added up to 63 years and 25 days, and included 42 years of shore-duty and 21 at sea.

Sixty-three years of unremitting toil and endeavour: of such was made up the life and lengthy career of Beautemps-Beaupré, their successive periods closely corresponding with the various political régimes that had prevailed in France from the Old Régime to the Second Empire.

Beautemps-Beaupré was born on 6th August 1766 at La Neuville-au-Pont, a small hamlet located near Sainte-Menehould in the vicinity of the forests of the Argonne, or in that section of Champagne now forming the Marne Department.

Nothing in his background seemed to point to a naval career. His father was a farmer, and young Charles-François seemed fated as a toiler of the land rather than of the sea. Little information is available regarding his early childhood. His biographers nevertheless relate that while playing with his small friends one day, he was badly wounded in the head and had to be trepanned. But the operation, then considered extremely serious, seems in no way to have impaired his mental faculties, if we are to judge from his subsequent prodigious and extensive career.

The boy moreover did not remain at home for very long. He was but ten years old when the chance event occurred that was to determine his fate and direct him in the path of cartography and hydrography.

In 1776, a cousin, Nicolas Buache, known as Buache de La Neuville, a geographer by appointment to the King and the owner of a geographical business establishment in Paris on the rue Noyers-Saint-Jacques, paid a short visit to his native village of La Neuville-au-Pont. Buache was much struck by his young relative's alertness and precocious intelligence, and took him back to Paris with the intention of later making him his shop-assistant. He was not slow in realizing that his cousins's capabilities went far beyond those required for keeping charts,

globes and geographical atlases in order. Observing that young Beautemps-Beaupré was evidently attracted by all that had to do with cartography, he initiated him in the exact sciences of the period, and particularly in navigation, astronomy, and the art of chartmaking. This was a comparatively unknown art at the time, and was the prerogative of a few interrelated families, who handed it on down to each other. Thus Nicolas Buache's knowledge had been acquired from his uncle, Philippe Buache, who in turn had obtained his own from the Delisle family.

In 1782, Nicolas Buache, who had been the geography tutor of Louis XV's grandsons, was rewarded for his outstanding services to the royal family by being appointed *ingénieur-hydrographe* at the Chart Depot (*Dépôt Général des Cartes, Plans et Journaux de la Marine et des Colonies*).

A year later, in 1783, Buache entered his cousin at the Depot as an unpaid student, and Beautemps-Beaupré, who was still only seventeen, was thus enabled to complete his scientific and cartographic formation. During this period of apprenticeship, he shared in Buache's various activities, including the preparation of the charts La Pérouse was to take on his voyage of discovery. These occupations were to have a decisive influence on his career.

While plotting charts according to the system then prevailing, the young engineer rapidly became aware of their imperfections, and it was then that he must have considered the use of more accurate surveying methods. Eagerly desirous of applying his ideas, he repeatedly begged to be allowed to join La Pérouse's expedition, but permission was denied -- fortunately, as it happened, as otherwise Beautemps-Beaupré would have disappeared with the expedition, and the famous scientist's extraordinary achievements would forever have been lost to us.

It may appear surprising that Beautemps-Beaupré was not authorized to participate in the La Pérouse expedition. At that time, however, hydrographic engineers seldom left the Naval Depot and only under exceptional circumstances shared in surveys at sea or in the field. Their job was to draw up the charts from information derived from log-books and special observations taken by navigators.

It is reported that Beautemps-Beaupré was extremely disappointed at thus not being permitted to take part in field operations, and that he even considered leaving the Depot. It was probably as a conciliatory measure that the Marquis de Fleurieu, the Assistant-Director of the Depot, secured his appointment on 1st September 1785 as an engineer at a salary of 1,200 *livres* per annum, and took him under his personal supervision.

The Marquis de Fleurieu was also a scientist, and in 1769, during the cruise of the *Isis*, had caused great advances to be made in the problem of longitude determination at sea with chronometers. He fully appreciated the talents of the youthful engineer, and entrusted him with various tasks, including the Neptune charts of the Baltic.

But it was with reluctance that Beautemps-Beaupré based his chart construction on surveys carried out according to methods he knew to be inaccurate. He looked forward patiently to the time when he could put his own methods to the test. He was compelled to wait six long years. Finally, in 1791, the opportunity he so ardently desired presented itself.

The La Pérouse expedition had left Brest on 1st August 1785, bent on undertaking the exploration of the Pacific Ocean. It had given, however, no sign of life since 10th March 1788, and some anxiety was beginning to be felt as to its ultimate fate.

Following proposals made by the National Assembly, Louis XVI decided in 1791 to send out a new expedition in search of La Pérouse, in charge of Captain, later Rear-Admiral, d'Entrecasteaux. The expedition consisted of two vessels: the *Recherche* and the *Espérance*. Beautemps-Beaupré once again petitioned to be included in the expedition. Thanks to the support of the Marquis de Fleurieu, who in the meantime had served as Minister of the Navy, Beautemps-Beaupré obtained satisfaction at last, and on 31st July 1791 embarked on the *Recherche* with the rank of *premier ingénieur hydrographe*.

D'Entrecasteaux's instructions were not only to explore in detail all shores that might contain the remains or traces of La Pérouse's passage, but to make a hydrographic survey of such coasts.

The expedition set sail from Brest on 28th September 1791. After rounding the Cape of Good Hope, Admiral d'Entrecasteaux crossed the southern part of the Indian Ocean, and put in at the southern point of Van Diemen's Land, at the spot now occupied by the city of Hobart. He then entered the Pacific, and investigated the coast of New Caledonia, the New Hebrides, Solomon Islands, Admiralty Islands and Friendly Islands. He reconnoitred the Santa Cruz Islands, of which a fairly extensive hydrographic survey was made, but considered it unnecessary to land on the Vanikoro Islands (1), although as if impelled by some obscure premonition, he gave them the name of « Île de la Recherche ». Investigations were continued on the coasts of New Guinea and neighbouring groups of islands. Unfortunately, from 1792 on, severe crew losses were suffered through illness. Both Amiral d'Entrecasteaux and Captain Huon-Kermadec, who was in command of the *Espérance*, succumbed, together with 89 men out of a total of 219. Political dissension moreover became rife among the staffs, who in part had rallied to the revolutionary cause. The two ships finally entered the port of Suabaja on 27th October 1793, where they were interned by the Dutch authorities. The various members of the expedition were able to make their separate ways back to Europe.

Although the expedition had not succeeded in discovering the remains of La Pérouse's ships, a large number of charts of the lands explored had been plotted, due to Beautemps-Beaupré. Numerous scientific observations of all kinds had been made, with particular regard to natural history. Most of these documents did not reach France until much later, as de Rossel, who had succeeded Admiral d'Entrecasteaux as the leader of the expedition and had charge of the documents, was taken prisoner by the British and did not arrive back to Paris until 1802, after the Peace of Amiens.

During his return voyage, Beautemps-Beaupré spent several months at the Cape. He made the most of his enforced stay by copying out his notes, and succeeded in having this copy reach the French representative in the United States.

(1) Traces of the La Pérouse expedition were discovered at Vanikoro by Dumont-d'Urville in 1828.

The account of d'Entrecasteaux's voyage and the final plotting of the surveys carried out during the expedition could not be undertaken until after 1802, upon the arrival of all the documents in France. Captain de Rossel was entrusted with their publication, but this was delayed by military tasks assigned to the Naval Depot during the Empire, and they did not appear until 1807 and 1808, under the title of *The Voyage of d'Entrecasteaux sent in search of La Pérouse*. The story of the expedition was accompanied by an atlas containing plans and coastal views of the voyage, and by an appendix, drawn up by Beautemps-Beaupré, describing the new surveying methods used by the engineer.

The Appendix to *The Voyage of d'Entrecasteaux* is an actual treatise on hydrography that was entirely original for the period, and consists of three chapters.

Chapter I describes the method of carrying out a survey while under way and without going ashore, by combining astronomical observations with landmark observations. The great innovation in the method developed by Beautemps-Beaupré was the disregard of compass bearings, which were then used in effecting surveys at sea. Conspicuous objects ashore were instead sighted exclusively with the reflection circle developed by Borda, by measuring the angles between such objects and another distant point or the sun, provided the latter was not too far above the horizon. Compass bearings were used solely to determine variation.

Chapter II discusses hydrographic plan surveying in small boats. Beautemps-Beaupré refers to the properties of the arc as capable of containing a given angle, which were well-known during his time, and shows how they can be adapted for obtaining the positions of soundings during boat operations, by using measurements of angles between known points ashore. He supplies a simple method, still in use today, for plotting the position of sounding stations on the sheets with a protractor. Forms of record books for entering sounding and tidal data also appear in the chapter.

Chapter III contains an actual illustration of the new survey process as applied to the construction of a chart of the Santa Cruz Islands.

Beautemps-Beaupré's book created a considerable stir, as it revolutionized prevailing hydrographic methods. In 1823 it was translated into English by Captain Richard Copeland of the Royal Navy, who recommended it to British hydrographers.

While on board the *Recherche*, Beautemps-Beaupré had made converts of all the officers serving on the ship. Admiral d'Entrecasteaux evaluated Beautemps-Beaupré's methods in his report as follows (1):

« I cannot praise the zeal of *Ingénieur hydrographe* Beautemps-Beaupré too highly; the chart he has made with the utmost accuracy was completed at the same time as the reconnaissance of New Caledonia; in this he was seconded by all the officers and pilots of the vessel. The unusual method of astronomical bearings and measurements of angular distances, taken with reflection instruments, was applied throughout: the exactness thus acquired for this work is one that could never be obtained by compass bearings, which compared with astronomical bearings, have always presented large differences where we are concerned. »

(1) *Voyage de d'Entrecasteaux envoyé à la recherche de La Pérouse*, edited by M. de Rossel.

In his correspondence, d'Entrecasteaux invariably showed the highest esteem for Beautemps-Beaupré. He expresses the following sentiments in a letter dated 22nd September 1792 sent from Amboina to the Minister of the Navy :

« It is with eagerness that I seize this opportunity to say that M. Beautemps-Beaupré is a person of the utmost distinction, and that he is deserving of the Government's every reward ».

Beautemps-Beaupré was luckier than de Rossel, who, it will be remembered, was kept as a prisoner by the British, while the former was able to leave the Cape on a Swedish ship and make his way back to France via Sweden and Denmark. He arrived in Paris on 31st August 1796. He was then thirty years old. He resumed his cartographic activities for a time at the Chart Depot under de Fleurieu, including the construction of the Neptune charts of the Baltic, begun prior to his departure, and drew up the charts that were to accompany the account of Etienne Marchand's voyage around the world in 1790, 1791, and 1792 (*Voyage autour du monde fait en 1790, 1791 et 1792 par Etienne Marchand*).

But the wars during the Consulate and Empire did not long delay in distracting Beautemps-Beaupré from these rather pacific occupations. By 1799, his talents were drawn upon to serve Napoleon's vast projects, and most of the tasks entrusted to him were military in purpose and concern.

From 1799 to 1803, he was charged with various hydrographic surveys between Dunkirk and Antwerp. He investigated the possibility of building a new port inside the Scheldt, and made a detailed study of the channels in the river and the beaconage of the channels between Antwerp and Flushing. Following these various activities, he published in 1804 a book entitled: « Nautical description of the North Sea coast from Calais to Ostend » (*Description nautique de la côte de la mer du Nord depuis Calais jusqu'à Ostende*). This work, illustrated by several highly detailed charts, contained sailing directions for mariners navigating in these parts.

On 2nd February 1804, at the age of thirty-eight, Beautemps-Beaupré became Deputy-Chief of Hydrographic Engineers and Deputy-Head of the Naval Depot. On 5th August 1804, he was designated a Chevalier of the National Order of the Legion of Honour, which had been founded two years before.

This was the period when Napoleon was planning the invasion of Great Britain and had concentrated a landing-fleet at Boulogne. Beautemps-Beaupré was entrusted with a secret mission involving the operations of this fleet. He took new soundings along the coast and drew up pilot instructions for the area between the Pas-de-Calais and Flushing.

In 1805 Beautemps-Beaupré resurveyed the Scheldt, where Napoleon had finally decided to set up a new naval port.

In 1806, following the Austerlitz campaign and the Peace of Pressburg, Napoleon was considering the fortification of the Dalmatian coast, and Beautemps-Beaupré was sent to the Adriatic with orders to survey the harbours on the east coast of the Gulf of Venice between Trieste and Cattaro. The years 1806, 1808 and 1809 were devoted to these activities. In the meantime, Beautemps-Beaupré had completed a new survey of the Scheldt.

On 1st August 1809, after the battle of Wagram, he was instructed to take to Napoleon's headquarters at Vienna an armistice agreement drawn up between General Maureillan, the governor of Zara, and an Austrian flotilla besieging the city. Beautemps-Beaupré availed himself of the opportunity by presenting the Emperor at the palace of Schoenbrunn with his fair sheets. As a reward for his accomplishments, Napoleon himself conferred upon him the cross of Knight of the Iron Crown.

The death of Fleurieu in 1810 left a vacant seat at the Academy of Sciences, in the section of geography and navigation. Beautemps-Beaupré applied to obtain it. Upon this occasion, Arago, whose mission it was to submit the candidate's innumerable achievements to his colleagues, remarked to Beautemps-Beaupré: « But, sir, you must be a hundred years old. » Actually he was only forty-four, and had not yet begun his survey of the North and West coasts of France, which was destined to be his masterwork.

In 1811 the Empire extended as far as the Elbe. Beautemps-Beaupré was then instructed to carry out a hydrographic survey of the coasts between the Scheldt and the Elbe, and to discover a likely site for a naval port on the Elbe or the Ems. Work proceeded until the end of the Empire.

In July 1813, Beautemps-Beaupré carried out a final mission on the left bank of the Elbe, which had been chosen as the site for the projected port.

Events culminating in the end of the Empire prevented Napoleon from carrying his plan to conclusion.

Elie de Beaumont, the life-secretary of the Academy of Sciences, relates in his historical account of Beautemps-Beaupré that in 1815, during the Hundred Days, at a reception given at the Tuileries, the Emperor said to Beautemps-Beaupré: « We're a long way from the Elbe! And your charts? — Sire, replied Beautemps-Beaupré, I thought it advisable to send them to the United States by an American ship. »

The Elbe charts were later handed over to the King of Hanover, who appointed their maker a member of the Royal Scientific Society of Göttingen in 1816.

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1814 marked the end of the Empire, and Napoleon was succeeded by Louis XVIII. In spite of the services rendered by Beautemps-Beaupré to the imperial cause, a Royal Order of 6th June 1814 setting up the corps of hydrographic engineers listed the following:

— Buache, as Chief Hydrographic Engineer and Conservator of the Naval Depot;

— Beautemps-Beaupré, as Chief Hydrographic Engineer and Assistant Conservator.

It may be assumed that the remembrance of Buache's past services as geography tutor to Louis XVIII and his brothers had some bearing on this decision.

Peace having at last returned, the Naval Depot could turn its attention to the revision of its French coastal charts, which owing to circumstances were in such poor condition that they constituted a definite anachronism. The French

Neptune charts dated back to 1693. The revision carried out in 1776 by Captain de La Bretonnière and Méchain, the astronomer, had mainly dealt with land areas. The marine sections, which had been surveyed according to the older methods, were far short of requirements. The basic idea involving a complete resurvey of the French coast was accepted by Louis XVIII as early as 1814, and Beautemps-Beaupré was commissioned to supervise surveying operations in February 1815.

The actual work, delayed by the political events of 1815, did not begin until 1816. Beautemps-Beaupré was then fifty years of age. Operations were to be carried on until 1838, for twenty-three years, or nearly a quarter of a century, and were to require twenty seasonal expeditions from early May to late October.

The methods used by Beautemps-Beaupré in carrying out this gigantic task are set out in a volume published by him in 1829 and entitled: *Description of work in connection with the hydrographic reconnaissance of the West coast of France (Exposé des travaux relatifs à la reconnaissance hydrographique des côtes occidentales de France)*.

Part I of the work, dealing with surveying operations at sea, was written by Beautemps-Beaupré, and Part II, which covers geodetic operations, was drawn up by *Ingénieur-hydrographe* Daussy, who had special charge of triangulation work.

The methods applied differ from those practised by Beautemps-Beaupré during d'Entrecasteaux's voyage only as regards certain minor details, in which the need for changes had been made apparent by surveying experience.

Beautemps-Beaupré began operations with two 50-ton schooners, the *Recherche* and *Astrolabe*, and two barges resembling large-sized launches manned by seven or eight oars. A greater number of small ships and boats were made available to him later on, built and equipped at Brest for the type of work planned.

Funds amounting to 60 000 francs were allotted to Beautemps-Beaupré for the first season. With these funds he had to pay and feed his entire staff (7 engineers, 2 students and 35 men) and cover all incidental expenses, such as signal construction, tidal observations, transport of equipment, etc. The same sum was appropriated for the seasons between 1817 and 1822. From 1824 to 1826 the allotment was increased to 70,000 francs, and from 1829 to 1838 to 80,000 francs.

The instructions given to Beautemps-Beaupré by Admiral de Rosily, the Director-General of the Depot, left him a completely free hand in the supervision of all types of operations connected with the work under his jurisdiction. He was merely requested to begin with the hydrographic survey of the Brest area, the charting of which was particularly inadequate.

The years 1816, 1817 and 1818 were devoted to this survey, and resulted in the publication of Part I of the French Pilot in 1822.

The 1819, 1820 and 1821 seasons, and a part of the 1822 season, were spent in surveying the West coast area between Pointe de Penmarc'h and Yeu Island, followed in 1829 by the appearance of Part II of the Pilot.

The latter part of the 1822 season and the 1824, 1825 and 1826 seasons were employed in surveying the coast between Yeu and the Spanish coast, the results of which were embodied in Part III of the Pilot, issued in 1832.

No expeditions took place in 1823, 1827 and 1828. These latter years were spent in putting into final shape at the Depot the work of the previous seasons.

The last ten seasons from 1829 to 1838 were concerned throughout with the survey of the Northern coast of France, and the outcome was the publication in 1839, 1842 and 1844 of the final three volumes of the Pilot.

The French Pilot thus consisted of six atlases totalizing 150 charts and plans, and including a large number of coastal views and tide tables. It was a tremendous task for the time, and was greatly admired by maritime circles both in France and abroad.

Beautemps-Beaupré was seventy-eight years old when the final volume of the French Pilot appeared. He had received the highest awards during the course of his surveying expeditions along the coasts of France, and had been successively designated as a Knight of Saint-Louis in 1819, an Officer of the Legion of Honour in 1823, and a Knight of the Scientific Order of Saint-Michael in 1826. He had been a member of the Bureau of Longitudes since 1824, had succeeded Buache as Conservator in 1825, and in 1830 had been made Assistant-Director of the Depot.

He acquired the rank of Commander of the Legion of Honour in 1835, and in 1844 King Louis-Philippe in person conferred upon him the star of Grand-Officer.

Beautemps-Beaupré's retirement took place on 15th September 1848, when he was eighty-two.

He spent the last years of his life quietly in his house near the establishment which had been the scene of his long career. His newly-won leisure enabled him to attend regularly the sessions of the Academy of Sciences, which he had been forced to neglect during the active period of his existence.

A year before his death, on 1st February 1853, a bust of Beautemps-Beaupré commissioned by Napoleon III was unveiled at the General Depot of Charts and Plans by Ducos, Minister of the Navy and Colonies.

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Beautemps-Beaupré's contemporaries remember him as an unassuming, wise, brave, and kind man.

His modesty was extreme, and the high marks of honour bestowed upon him were never solicited. Admiral Decrès, a former Minister of the Navy during the Empire, said in 1819 of Beautemps-Beaupré: « Throughout the eighteen years of my contacts with Monsieur Beautemps-Beaupré, he consistently compelled my attention by his work, but never once by requesting a favour. Since he is forgetful of himself, he must be remembered by justice and friendship. »

The life of Beautemps-Beaupré is a superb illustration of the results that can be supplied by an unrelenting will and assiduous labour.

It can be stated as an indisputable fact that Beautemps-Beaupré originated the principles of accurate hydrography, as set forth in his various works. But the works in themselves, as *Ingénieur-hydrographe général* Rollet de l'Isle

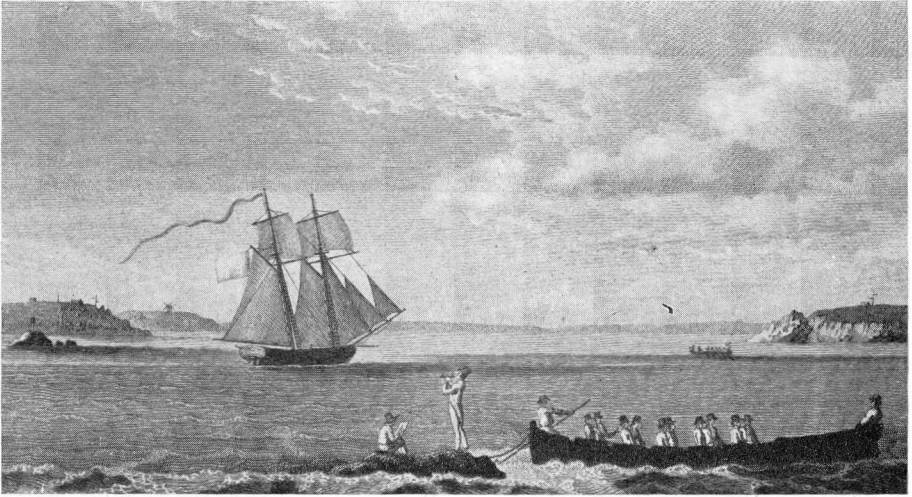


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BEAUTEMPS-BEAUPRÉ,
(Charles-François.)

*Ingenieur Hydrographe en chef de la Marine,
Chevalier de S. Louis et de la Légion d'honneur.*

Né à La Nouvelle-au-pont (Marne) le 6 Août 1766 - du en 1810.



Frontispiece of Volume 1 of French Pilot Hydrographic operations
in Brest Narrows.

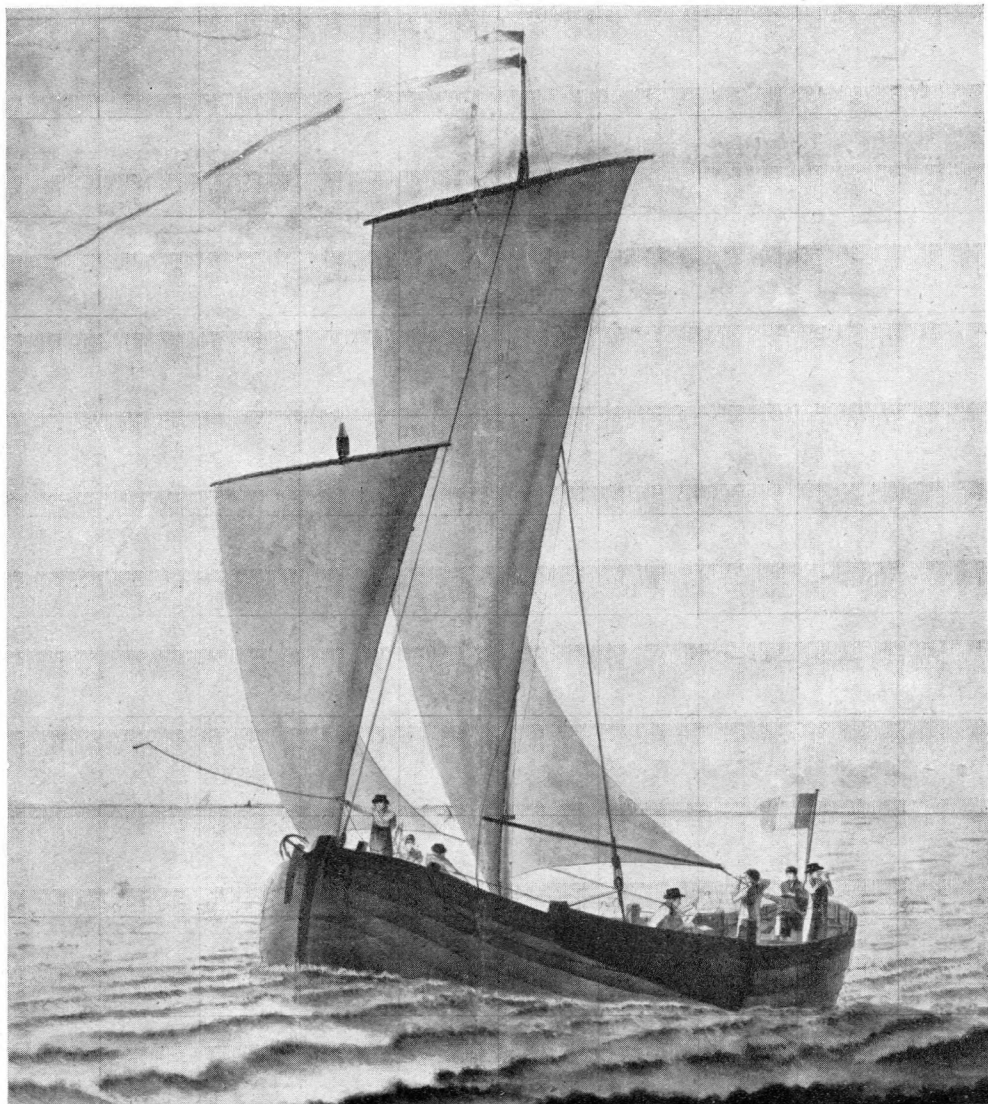
Monsieur

Le hasard m'a fait retrouver un exemplaire
de mon portrait lithographié en 1822. J'
m'empresse de vous l'adresser, avec prière
d'en faire l'hommage de ma part à m.
l'amiral Beaufort.

Paris le 8 avril 1852.

Beautemps-Beaupré

Facsimile of inscription on back of Beautemps-Beaupré's
portrait presented in 1852 Beaufort, the British Hydrographer.



Sailing craft of Beautemps-Beaupré used in hydrographic operations
on the North coast of France (1799-1805).

points out in his *Historical Study of Hydrographic Engineers and the Navy Hydrographic Office*, would not have sufficed « in creating the traditions that have been carefully preserved by the corps of hydrographic engineers ». During nearly half a century, he had to practise what he preached and train, much as a father would, the engineers who shared in his activities. He therefore widely deserves the appellation bestowed upon him of « Father of Hydrography ».

Since Beautemps-Beaupré's time, the constantly developing requirements of navigation have necessitated increasingly accurate surveys. The methods devised by Beautemps-Beaupré have had to be adapted to these requirements, but the principles yet endure and have been adopted by hydrography abroad.

Since the close of the last century, a systematic revision of French coastal hydrography has become necessary, and soon no trace will exist on charts of Beautemps-Beaupré's surveys.

Moreover, the application of new systems of depth determination and investigation will doubtless lead to the use of new surveying methods.

It is therefore possible that in the fairly near future the immense amount of labour expended by Beautemps-Beaupré may remain unused. Whatever happens, we can be sure that the memory of him will not perish and that his valuable services will ever be recognized.