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D'APRÈS DE MANNEVILLETTE, CAPTAIN AND HYDROGRAPHER TO THE FRENCH EAST INDIA COMPANY (1707-1780)

MANONMANI FILLIOZAT
32 rue charlot, 75003 Paris

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English and Portuguese cartographers are mostly known for this work on India and the Indian Ocean. The French and Dutch are almost forgotten, though they produced many important charts and essays on this part of the world. D'Après de Mannevillette is one of these French hydrographers who was very famous for his atlas, the *Neptune Oriental*, in the second half of the 18th century, even in England, but has been completely overwhelmed by the fame of James Horsbugh's book. His work is an important document in the fields of nautical astronomy and cartography of the Indian Ocean on the data given and is still available in the archives and libraries in France.

Jean-Baptiste d'Après de Mannevillette was born in Le Havre, a port town in Normandy on the Atlantic coast, on February 13th, 1707. His father, Jean-Baptiste Claude d'Après de Blangy, had been Lieutenant in a company of Coast-guards from 1705 to 1716, and then entered in 1719 into the service of the new Compagnie des Indes (i.e. the French East India Company) as a captain of a ship, the solide, bound for Pondicherry and Bengal. The father took his young sons in his first journey to India. The ship left Le Havre on December 13, 1719, after a stop at Madeira and arrived at La Réunion (île Bourbon) on May 8, 1720. It left La Réumon on the 29th of May and reached Pondicherry on July 21 after a force. At that time the only route from the Mascareignas Islands (La Réunion and Mauritius) to India was to join the Parallel of 34-35° of south latitude and to continue eastwards with the trade winds. At about 60° of longitude east of paris, the ships turned their route to the north to sight Galle Point in Sri Lanka and join the western or the eastern coast of India. They could thus avoid all the islands and reefs which are at the north-east of Madagascar and which were not explored yet. Generally the duration of the voyage from La Réunion was usually of two and a half months, but in 1720 the *Solide* took only thirty-three days to reach Pondicherry.

The young d'Après returned to France with his father in August 1721[1]. D'Après de Mannevillette was then sent to Paris to study geography under Guillaume Delisle, the best geographer of his time, who was the king's geographer. D'Après studied also astronomy under Philippe Desplaces, member of the Academy of Sciences, who published astronomical tables based on those of Philippe de la Hire.

In 1724, d'Après de Mannevillette entered the service of the French East India Company. In 1726, he became second sub-lieutenant on the *Maréchal d'Estrées,* a ship bound for Senegal and the French West Indies and was back in 1728. D'Après

de Mannevillette went to Senegal as a sub-lieutenant and a second mate, in 1730-1731 and 1732 respectively.

First Journeys to the East Indies

In january 1733, d'Après de Mannevillette became first sub-lieutenant on the ship, the *Galathée,* bound for India. He left Lorient on january 24 for Bordeaux, São Tiago and Anjouan, one of the Comoros islands where they arrived on August 23. Wing to a series of mishaps they arrived at Pondicherry only on january 25, 1734. They started on their return voyage on October 11 and arrived in Lorient on July 19, 1735. It is during this voyage that d'Après de Mannevillette started a collection of charts and memoirs on the Indian Ocean and its navigation. He said that he was induced to do so because of the numerous errors on the English and Dutch charts which the sailors used[2].

A few months later, d'Après de mannevillette was appointed second mate on the ship, the *Prince de Conty.* The ship left Lorient on December 18, 1736, bound for China. Arriving off Macau in July, they lost their bearings between the numerous island off the chinese coast[3].

Nautical Instruments Utilised

Invented by John Davis, the backstaff was the instrument most commonly used at that time to know the latitude of a ship. A mariner, turning his back to the sun, could measure the altitude of the sun above the horizon by aiming at the latter and the shadow of the other successively. To measure the distance between a star and the moon, it was difficult to keep the images of both the heavently bodies together due to the movements of the ship. He then calculated the latiude and reckoned the longitude according to the course and speed of the ship. The errors could be of three to four degress in latitude and much more in longitude. There were no timekeepers which were accurate enough to keep the time of the place of origin for several months.

On May 13, 1731 during a session of the Royal Society of London, Edmund Halley, the second Astronomer Royal, complained that the navigators did not have any good instrument to observe the stars and the sun so as to know the exact position of their ship[4]. So on May 20, John Hadley presented two quadrants to take the altitude of the sun or a star above the horizon, or to measure angles between two stars or planets, with a single aim. It was a quadrant of 45° of arch mounted with two spicular, a big one mobile with the index arm and a small one quicksilvered only in its lower half, instrument which reflected twice the rays of one of the stars. To measure the altitude of a star, the observer pointed directly at the horizon through the part of the small speculum which was not quicksilvered and moved the index arm so that the image of the sun twice reflected coincided with the horizon. He had to read the measure shown by the index arm to know the altitude of the star. The procedure was the same to observe an angle between two stars or the moon and a star. This quadrant

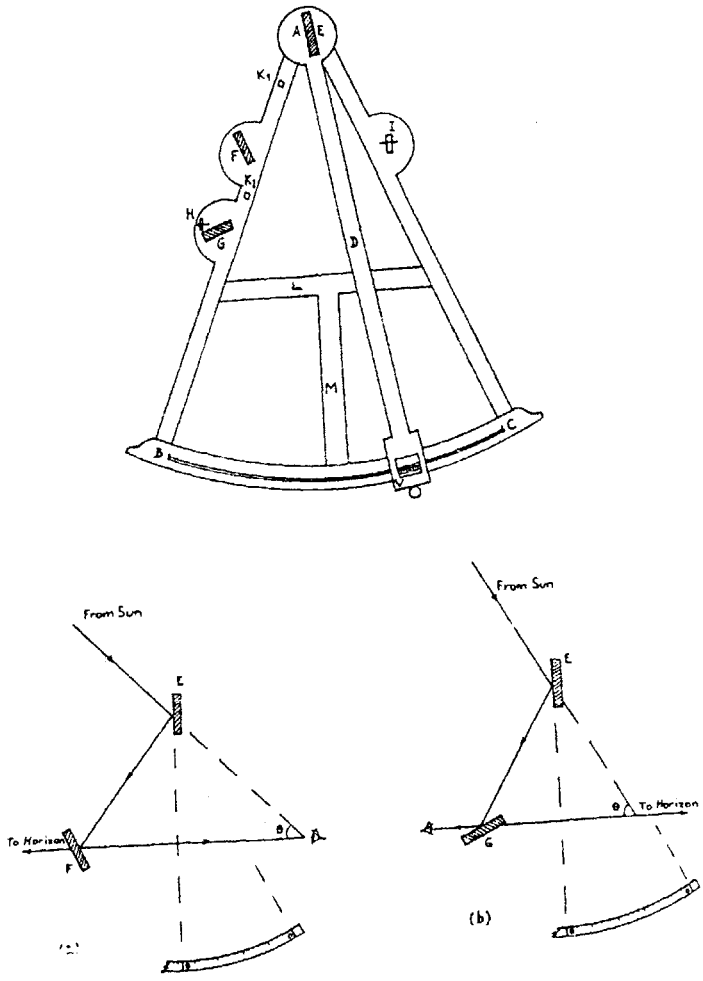

Fig. 1

(a). Forward Observation. (b) Backward Observation.

Taken from: C.H. COTTER. History of the navigator's sextant, Glasgow, 1985.

Current type of Hadley's octant around 1750.

The octant is an are of circle (BC) of 45^0. An index arm (D), fitted with a vernier scale (V), rotates at the point (A). (E) is a big speculum which moves along with the index arm. (F) and (G) are small specula, the lower part of which only is quicksilvered. When the sum is in front, the observator aims at the horizon through the vane (1) and the part of the speculum (F) which is not quicksilvered, then moves the index arm so that the image of the sun which is reflected by the specula (E) and (F), seems to touch the horizon line. For the observation with the sum behind one's back, the observator points to the horizon through the vane (H) and the speculum (G), then moves the index arm so that the sun coincides with the horizon. Owing to the principle of double reflection, one can read measurements upto 900 on an arc of 45^0. When telescope were fitted on the octant, the vane and the speculum for the observation with the sun at the back were removed.

invented by Hadley was the ancestor of today's mariner's sextant. With this quadrant one could observe the altitude of the sun even when it was near the zenith, because any movement was visible on the readings of the index arm.

Hadley proposed two models of octant. He fitted one of them with a telescope at the radial edge of the instrument, its axis being in the plane of the quadrant. The second octant was also fitted with a telescope, but this one was perpendicular to the radius, almost like the telescopes on the sextant. Hadley preferred the first model, but as it was very costly and the spicular were not completely plane, he removed the telescope, using only vans which were sufficient to observe the altitude of the sun or few brilliant stars. Hadley, his two brothers and John Bradley tried at sea both the types of octants in September 1732. The results were accurate to a few minutes of arch, so the instrument was manufactured for the navigators.

D'APRÈS DE MANNEVILLETTE AND HIS NAVIGATIONAL AIDS

D'Après de Mannevillette is said to be among the first French men to have used Hadley's octant in France. In 1737-1738, he was commissioned to test this instrument. Its accuracy was tested when on a voyage to China undertaken on the *Prince d' Conty*, d'Après successfully calculated the latitude by measurement of the altitude of the sun when it was close to the zenith. This demonstrated the accuracy of the instrument when compared to the measurements projected through the process of dead reckoning.

In 1739, d'Après de Mannevillette published a booklet[5] on the use of the octant for measurement of latitude of the ship. It is among the first publication on this instrument in French. The major part of this booklet is derived from a translation of the text published in the *Philosophical Transactions* of 1732 but d'Après ignores the principles of catoptrics. He adds some comparisons with the arbalestrilla and the backstaff which demonstrate the superiority of the octant. At the end of the booklet d'Après gives a table of the dip of the horizon and tables of refraction and declination of six bright stars. This booklet was published by Pierre Lemaire, instrument maker to the Royal Academy of Sciences and one of the first to manufacture octants in France.

D'Après de Mannevillette embarked for Pondicherry as first mate on the Penthiévre in 1740. During a stopover at Mauritius and La Réunion in July and August, d'Aprés observed the immersion of the first satellite of Jupiter in order to determine the longitude of Saint-Denis. Forced to stop at Mergui (Burma) in November 1740, d'Après de Mannevillette observed another immersion of the first satellite of Jupiter from King Island to determine the longitude of Mergui. The captain of another French ship sighted an underwater reef and informed d'Après immediately. He took soundings, drew a map and wrote new instructions to enter this bay. On December 20th they left King Island for Pondicherry where they arrived on January 8, 1741.

Being retained on shore by the governor because of the threats of the Marathas

on the town, d'Après could leisurely finish his charts and instructions on the navigation to India. He submitted his work to the local captains and pilots who were involved in country trade. They showed him the charts which they used and corrected his materials. One Mr Desjardins, captain of port in Pondicherry, gave informations on the west coast of India. An engineer, Deidier, gave instructions to enter the Bay of Pulau Condor (Con Son).

The ship set out on its return voyage in October 1741 and arrived at Mauritius on December 23. During this journey, d'Après was able to correct the reckoning of the longitude by an observation of the end of a solar eclipse on December 8. They had an error of about hundred leagues to the east. During his stay at Mauritius where the ship had to be cleaned, d'Après de Mannevillette observed an immersion of the first satellite of Jupiter to calculate the longitude of Port-Louis. Having left La Réunion on February 2, 1742 they proceeded to Lorient where they arrived on June 4[6].

The long stay in Pondicherry enabled d'Après de Mannevillette a finish the atlas and rutter he was preparing for the last ten years. At the end of June 1742 he offered his work, the *Neptune Oriental*, to the French East India Company who accepted it and decided to publish it. D'Après was elected member correspondent of the Academy in February 1743 and started a long correspondence with the astronomer Pierre-Charles Lemonnier[7]. The Neptune Oriental was published in 1745 and was used on all the ships bound for India and China. It was the first rutter written by a French man since the years 1660's.

In 1749 d'Après was given the commission of captain on the ship, the Cheval marin, bound for Senegal. During this short journey he started some observations on the mariner's compass and used an octant manufactured by Smith to measure angles on the coast. He found the instrument unsatisfactory and ordered a new one after his return to France.

FURTHER SCIENTIFIC ATTAINMENTS

In 1750, d'Après de Mannevillette became the captain of the ship, the Glorieus, bound for the Cape of Good Hope and Mauritius. He had to take to the Cape the abbè de Lacaille, an astronomer and member of the Royal Academy of Science, who had proposed to the Academy to observe the stars in the south hemisphere and measure the length of an arch or meridian of one degree. The latter was made to put an end to the disputes to know whether the earth was a perfect ball or was flattened at the poles. The observations of Maupertuis in Lapland and of Charles-Marie de la Condamine in Peru had proved that the earth was flat at the poles so the measurements of the abbè de Lacaille were only to confirm them. D'Après de Mannevillette had orders of the French East India Company to explore the eastern coast of Africa between Durban (Natal) and the Cape of Good Hope.

D'Après had given special orders for an octant to be made by Canivet, instruments

maker to the Academy of Sciences. This octant had two telescopes fitted, one parallel to the radial edge of the instrument and the other perpendicular to it. This was at a time when telescopes were hardly used on octants because of the bad quality of the glass specula. With this octant d'Apès de Mannevillette could observe eclipses of the satellites of Jupiter to determine the longitude of a place. The abbé de lacaille graduated it at the Cape of Good Hope and adjusted micrometers on the telescopes.

Having left the abbé de Lacaille at the Cape, d'Après set off to explore the eastern coast of Africa. Owing to many delays, he could hardly make any thorough observations on the coast except in the Bay of Lourenco Marques where he tried to enter. He had to come back to the Cape due to a shortage of food and water. The main achievement of abbé de Lacaille was to determine correctly the longitude of the Cape. D'Après de Mannevillette left the Cape on April 17. On his way back he decided to search for the Islands Martin Vaz which had been seen by the first Portuguese who came to India, but were not found by Edmund Halley and Lozier-Bouvet, a captain of the French East India Company who had travelled round the world in 1739. According to a Portuguese pilot whom d'Après questioned, these islands were situated on the parallel of 21° of south latitude. D'Après thought that, if they existed, they could be a good base for the ships of the French East India Company in the south of the Atlantic Ocean in order to counterbalance, in time of war, the power of the English who had Saint-Helena.

D'Après travelled along this parallel from 6° of longitude west of Paris upto May 25 when, by an observation of the distinct of the moon to a star of the Virgo constellation, he found himself nearer to the Brazilian coast than what he had thought by dead reckoning. He then changed his route to go to Lorient where he arrived on August 2 1752. He concluded that those Islands Martin Vaz did not exist at all[8]. In fact,. they are rocks situated at the north of Trinidad Island.

Though d' Aprés de Mannevillette did not accomplish his mission entirely, because he never went on land to make observations and measurements and could not enter in any bay-except Lourenço Marques- this voyage was very fruitful. On his return, he published a new chart of this part of the African coast and of Madagascar, and another of the Indian Ocean from the Cape of Good Hope to Japan. For the first time the Cape, the Mauritius and La Réunion were correctly situated on a map. Madagascar's form was also corrected, specially the north-eastern part which he straightened a bit. D'Après gave new material about Africa. The informations used till his journey were the ones given by the Portuguese at the end of the 16th century. The main correction he did were on the latitude of the places[9]

Progress In Nautical Astronomy

This voyage was also successful in the field of nautical astronomy. For the first time, with the help of the abbé de Lacaille, d'Après de Mannevillette used the method of lunar distances to calculate the longitude of his ship. He is one of the first French

navigators to use this method. Though Peter Apian had explained the principles of lunar distances in the beginning of the 16th century, these could be used only in the 18th century, i.e. when a proper instrument of measurement had been invented and fairly correct lunar tables published by John Flamsteed and Edmund Halley[10]. D'Après had to choose a star which was quite bright and measure its altitude and distance to the moon. For example, for his first observation, on January 21, 1751 by 20°41' of south latitude and 35°50' longitude west of Paris by dead reckoning, he measured three altitudes of the moon and of the star Antares, between 4.26 and 4.45 a.m. At 4.42 a.m. he measured the distance of the moon to the star and calculated the exact altitude of both the bodies at the same time. Having corrected the position of the moon and checked the local time, he calculated the position of the moon for the time of the observation and an hour later, supposing the reckoning of longitude correct. All his calculations were made with reference to the equator. He thus obtained the horary movement in longitude and the right Ascension of the moon, its latitude, longitude, declination, etc. Supposing that the difference of merdian was correct, d'Après calculated the distance of the moon to the star Antares with reference to the meridian of Paris. He added twenty minutes to the reckoning. He thus obtained two distances of the moon to Antares for two different hours in Paris. To these distances he subtracted the distance he had observed. Having two differences of opposite signs, he added them without taking the signs into account, and, by a rule of three, found the number of minutes and second he had to add to the dead reckoning to find the correct longitude which was 39°22'15"[11].

The motion of the moon was not completely known, and therefore difficult to predict. The tables were not sufficiently correct. During his journeys d'Après de Mannevillette used the tables published by the French Academy of Sciences since 1678, *the Connoissance des Temps*, the ephemeridis of the abbè de Lacaille, Ephémérides des movement *célestes*..., based on the tables of Philippe de la Hire, and the tables published by Lemonnier. The latter adhered to the theory of the saros which Halley had used when publishing his tables of the moon. D'Après needed two or three hours to calculate the longitude of the ship from his observations. It is only in 1767 that Sir Nevil Maskelyne published the *Nautical Almanac* based on the tables of the moon calculated by the German professor of Göttingen, Tobias Mayer. In this ephemeridis the mariners could find table of the distance of the moon to the sum or to bright star for every day and every three hours of the day, with reference to the méridian of Greenwich. The calculation were made easier and longitude could be found in half an hour's time. After their jopurney to the Cape, d'Après and the abbè de Lacaille worked together to bring the navigators to use this method of knowing longitude. In 1755 the astronomer even proposed in his Ephemerides des movements celestes... a model of tables which were finally published in the Nautical Almanac.

THE ACADEMY OF MARINE AND THE STUDIES ON MAGNETIC VARIATION

D'Après de Mannevillette was back to France just on time to become an associate member of the Academy of Marine which was founded in the port of Brest by Bigot

de Morogues, ship's captain and captain of artillery in the Royal Navy. Then aim of this academy was to develop the nautical science and techniques so that journeys become safer from all points of view: reckoning the exact position of the ship, health of the crew, construction of ships, artillery during wars, etc[12]. D'Après sent all his new charts and memoirs to this academy before publishing them. He took part in the discussions about the determination of longitude by astronomical methodism the use of octants, the mariner's compass and the route to India. In 1770, D'Après always removed one of the compasses of the pilot's cabin since the experiments he had done in 1747. The pilots were opposed to the use of only one compass because they were accustomed to consult two compasses, one on each side of the steering wheel, a convenient device when changing the direction of the ship, but for the sake of accuracy d'Après proposed to place the second compass on the forecastle as on the English ships.

In the 18th century when it was difficult to measure the longitude of the ship by astronomical methods and when the timekeepers were not accurate enough, many sailors thought that by observations of the magnetic variation and of the latitude which was quite easy to measure, they could correct the dead reckoning. One could place himself on a line of equal variation by an observation of the variation and by the latitude find the correct longitude. Colombus had noticed that off the Açores Islands the needle of the compass moved a lot, but it is only at the end of the 17th century that the theory of magnetic variation was developed, when the magnetic as well as the geographic poles were understood as placed on the earth. In 1683, Edmund Halley published a model of tables of observations of the magneticc variation in the *Philosophical Transactions* and declared that the earth was a big magnet. In 1701 he drew on a map of the Atlantic Ocean lines of equal variation every five degrees. He obtained all these observations during his journey to Saint-Helena and the South Atlantic in 1700 and from other sailors. A map of the whole world with the indication of magnetic variation was printed in 1704. This map was incorrect for the geographical positions but was published several times till 1756. In 1757 Euler corrected the theory of Halley who explained the change of variation in time by the presence of two poles which were stable, and two others mobile. Euler understood the role of the four poles and explained the magnetic currents[13].

In 1768 and 1772 d'Après de Mannevillette tried to draw a new chart with lines of equal variation with the help of Lemonnier who was keenly interested in this field. The latter asked d'Après to add to the *Neptune Oriental* tables of magnetic variations. In 1775 Lemonnier who was preparing a work on magnetism, searched a third line where the variation was equal to zero. He wanted to prove that it cut the terrestrial equator in the Pacific Ocean. He asked thus d'Appès to send to him observations taken from the logbooks of his contemporaries, specially those of Julien Crozet who had sailed among the Indonesian islands, and those of Frondat who had crossed the Pacific Ocean in 1710. Adding observations by Cook and Carl Ekeberg, Lemonnier found the third line of variation equal to zero which cut the equator a little to the north of Tahiti Island. Lemonnier published his results in 1776 and 1778. In his book he added a map

of the dip of the magnetic needle drawn by Ekeberg which could also help to correct the reckoning of longitude.

In the *Neptune Oriental* d'Après de Mannevillette advises to use the magnetic variation to check the longitude of a ship, but this was possible only around the Cape of Good Hope, the Mascareignas Islands and in the China Sea, where the lines were not horizontal. The variation was equal to one and zero off the coasts of India and Sri Lanka. During his journeys, d'Après de Mannevillette did not use this method, or if he used it, he was very cautious and always tried to ascertain it by an astronomical observation. He knew that the compasses were not safe and that all the metallic objects around influenced them. As the theory of the magnetic variation was not known very accurately yet, most of the sailors noted nearly every day their observations. D'Après published these tables at the end of the Neptune oriental.

Curator of the Department of charts in Lorient

D'Après de Mannevillette was again appointed as a captain on the Montaran in 1754-1755. During this voyage he was the first French to follow the middle passage opened by Admiral Boscawen in 1748 to reach Pondicherry. In 1756-1758, he served on the *Due de Bourgogne* during the Seven Years war but, being a better scientist than a fighter, he was soon dismissed.

In recognition of his services to the French East India Company, the directors decided to create, in Lorient, a Department for all the charts, log-books and memoirs concerning the navigation to the Indies and gave the direction to d'Après de Mannevillette in February 1762. D'Après had to collect all the log-books of the officers and pilots of the Company's ships, examine them to take all the informations which could help him to write new sailing instructions. In 1763 d'Après wrote a rutter for the Atlantic Ocean which was printed by the Royal Press.

D'Après prepared the second edition of his atlas with all the material he could collect in his new post. When in 1770 the French East India Company was bankrupt and ceded her monopoly of commerce to the king, d'Après de Mannevillette could keep his Department but had to ask the permission of the Central Department of Charts of the Marine in Paris to get copies of their log-books and maps or wrote to him during their journey. D'Après could thus correct the charts of the Seychelles, Amirantes and Chagos Archipelagoes. All these informations were complemented with others which were sent to him by Alexander Dalrymple. After 1770 d'Après got more maps than memoirs or log-books. In 1776 to get a pension from the king, d'Après had to make a catalogue of his collection which included about six hundred log-books and two hundred maps. After his death on March 1, 1780, a catalogue was made of all the articles entered since 1776, including his personal collection which was very important. He had to bequeath to the king all the copper plates of the charts of both the editions of the Neptune oriental, but received only one third of the money promised[14].

D'Après de Mannevillette corresponded with Alexander Dalrymple, the Hydrographer of the English East India Company and first hydrographer of the British Admiralty. They exchanged informations on navigation and hydrography. Dalrymple sent his works on the maps and ports of India as well as the discoveries of English officers in the Chagos and Seychelles archipelagoes. Dalrymple was mainly interested in the China and Sulu seas. He had himself sailed there and asked d'Après further informations to complete his, specially the observations of Marion-Dufresne and Surville in the Pacific Ocean or those of Julien Crozet in the Straits of Sunda and Bangka. The English hydrographer published an English translation of the *Neptune Oriental.*

French Explorations in the Indian Ocean

In the 1770's d'Après de Mannevillette was known as the specialist of the navigation in the Indian Ocean and his advice was sought by all the captains who tried some discoveries. In 1770 Jean-Francois Denis de Trobriand, captain of the *Thetis,* sought his help when he set off to make some explorations in the Indian Ocean. In 172, captain of the *Etoile*, he explored the X Channel of 6° between the Maldives Island as well as the Seychelles Islands where he discovered the Island Denis, etc. During a passage from Pondicherry to Balassore, Trobriand corrected d'Après maps of India, specially of the region of Visākhāpatnam and Godāvarī Point.

D'Après de Mannevillette took part in the organisation of the journey of Yves-Joseph de Kerguelen in search of Australia in 1770. He advised him to follow a route through the Indian Ocean, by the west, instead of starting from South America. He gave him also maps and instructions on the route. Kerguelen set forth in April 1771. In September and October, he tried the new route to India and proved it to be very advantageous. He then sailed to the south and discovered the islands bearing his name today, but he did not go further because of a tempest and, leaving the other ship which had gone out of this sight, came back to France saying he had discovered Australia. Few months later Cook saw the same islands but did not claim their possession because of the physical and climatic conditions which were very bad. In 1773 and 1774 Kerguelen was obliged to go back to these islands to make better observations. On his return the disappointment was greater because he had to own that all he told after his last voyage was not true. In the mean while Cook had discovered Australia.

After the treaties of Paris in 1763 by which the French lost most of their possessions in India, the Minister of Marine, the Duke of Choiseul, encouraged expeditions of explorations in the Indian Ocean to get new colonies. The French were thus very active at the end of the years 1760's and 1770's and discovered many islands in the Seychelles, Amirantes, Farquhar, Providence Archipelagoes. Most of these islands bear French names today. All these discoveries were published in the second edition of the Neptune Oriental in 1775. In 1778 d'Après corrected again his charts. At that time the English, fearing that the French would dominate that region, started explorations, specially in the Chagos Archipelago, and Dalrymple communicated all this material to the French hydrographer. On these charts, the number of islands and

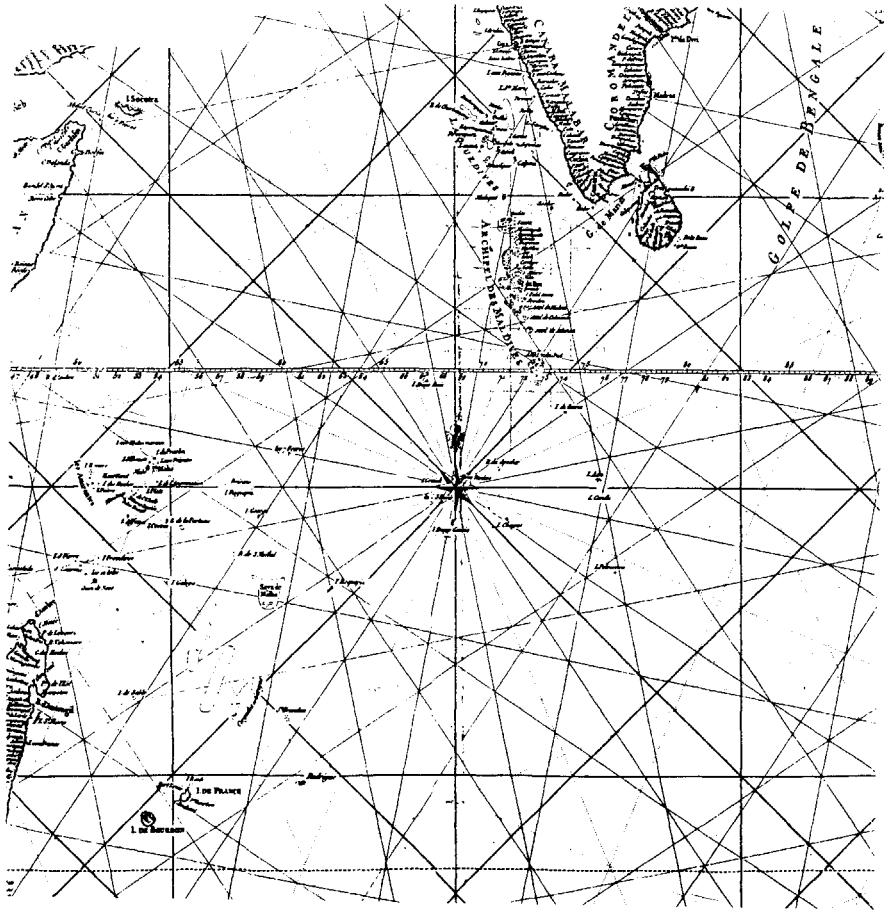

Fig. 2 Extract of the general chart of the Indian Ocean by d'Aprés de Mannevillette, 1975.

reefs is nearly correct as well as their position in latitude. Their longitude is usually a little false, specially in the Chagos Archipelago which was really known only after the surveys of Archibald Blair.

As a specialist of the navigation in the Indian Ocean, the Academy of Marine and Minister of Marine asked d'Après' opinion on the new route to India that the chevalier of Grenier proposed. This route was based on a fairly good knowledge of the winds and currents in the Indian Ocean, and that of the islands and reefs at the north-east of Madagascar. On the old Portuguese, Dutch and English charts the islands of the Seychelles, Amirantes, Farquchar and other archipelagoes were not situated at their right place and were sometimes duplicated. Already, d'Après de Mannevillette who had drawn the routes of twenty to thirty ships, had removed many of these imaginary islands and had corrected the position of others on his chart of the Indian Ocean of

1753. In 1768-1769 Grenier explored parts of these archipelagoes and in 1771 published a book. With his help d'Après corrected his map of 1753. For the first time in France, Grenier explained fairly well the system of winds and currents in the Indian Ocean. He said also that the currents were created by the winds and their directions were according to the latter. Having thus described the winds, he proposed shorter routes to India. One during the south-west monsoon is known in English as the middle passage and in French as Boscawen's route. During the north-east monsoon in the northern hemisphere Grenier suggested to join the parallel of 5° of south latitude and to continue towards the east to cut the equator enough in the east to join the coast of Coromandel or Bengal.

Most of the sailors were favourable to this route, but an astronomer who had been sent with Grenier, the abbè Rochon, opposed this. He said that the island were too dangerous for a ship, that the winds from the west were not sure on the parallel of 5° of south latitude. The Minister and the Academy consulted d'Après who took Grenier's side. The abbè criticised quite violently d'Après' maps. The quarrel was set in 1774-5 when many sailors tried this route and proved that it was very convenient. A thorough description of the winds and currents of the Indian Ocean was given by d'Apès' de Mannevivllette in the second edition of the *Neptune oriental.* He gave first a general description which he completed for every portion of coast from the Cape of good Hope to Canton in China. It was the most accurate description which was used by the European sailors till the publication of Horsburgh's Directions for sailing to and from the East Indies... in 1809-1811.

The Neptune Oriental

D'Après de Mannevillette's major work is the *Neptune oriental,* an atlas and rutter of the Indian Ocean. The first edition of 1745 was completely revised in 1775. A supplement was published by d'Après brother in 1781. The second edition shows the knowledge that the Europeans had about the Indian Ocean in the second half of the 18th century. In the rutter d'Après de Mannevillette described the route of the ships from Lorient to the Cape of Good Hope as in the instructions he had published in 1765. To this he added the rutter of 1745, but described also the winds, currents and routes to India and China as well as all the coasts from Africa to China, giving informations on the towns and anchorage there. He discussed much on the direction of then coast and the distance between two places. Very rerely does he give indications on the commerce or the people.

D'Après major innovations were the fifty-six charts. These were corrected and complemented by eighteen new charts which were published in 1781 posthumously. The first three charts of the coasts from England to Portugal were drawn by one of his friends in Le Havre and three other charts were drawn by d'Après himself or copied from charts given by sailors, as for example the chart of the Strait of Bangka by Julien Crozet or the chart of Chagos Archipelago by Grenier. The general charts are drawn on the canvass of Mercator or reduced maps. Those with less than seven

or eight degrees of amplitude in latitude were designed by the method of plain square maps on which the meridians and parallels are orthogonal and equidistant lines.

For the establishment of his charts, d'Après de Mannevillette used three methods. The first one was to place a point on the basis of an astronomical observation. This was the most accurate method but he had eight observations in 1745 and twenty-four in 1775 for the whole of Indian Ocean. The second method was to use triangle made from the above mentioned points. This was not as accurate as the first methods but was better than the third one which was to deduce from the route of a ship the position of a place. This last method being the easiest, was used commonly. To ascertain to some extent these positions d'Après de Mannevillette tried to compare the routes of several ships. In 1775 there were not many surveys of triangulation done in the Indian Ocean yet, but some sailors measured angles with an octant, sextant or the azimuth compass between remarkable points on the coast. Sometimes from the ship they made a sketch of the coast and indicated roughly the bearings.

By and large the charts are correct in latitude but not in longitude. The errors are however less important than on the previous charts. This atlas was used on all the French ships in the Indian Ocean and even by some foreign captains. It replaced the English Pilot published by John Thornton in 1700 and the charts of the Van Keulens, the hydrographers of the Dutch East India Company, which were full of errors. The contemporaries criticised much the maps, especially those of the regions to the east of the Strait of Sunda. With the help of these criticisms d'Après de Mannevillette corrected the charts for the second edition.

D'Après de Mannevillete was thus one of the best hydrographers of his time. Alexander Dalrymple who is better known today, admired him and declared after his death: "M. d'Après was not one of these men which are born every day. Few, very few indeed, have shone in that line and not one hydrographer of any age or nation can claim even to his rival. His equal never was. "His work for the progress of cartography of the Indian Ocean is one of the foundation stones of the British hydrography in this ocean. For a few decades the French charts and rutter were more commonly used in the navigation to the East Indies and were the models of those in English.

D'Après de Mannevillette devoted also his whole life to the progress of navigation. Leaving the theory to others, he contributed in practice the use of octants and lunar distances and calculate other longitude. Having been very famous among the sailors, astronomers and amateurs of voyages of his time, d'Après' de Mannevillette has been forgotten in the 19th century when his charts had been replaced by those of Horburgh. The French Admiralty considering that the Neptune oriental was too dangerous for the navigation, ordered the remaining copies to be destoryed. Luckily, by the grace of book lovers, some copies have been saved and are now at the disposal of historians and research scholars.

NOTES AND REFERENCES

1. AN (National Archives in Paris) Marine 4JJ94. Log-book of d'Aprés de Blangy. In this series, Marine 4JJ, are kept the log-books of the French ships whose captain or pilot deposited a copy of the book in the Department of Charts of the Marine. Most of the log-books of the ships bound for the Indian Ocean were first deposited in d'Après Department in Lorient and brought to Paris after his death. These log-books contain mainly informations on the routes and winds in the Indian Ocean, and sometimes on port towns. Geographical observations are very frequent.

2. AN Mar 4JJ97. Log-book of d'Après de Mannevillette.

3. AN Mar 4JJ130. Log-book of d'Après de Mannevillette.

4. C.H.COTTER. *History of the navigator's sextant*, Glasgow, 1985.

5 *Le Nouveau Quartier anglois ou description et usage d'un nouvel instrument pour observer la latitude en mer*, Paris, 1739.

6. AN MAR 4JJ100. Log-book of d'Après de Mannevillette.

7. All the letters which d'Après received are now in the National Archives in Paris the serie Mar 3 JJ.

   The letters to the Company are in the serie Colonie C^2

8. AN Mar 4JJ 78. Log-book of d'Après de Mannevillette. The results of the exploration along the eastern coast of Africa were published in the memoirs of the Academy of Sciences. The abbè de Lacaille narrated his journey to the Cape in manuscript preserved today at the Observatory of Paris. This narration was published posthumously without the details of his observations.

9. The memoirs on theses maps are in the manuscript files of the meeting of the Academy of Sciences in the archives of the same Academy.

10 D.HOWSE. Grenwich *time and the discovery of longitude*, Londres, 1984.

11. AN Mar 3JJ 16 piece 59.

12. The archives of the Academy of Marine where are to be found the minutes of the meetings and memoirs which were read, as well as the correspondence, are now in the Archives of Marine at the chateau de Vincennes in Paris.

13. P. RADELET DE GRAVE. *Les Lignes magnetiques du XIIIe siecle*, Paris, 1982.

14 The archives of the Central Department of charts of the Marine in Paris are in the serie Mar IJJ in the National Archives in Paris. All the collections which d'Après had in Lorient were transferred to Paris after his death and are now in the National Archives with the other papers of the Ministry of Marine. The correpondance, notes and memoirs that d'Après had in Lorient were transferred to Paris after his death and are now in the National Archives with the other papers of the Ministry of Marine. The correspondence, notes and memories that d'Après received or wrote are in the serie Mar 3JJ which is very rich in informations. Most of the charts are in the Department of Maps and Plans in the National Library in Paris.