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2.4 The First International Conference on Oceanography (Brussels, 1853)

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M. F. Maury, head of the U. S. Naval Observatory, started to compile meteorological and sea surface data from the logbooks. This allowed him, during the 1840's to expand knowledges in descriptive oceanography. Willing to extend the geographical coverage of his data bank and chartings, Maury wanted to involve merchant navy as well as ships from other nations. This led him to consider favourably projects of universal networks for meteorological data collection such as proposed by the Russian Kupffer in the early 1850's. Maury tried to establish such co-operation when British and US officials came together to uniformize their network. Maury did not succeed to bring the project at an international level. Instead, he only was allowed to call upon an international maritime conference excluding land meteorology. He managed to get scientific support and tried to settle a conference in Paris. Different problems made it not possible in France at that time. Quetelet, Director of the Royal Observatory in Brussels and Secretary of the Royal Academy in Belgium, helped Maury to call up the conference in Brussels in 1853. Attended by naval representatives from the leading maritime countries, the Maritime Conference covered topics fundamental for establishing a worldwide data collection network; among them, technical and scientific matters concerning the parameters to be observed, the instruments, scale and units for the measures and the log sheets to standardize the records. Thank to this Conference, the first international co-operation towards a world-wide oceanographic and meteorological data bank was settled in 1853. Through this, oceanography gaining new and standardized basic tools became a modern science.

1 Introduction

Last century, the most prominent progresses in oceanography where in biology. Chemistry and physics remained behind mainly because of the lack of instruments, methods and data bank. The evolution of the scientific knowledges of the oceans towards modern oceanography occurred into two main steps: first a global understanding of surface phenomenon, especially winds and derived from data in navigators logbooks, and secondly the exploration of the depth when sounding and dredging by properly designed vessels became available.

Contributions to the History of oceanography describing the first step are scarce compared to those dealing with the discoveries of the submarine world.

The physical description of the surface of the oceans resulted from laborious computations of oceanographic and weather data from the logbooks which were, if any, more or less carefully recorded, not comparable, scattered and almost useless when in small amounts. Their standardization was necessary for scientific exploitation.

The pioneer in this field is Matthew Fontaine Maury (1806 to 1873), head of the U. S. Naval Observatory, who compiled amounts of raw data and drew ocean wide winds and surface currents charts. First published in 1847, they were progressively improved, and since 1850 commented by "Explanations and sailing directions". These charts which became the actual "Pilot Charts" immediately caught the interest of shipmasters and owners since sailing journeys were shortened by following more adequate routes indicated by Maury. The american seafarers appreciated it since trade with Europe or between both coasts of the U. S. required long sailings. This success induced Maury to improve and extend geographically his charting and routing. Therefore, besides data from U. S. naval sources he was seeking mercantile ones by giving to willing shipmasters charts and sailing directions free of charge in exchange of accurate observations.

Nevertheless Maury became aware that more data were necessary from all parts of the oceans so that observations by ships of other nations should be collected too. He became also convinced that the understanding of global phenomenon, like sea weather could not ignore the land meteorology. Moreover to be efficace, observations required standardization of instruments and methods. Like other meteorologists willing to settle observation networks through co-operation at national or international size, Maury did not evaluate enough negative human or national factors like precedence, rivalry, jealousy, conflicts of interests.

From Maury's biography (Williams [1963]) it appears clearly that his plans and declared good-will towards a U. S. and an international co-operation for the study of global meteorology suffered from such restrains which were basically at the american side as also documented by Deacon [1980] in her analyse of the anglo-american co-operation in marine science.

Maury wanting to reach his aim, managed with tactics, at the U. S. official level and with the help of european scientists, to launch in Europe an international maritime scientific conference.

Most references to this conference held in Brussels in 1853, emphasize its importance but remain general or bring little details: Wayland [1930], Darter [1941], Canfield [1953], Schumacher [1953], Leighly [1963], Charlier et Leloup [1966], Houvenaghel [1980], Schott [1987]. Others evoke also the event providing some original data: De Ridder [1974, 1979, 1984], Deacon [1980]. In Williams [1963] impressive biography of Maury the chapter devoted to scientific international co-operation is mainly documented from the letters to and from Maury at the Naval Observatory give indications about the events on U. S. and British grounds. Informations about the conference itself are rather limited (10 items) and general mainly quoted from Maury [1854, 1858] himself.

From the survey of the literature, it appears that informations and details about this International Maritime Conference in Brussels are scarce in regard to its importance for the History of Sciences, oceanography, meteorology, nautics . . .

The present contribution about this Maritime Conference prepared by Maury and chaired by Adolphe Quetelet (1796 to 1874), Director of the Royal Observatory in Brussels, is based on original records and documents available in Belgium. They belong to the institutions Quetelet was linked with (the Royal Observatory and the Royal Academy of Belgium), and contain the correspondence of Quetelet of which the inventory at the Academy has been made by Wellens De Donder [1964] and the minutes of the Conference and its final report.

2 The Launching of the Maritime Conference

The last paper of Quetelet [1874] is a note on Maury in which he wrote that

"... one of the most curious venture occured: proposed by a savant from northern America, by Maury at that time director of the Observatory of Washington . . . These propositions were acknowledge with favour and the nations most involved in sailing agreed to meet and judge the advantages one could deduce from them" Quetelet [1874].

This indicates that Quetelet gave to Maury all the credit for the launching and the content of the Maritime Conference. This last note from Quetelet looks like some kind of testimony and recall of Maury's pioneer work for this launching and of the efforts afterwards, to reach the original aim of establishing a world wide conference and scientific co-operation for global meteorology.

In these writings, Quetelet, remained modest about his personal contribution towards the success of the Brussels's Conference. On the other side, Maury glorified Quetelet's role as deduced from Maury's compliments in letters to Quetelet many years after the event (2. 4. 1860 and 25. 3. 1872).

In facts, the venture was shared by both of them. The launching of the Conference itself and its content were an achievement of Maury's obstinate efforts, while the organization, chairmanship and publication of the minutes and the final report were taken over the Quetelet.

2.1 The Basis

According to the U. S. records (Williams [1963]), Maury got involved as a consequence of a British request to the U. S. Government in November 1851 for establishing co-operation for uniform land meteorological observations. Since the U. S. Navy was asked to which extent she would be ready to participate. Maury took the opportunity, in his answer through official channels, to express his views about stadardization of methods and to amend the project by adding: "For this reason, I beg leave to suggest a meteorological conference . . .". Mentioning former contacts with Kupffer (director of the St Petersburg's Observatory, Russia), he also suggested:

"I am induced to believe that he is already authorized, by the proper authorities in that country to confer with the proper authorities in this, as to the establishment of a uniform system of observations on land for the two countries"

allowing him to express his aims, "dreams" according to Williams [1963], towards a wider forum:

"For these reasons . . ., I respectfully suggest that as an amendment to the British proposition, a more general system be proposed: that England, France, Russia and other nations be invited to co-operate with their ships by causing them to keep an abstract log . . . and establishing an universal system of meteorological observations for the sea as well as for the land".

Maury was perfectly fair when quoting Kupffer's earlier initiatives towards an universal co-operation. Through this he might also have indicated for those able to understand it that he was well aware of Kupffer's aborted approaches. Quetelet too had been informed by Kupffer himself (letter from 10. 9. 1851) of his efforts calling for the "Projet d'une Association pour l'Avancement des Sciences météorologiques" which he submitted to the Smithsonian Institution and presented in 1850 to the British Association and in Paris to Arago (Académie des Sciences). Kupffer then explained that the project was perhaps premature because of the British refuse and the political troubles in France although it has been accepted there.

2.2 Towards a Maritime Conference

Starting from the British proposition dealing with land meteorology only, Maury skilfully managed to involved maritime meteorology which he wanted to put forward to reach the "establishment of an universal system of meteorology by sea and land" he claimed for. Not everybody was in favour of this. From Williams [1963] it is understandable that there was scientific and precedence quarrel in the U. S. between Maury and those he

called the "professors", mainly Henry (Smithsonian) and Bache (Coast Survey). Both influent at the A. A. A. S., were opposed to any implication of Maury in land meteorology as well as to any intergovernmental co-operation. In spite of that, Maury received official permission (on 6. 12. 1851) to confer as to a uniform plan with British and other nations in order to agree with them the launching of a conference. He took immediately actions to settle the project in continental Europe. He did contact representatives of different maritime countries, scientists and scientific societies. He also gave special tasks to the U. S. representatives in England and France, the last one being asked to investigate the possibilities to organize the conference in Paris. At the same time he also managed to enlist the support from leading scientists: Von Humboldt in Prussia and Arago in Paris. Walsh, the U. S. Consul in Paris and friend of Maury, reported to him the success of his approaches at the Académie des Sciences (in Maury [1854]); he joined mail from Jomard mentioning that a commission of the Académie discussed the plan which was supported by Arago. These information allowed Walsh to mention to Maury that "the affair is launched".

The project for a conference in Paris never got any further. However no records were found giving indications about this failure. One of the reason could have been Arago himself, a liberal minded scientist engaged in politics and in charge of the army and the navy in the French Government formed after the 1848 events but not anymore in favour under the empire, rather authoritarian and conservativ who was brought back by the coup d'état in 1851. Moreover, Arago was very ill and died in 1853.

1852 was the turnpoint for the project mainly because oppositions in U. S. and Britain, where the feelings were not in favour of an international conference on land meteorology. The Royal Society recommended however to the Government to support a maritime one. This attitude and the lack of agreement with U. S. colleagues forced Maury in November 1852 to recommend to the U. S. Government to abandon the land part of the "universal system" and limit the conference to the maritime part only.

In conclusion, in 1852, the entire project was modified: the seat for the conference could not be Paris, a leading and renown scientist was to be found to enhance the scientific participation and the scope was reduced to maritime meteorology and oceanography.

2.3 Brussels as Seat

How and when the conference moved to Brussels to be organized under the control of Quetelet is still not documented. No records could be found on this particular subject, neither in the archives of the Royal Academy in Brussels of which the inventory was made in details by Wellens De Donder [1964] nor in those of the Observatory we were allowed to analyse.

A reason for this could be a lack of documents because of the positive answer of Quetelet to a request by Maury's daughter after her father's death (letter from 2. 10. 1873) asking for getting back her father's letters for biographical purposes because the home archives were destroyed during the civilian war. This seems however unlikely since in this note in 1874, Quetelet specified that he got copies and kept them in Brussels. Another indication for the absence of records concerning the preparation of the conference in Brussels could result from the use by Maury of an emissary to approach the scientific leaders and make contacts. This could well be the case, since according to the archives at the Royal Academy, Walsh, the Maury's emissary in France, met Quetelet and wrote to him as early as 1850. This means that they knew each other and could well have arranged the organization of the Conference for which there are evidences that it happened in the hurry. This lack of informations about this phase of the launching of the Conference does not indicate why Belgium had been chosen for seat and Quetelet for scientific organiser.

About Quetelet's implication, three points have to be mentioned:

1. This broad minded scientist, mathematician, statistician, meteorologist and astronome, Director of the Royal Observatory and Secretary of the Royal Academy of Belgium, already informed by Kupffer about his project of international co-operation in meteorology, and himself involved in establishing a network of stations in Belgium, must have been soon convinced by Maury's project of maritime conference as stepping stone towards a second conference, dealing with global meteorology. Many actions and writings of Quetelet following the Brussels Conference, until his very last note in 1874, were devoted to efforts in this direction.
2. Quetelet knew Maury since a long time: he had been elected corresponding member of the National Institution for the Promotion of Sciences (U.S.A.) in 1840 together with Von Struve (Observatory of St. Petersburg). They were the only European fellows, among American colleagues like Henry, Bache and Maury himself.
3. Quetelet could face the organisation of such a scientific congress since at the same period, he also launched the first International Congress for Statistics attended by 153 delegates from 26 different countries.

Arguments for the choice of Belgium as seat of the Cobfirmence, besides Quetelet's personality and good will, must be have been, that the country was young, with no naval power, and enough neutral in diplomatic affairs to welcome naval representatives from different nations.

3 The Organization of the Conference

3.1 The Delegates

Maury's call on behalf of the U. S. Government to investigate what countries would be ready to join a meteorological conference was addressed after December 10th 1851 to 25 nations through diplomatic ways. The ultimate calls making appointment in Brussels on August 23rd 1853 were forwarded on June 25th to Russia, Britain, Sweden and Norway, and on June 27th to Spain, Portugal, France, Austria, Belgium, Brazil, and Prussia.

The absence in Britain of decision whether to participate or not was disturbing Maury. Nothing was settled when he left the U. S. for Europe (July 20th 1853) and it was thought that the success of the conference was largely depending on the attitude of the British towards it. When Maury landed in Liverpool, he soon gave the shipowners a speech on the economy of meteorological shipsrouting. In London he gave a similar talk (August 18th) and met Lord Wrottesley, a scientist who supported him at the Parliament. Ultimately, the Admiralty decided to delegate to Brussels Cpt. Beechey, hydrographer and arctic explorer. Cpt. James (Royal Engineers) joined too. Such late appointment may explain why, according to the minutes, they showed up on the second day of the Conference only. Another explanation for this delay could be their expectation for knowing how the conference started. The announcement by the Russian delegate, at the first session, that the British would arrive in the evening and words from Maury in his opening speech give strength to this assumption.

The delegates present at the Conference were:

The Governments represented at the Conference, and the names of the officers who attended.

BELGIUM,	by A. QUETELET, directeur de l'Observatoire royal, secrétaire perpétuel de l'Académie royale des sciences, des lettres et des beaux-arts de Bel- gique, and VICTOR LABURE, capitaine de vaisseau, direc- teur général de la marine;
DENMARK,	by P. ROTHE, captain-lieutenant royal navy, director of the depot of marine charts;
FRANCE,	by A. DELAMARCHE, Ingénieur hydrographe de la marine impériale;
GREAT-BRITAIN,	by F. W. BEECHEY, captain royal navy, F.R.S., etc., member of the Naval Department of the Board of Trade, and HENRY JAMES, captain royal engineers, F.R.S., M.R.I.A., F.G.S., etc.;
NETHERLAND,	by M. H. JANSEN, lieutenant royal navy;
NORWAY,	by NILS IHLEN, lieutenant royal navy;
PORTUGAL,	by J. DE MATTOS CORRÊA, captain-lieutenant royal navy;
RUSSIA,	by ALEXIS GORKOVENKO, captain-lieutenant im- perial navy;
SWEDEN,	by CARL ANTON PETTERSSON, first lieutenant royal navy;
UNITED-STATES,	by M.-F. MAURY, L.L.D., lieutenant United- States' navy;

At the opening, all delegates declared that by taking part to the Conference they were not binding their government.

Two other persons were also present: Quetelet's secretary, De Groote, stenographer of the Belgian Parliament, and Maury's one. He asked permission to bring in at the first session: "an officer of the American Navy", "now residing in Brussels", "perfectly acquainted with subject" and "possessing a knowledge of the french language". Everything but his name (Wells according to the minutes) correspond to Walsh, the Maury's emissary, in France who helped him launching the Conference.

From the minutes also, it is clear that next to Maury and Quetelet, the leading participants were Beechey and Jansen, both representatives of powerful navies.

3.2 The Seat of the Conference

The Conference met at the Home Office since the Minister of Interior ruled the Observatory, instead of meeting at the Observatory (a sub commission will do) or at the Academy. Another sub commission met in Maury's apartments (Hotel Belle-Vue).

By this choice for the seat, Quetelet made the Conference being hosted by the Belgian Government. The official character was also attested by the opening dinner given to the delegates by the King Leopold I and the Royal Family on August 25th in presence of many Belgian Dignitaries, Governors and Generals (Van De Woude [1987]).

3.3 The Dates

The delegates met daily from August 23rd till September 8th 1853 except on 24, 27 and 28 August and 5th September.

3.4 The Chairmanship

At the opening of the Conference, when electing a president, Maury, initially requested, declined and suggested that Quetelet would take the chair. Quetelet accepted and immediately announced that besides the minutes of the sittings a scientific report would be issued. His next action was to give Maury the floor to explain to the delegates the object of his mission.

3.5 The Language

Quetelet [1874] indicates that every delegate was free to speak either English or French. According to Smith [1923] (in Williams [1963]) Maury spoke French.

The French delegate Delamarche claimed for two official reports: one in each language. So did Quetelet.

3.6 The Minutes and Reports

Besides the minutes drafted by De Groote and signed by Quetelet, the Conference issued a scientific report prepared by Maury and deposited at the Royal Academy.

Both were printed by "the Belgian Government" (Quetelet [1874]). The printer of the Royal Academy, Hayez, managed to issue them about 3 weeks after the closure of the Conference in the form of a 126 pages in ^o4 binding (plus annexes) that Quetelet forwarded to the delegates and the governments of the participating nations.

The scientific report which covers the first 33 pages was reproduced or quoted by Maury in many of his publications, among them the "sailing directions". Proofs of them were found in Quetelet's archives classified by Wellens De Donder [1964]. This report was also reproduced in the 1854 edition of the Annals of the Royal Observatory of Belgium.

4 The Matters of the Conference

4.1 The Aims

When Maury got the word at the opening session he explained with details, but also with diplomacy, why and how the conference was launched. This is summarized as follow in the final report:

The moment then appeared to him to have arrived, when nations might be induced to cooperate in a general system of meteorological research. To use his own words, he was of opinion that « the » navies of all maritime nations should cooperate, » and make these observations in such a manner and » with such means and implements, that the system » might be uniform, and the observations made on » board one public ship be readily referred to and » compared with the observations made on board » all other public ships, in whatever part of the » world. And moreover, as it is desirable to enlist » the voluntary cooperation of the commercial marine, as well as that of the military of all nations, » in this system of research, it becomes not only » proper, but politic, that the forms of the abstract » log to be used, the description of the instruments to » be employed, the things to be observed, with the » manipulation of the instruments, and the methods » and modes of observation should be the joint work » of the principal parties concerned. »

4.2 The Topics and Results

From the second session on, the Conference discussed scientific and technical matters. The only delegate less in favour of deep scientific concerns was the French Delamarche who considered them as being of the responsibility of the Academy for the theory and of specially designed scientific vessels for the observations at sea.

The topics covered three main chapters: the instruments, the parameters to observe and the way to record them.

For the instruments, talks went on the uniformization of scales and methods. Standardization was a master idea. For the temperature readings the Conference did agree the French centigrade scale. Discussion covered also the measurement of deepwater temperature. About barometers the aneroid one was discarded in favour of the mercury one.

The aim of standardization, Gorkovenko had to accept the use of the Gregorian calendar in the Russian logbooks. The Conference also introduced the use of the Beaufort scale for recording wind forces.

The parameters observers should record include: magnetic variation, currents, winds, clouds, rain, barometric pressure, temperature (air dry and wet, water at surface and in depth). For each data there is a column in a properly designed meteorological logbook sheet which also contains the hours at which observations should be made. Two kind of logs were prepared: a detailed one for warships and a simplified one for the merchant navy.

Besides the routine parameters, the observer was requested to add descriptive data like manifestation of currents, presence of drifting material (algae, wood, ice, surface coloured patches (with sampling)), thunder, fog, dew, presence of birds, insects, dust fallouts (with sampling), aspects of snow or hail. While sailing as much as possible soundings should be made and in the harbours tides must be observed. Phenomenons like waterspouts, shooting stars or aurea borealis should also be reported.

5 The Conference as Ground for Future Developments

During the Conference, Maury was obsessed by two major facts clearly understandable from his attitudes and talks: his shrewdness about the British he managed to spare during the debates and his obstination towards Kupffer's original plan for a global meteorological conference. They were many allusions, statements or data referring to the land meteorology and to a next conference including it. The president, reading a letter from Kupffer to Maury covering these matters, was asked to reply to him.

By this position and the hopes expressed when ending the fruitful Conference the loop closes back to the original project of an unified network of observations and data recording.

As a consequence of this Conference, Quetelet was expected by Maury and other scientists who wrote him afterwards to launch an universal meteorological conference. This issue occurred much later (Congress of Vienna, 1873). Maury was dead and Quetelet, being ill, could not attend. Nevertheless he published his last contribution, the notice on Cpt. M. F. Maury we referred to earlier as a kind of testimony in favour of the fellow who fought for the achievement of the first step towards an universal network which became the WMO.

6 Conclusions

Instead of having uniformized world meteorology, what both Maury and Quetelet had in mind, they settled modern oceanography.

This maritime Conference, remarkable example of peace minded and world-wide co-operation for the progress of sciences, made possible to bring together from all over the oceans adequate data which allowed modern oceanography to step forward. Since then, in all seas, on all vessels and at each watch, the routine of sea and weather data recording in logbooks results from the decisions made in Brussels in 1853 and is still done in the way proposed by the Conference.

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References

- Charlier, R. H. and E. Leloup, 1966: Brief summary of some oceanographic contribution in Belgium until 1922. *Bull. Inst. Océanogr. Monaco*, N° special 2 (1er Congrès int. d'Histoire de l'Océanographie - 1966) 293-310.
- Canfield, N. L., 1953: Matthew Fontaine Maury and the World Meteorological Organization. A meteorological centennial. *Pilot Chart*. U. S. Department of the Navy, Hydrographic Office, Sept. 1953.
- Darter, L. J. jr., 1941: The federal archives relating to Matthew Fontaine Maury. *Amer. Neptune*, 1, 149-158.
- Deacon, M., 1980: Some Aspects of Anglo-American Co-operation in Marine Science, 1660-1914. In: M. Sears and D. Merriman (eds), *Oceanography: The Past*. New York: Springer, 101-113.
- De Ridder, A., 1974: Conférence Maritime tenue à Bruxelles pour l'adoption d'un système uniforme d'observations météorologiques à la mer. item 42. 56-57, in *Catalogue, Mémorial Adolphe Quetelet* publié à l'occasion du centième anniversaire de sa mort. N° 1, 205 pp.
- De Ridder, A., 1979: Il y a 125 ans, à Bruxelles: première conférence météorologique internationale. *Ciel et terre*, 95, 279-280.
- De Ridder, A., 1984: 150 ans de météorologie en Belgique 1833-1983. *Inst. Roy. Météor. de Belg. - Kon. Meteor. Inst. Belg.* 15 pp.
- Houvenaghel, G. T., 1980: Belgium and the Early Development of Modern Oceanography, Including a Note on A. F. Renard. In: M. Sears and D. Merriman (eds), *Oceanography: The Past*. New York: Springer, 667-681.
- Kupffer, A. T., 1851: Lettre to Quetelet (10. 9. 1851), *Corr. A. Quetelet* N° 1480, *Acad. Roy. de Belgique*.
- Leighly, J., 1963: Introduction. In: M. F. Maury. *The physical geography of the sea and its meteorology*. Cambridge: Harvard Univ. Press, XXXII, 432 pp.
- Maury, M. F., 1854: *Explanations and sailing directions to accompany the wind and current charts*. 6th ed. Philadelphia: E. C. and J. Briddle, 772 pp.
- Maury, M. F., 1858: *Explanations and sailing directions to accompany the wind and current charts*. 8th ed. Washington D. C.: W. A. Harris. 377 pp.
- Maury, M. F., 1860: Letter to Quetelet (2. 4. 1860), *Corr. A. Quetelet* N° 1761, *Acad. Roy. de Belgique*.
- Maury, M. F., 1872: Letter to Quetelet (25. 3. 1872), *Corr. A. Quetelet* N° 1761, *Acad. Roy. de Belgique*.
- Maury, M. F., 1873: Letter to Quetelet (2. 10. 1873), *Corr. A. Quetelet* N° 1760, *Acad. Roy. de Belgique*.
- Quetelet, A., 1853: Minutes of the sittings - Procès-verbaux des séances, 34-125. In: *Maritime Conference - Conférence Maritime*. Brussels.
- Quetelet, A., 1854: Rapport de la Conférence, tenue à Bruxelles, sur l'invitation du gouvernement des Etats-Unis d'Amérique, à l'effet de s'entendre sur un système uniforme d'observations météorologiques à la mer. *Annuaire de l'Observ. Roy. de Belgique*, 21, 155-167.
- Quetelet, A., 1874: Notice sur le Capitaine M. F. Maury associé de l'Académie, *Annuaire de l'Acad. Roy. de Belgique*, 40, 291-341.
- Schumacher, A., 1953: Matthew Fontaine Maury und die Brüsseler Konferenz. *Dt. Hydrogr. Z.* 6, 87-93.
- Shott, W., 1987: Early German oceanographic institutions, expeditions and oceanographers. *Dt. Hydrogr. Inst., Hamburg*. 50 pp.
- Van de Woude, E., 1987: personal communication.
- Walsh, R. N., 1850: Letter, *Corr. A. Quetelet* N° 2604. *Acad. Roy. de Belgique*.
- Wyland, J. W., 1930: *The pathfinder of the sea. The life of Matthew Fontaine Maury*. Richmond.
- Wellens-De Donder, L., 1964: Inventaire de la correspondance d'Adolphe Quetelet déposée à l'Académie Royale de Belgique. *Bull. et Ann. Acad. Roy. Belgique*. 37, 2.
- Williams, F. L., 1963: *Matthew Fontaine Maury, scientist of the sea*. New Brunswick, New Jersey: Rutgers University Press, 720 pp.