Conclusion

Overview and Contributions of the Expedition of the H.M.S. Challenger

C.1. Observations and material collected during the cruise

In the view of C. Wyville Thomson, the expedition of the H.M.S. Challenger was a success because the instructions formulated by the Admiralty and the recommendations made by the Royal Society before the departure of the expedition were, for the most part, faithfully carried out. The two captains who came aboard, G.S. Nares and F.T. Thomson, for their part, had the intelligence to give preference to the spirit over the letter when it was useful for the mission. This was how the provisional cruise itinerary was modified several times and more particularly in the Pacific Ocean.

The official dates used by the Admiralty to mark the day of commissioning and the day of paying off of the expedition of the H.M.S. Challenger from Sheerness are November 15, 1872, and June 12, 1876, respectively. The dates corresponding to the cruise itself, from the departure from Portsmouth until its return to this same port, are December 21, 1872, and May 24, 1876, a duration of 3 years, 5 months and 3 days. These are the last dates that have been retained as references in our book. The Challenger thus sailed the seas of the world over a distance of approximately 127,584 km (or three times around the Earth). It would have stayed at sea for approximately 720 days and anchored or docked for 540 days at its many stopovers.

Figure C.1 summarizes the chronology of the various stages of the expedition of the H.M.S. Challenger. For better readability, we split the cruise into two parts: Portsmouth (departure) to Cape York, 624 days’ duration (Figure C.1a); and from Cape York to Portsmouth (arrival), 627 days’ duration (Figure C.1b). The size of the sections is proportional to the length of the stage, at sea or on land. The four main cities/steps are marked in bold, underlined characters: Cape Town (duration of the
stopover was 50 days), Sydney (67 days), Hong Kong (51 days,) and Yokohama (60 days). We have also separated the successive passages in the three great oceans by different colors.

Figure C.1. Chronology of the steps of the scientific cruise of the H.M.S. Challenger. For a color version of this figure, see www.iste.co.uk/aitken/deepsea1.zip
COMMENTS ON FIGURE C.1.– (a) The first part of the cruise: Portsmouth – Cape York (Australia), the shaded area in part (a) corresponds to the second part of the cruise; (b) the second part of the cruise: Cape York – Portsmouth, the shaded area in part (b) corresponds to the first part of the cruise. Color legend: gray (stopovers on land), blue (Atlantic Ocean), yellow (Indian Ocean) and green (Pacific Ocean).

The more substantial work of the expedition of the H.M.S. Challenger, and, in fact, that which was later highlighted the most, is, to their credit, the work of the naturalists who collected thousands of animal species that were often unknown and who observed and took samples of various plants and vegetation from the numerous islands visited. This is not surprising because the scientific team aboard the Challenger mainly consisted of naturalists.

The second part of the Challenger’s mission was mainly geography and physics of the seabed: hydrography of the oceanic basins, physical and chemical characteristics of the water (and sediments). The second part of the mission, which is much less known than the first and relatively little used, is the focus of the ensuing volumes.

Many surveys and measurements were conducted throughout the cruise by scientists and members of the crew. Spread out approximately equidistantly along the various sea routes, the observation stations were defined. At each station, the task was to carry out a sounding (depth measurement with sediment sample collection); dredging (lifting various mineral or organic substances resting at the bottom of the sea); temperature measurements at surface and at depth; water sampling at different depths to measure its density, salinity and gas composition (nitrogen, oxygen, carbon dioxide); checking the direction and the strength of the wind speed and checking the direction and the measurement of the surface current speed. Between observation stations, scientists were free to make additional investigations. They carried out some soundings and measurements of temperature that were certainly more numerous than initially planned. It was also at the observation stations that most of the trawling operations for collecting live organisms and fish were undertaken.

The figures below (number of locations or operations) reflect the work done during (and after) the Challenger expedition:

– observation stations: 504;
– soundings: 504;
– dredging: 132;
– trawling: 151;
– observations of ocean waters (measurements) at the surface (S), intermediate
depth (I) and the bottom (F):
- temperature: S (475), I (~8,000)\textsuperscript{1}, F (308);
- density: S (391), I (814), F (222);
- salinity: S (44), I (184), F (99);
- gas composition: S (69), I (56), F (40).

In addition to the scientific and hydrographic work previously mentioned,
numerous zoological, botanical, geographical and ethnological illustrations, or
retracings of various events of importance, were done by members of the expedition:
about 800 photographic plates were made by the three successive photographers, a
multitude of drawings and sketches were made by John Wild and other similar
works were undertaken occasionally by several officers and scientists.

**C.2. Evaluation and publication of results**

As had been expected by the Admiralty, the scientific team of the H.M.S. *Challenger* periodically mailed zoological and botanical samples collected at sea
and on land to England\textsuperscript{2}. Zoological samples were temporarily stored in the premises
of the University of Edinburgh to be listed and then sent to be studied and examined
by the best specialists in the field in Britain, Europe and North America. The
botanical collections were grouped together at the Royal Botanic Gardens, Kew, a
suburb of London. In addition, scientists and officers of the *Challenger* sent many
notes and working documents to the British authorities during the course of the
cruise. The first scientific results were thus published in scientific journals before
the *Challenger* returned to Portsmouth.

It was Charles Wyville Thomson who himself selected the naturalists to examine
the zoological and botanical collections as well as the specialists, physicists and
chemists who analyzed the observations and surveys during the cruise\textsuperscript{3}. This lengthy
investigative labor, spread over 20 years and involving dozens of eminent scientists,
came to fruition with the publication of a scientific report bringing together

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\textsuperscript{1} About 20 temperature measurements were carried out at intermediate depth at each station.
An example of temperature measurements in depth can be seen in Figure 1.2 of Volume 2,
where between 10 and 1,500 fathoms and 33 surveys are recorded.

\textsuperscript{2} Essentially, sample shipment towards England started from big cities: Cape Town, Sydney,
Hong Kong and Yokohama.

\textsuperscript{3} Burstyn H.L., “Science and government in the nineteenth century: the *Challenger*
expedition and its reports”, *Bulletin de l’Institut océanographique de Monaco*, special edition 2,
50 volumes in quarto\textsuperscript{4} under the aegis of C. Wyville Thomson. After his death, in March 1882, John Murray was to continue publishing the scientific reports.

We can schematically classify the various volumes of the scientific report of the expedition of the H.M.S. \textit{Challenger} into four main themes:

– terrestrial and marine \textit{zoology}: 40 volumes, published from 1880 to 1889;

– \textit{physics} and \textit{chemistry} of waters and the seabed: 6 volumes, from 1882 to 1895;

– \textit{botany}: 2 volumes, 1885 and 1886;

– \textit{narrative} of the voyage: 2 volumes, 1885.

\textsuperscript{4} The general title of the official report of the expedition is: \textit{Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873–76}, prepared under the Superintendence of Sir C. Wyville Thomson and John Murray, and published by order of Her Majesty’s Government.