

Sir C. Wyville Thomson's correspondence on the "Challenger" fishes

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HISTORICAL ACCOUNT

WYVILLE THOMSON'S correspondence with ALBERT GÜNTHER, Keeper of the Department of Zoology in the British Museum, about the disposition and study of the fishes taken on the H.M.S. *Challenger* expedition, 1872-1876, and about the publication of results, extended from 1877-1881. In a sense this correspondence centred around the year 1879—the year in which HENRY BRYANT BIGELOW was born on October 3rd in Boston, Massachusetts.*

Now-a-days it is common practice to call oceanography a "new" science. The speed with which it has advanced and, accordingly, with which our knowledge of the oceans has increased, is generally recognized. None the less, it is not altogether easy to maintain perspective and to realize that "... the famous 'Challenger' reports, which may be said to form the solid base upon which the superstructure of the science of oceanography has since been built" (RUSSELL and YONGE, 1928), began first to be published only three-quarters of a century ago—in short, during the life-time of the man whom this volume honours. For this reason, it is perhaps worth looking with some care at the year 1879, both in its broad and special aspects, before turning to the hitherto unpublished correspondence which is the subject of this paper.

The second half of the 19th century in Europe was marked by many political and economic changes stemming from the Industrial Revolution. As a result of the Franco-Prussian war (1870-1871) there emerged a united Germany and a unification, too, of the Italian States. Russia had effectively pushed the Turks back into Asia, but the western powers resisted her attempts to obtain Constantinople and a command of the eastern Mediterranean. With the Congress of Berlin in 1878 the independence of the Balkan countries, Montenegro, Servia, and Roumania, was established. And the alliance of Germany and Austria-Hungary in 1879 proved most aggravating to Italy, who feared it would block her potential control of the Adriatic; to France, who saw it as a blow to her ambition to regain Alsace-Lorraine; and to Russia, who still wanted a foothold in the Balkans and the Mediterranean. China posed problems in the Far East, as the western powers and Russia both tried to gain concessions to her great natural resources.

In the United States, 1879 was a singularly happy and prosperous year. Crops flourished, manufacturing and trade were stimulated, and the railroads were expanding to meet these demands. We were at peace with the world, except for Indian skirmishes in the west where Sitting Bull had been forced to retreat across the Canadian border.

* The October 3rd, 1879, edition of the London *Times* carried an admonition that there were 12 different Bostons in the U.S.A., and that the name of the state on the envelope address would facilitate accurate delivery.

England, it is said, was not so happily situated that year. There were wide crop failures and a continuing depression. Ireland, with the loss of her potatoes due to adverse weather, was agitating for Home Rule and land rent reforms; the situation was so acute that the American Irish were sending \$10,000 a week towards relief in the homeland. England was fighting in Afghanistan to protect her affairs in India. She was also engaged in military operations in South Africa to keep this portion of her Empire. And she was even sending warships to the west coast of South America, where Chile and Peru were fighting, in order to guard her ". . . interests in guano for the fields of Yorkshire". However, England's firm policy of colonization was to stand her in good stead. In addition to India and South Africa, she had acquired control of the Suez Canal, and had long since colonized Australia, New Zealand, Tasmania, and Canada—this, as other countries, notably Spain, had tended to lose their colonial domains. In a different context, Charles Darwin at the age of 70 in 1879,* just twenty years after the publication of *The Origin*, was doing the experimental work at Down which led to the publication in 1881 of *The Formation of Vegetable Mould through the Action of Worms*, to be received ". . . with what struck DARWIN as 'laughable enthusiasm'" (MOORE, 1955). And the "episcophagous" HUXLEY had turned to more peaceful pursuits and was preparing to publish *The Crayfish* (1880). It was not, after all, such a bad year for England.

Perusal of the London *Times* in the year 1879 yields amusing coincidence with today. The *New York Herald* was sponsoring a naval vessel's exploration of the North Pole.† The *Macon* (Georgia) *Telegraph* reported, and got space in the London *Times* on January 1, 1879, that there was a remarkable phenomenon on the Florida coast where ". . . dark, reddish water" was killing fish and creating ". . . a pestilential stench"; the account went on to state, "We have no other explanation of the poisoning" (reported to have extended as far as 150 miles into the Gulf) "than that it comes from inland waters—the everglades predominantly. . . ." Panama had a revolutionary outbreak. The stevedores on the piers of New York were striking. A large underground cave in Algeria was found to contain blind fish.‡ Even the book titles have a familiar ring: we read reviews of "The Sea, its Stirring Story of Adventure, Peril, and Heroism" by F. WHYMPER. "The Broad, Broad, Ocean", "Notable Voyages", and "Episodes of the Sea" are a few others of the spate. And another Mr. WHYMPER** was bringing out "The Ascent of Matterhorn".

We are also struck by many changes. In 1879 Woolworth opened his first store in Utica, New York (in 1955 the Woolworth Company reported its sales for the previous year at an all time high of \$721,312,990). In 1879 Harvard College offered 112 scholarships varying from \$40 to \$350—today it offers over 1,000 scholarships at an average worth of nearly \$700 each. In 1879 the Shah of Persia was planning to undertake a pilgrimage to Meshhed with 10,000 troops, while this year the Shah's

* "It was on . . . February 12, 1809 that the other man who along with Charles Darwin was most profoundly to influence their time, and perhaps the future, was born—Abraham Lincoln" (MOORE, 1955).

† See, for comparison, WALTER SULLIVAN's articles about the *Atka* expedition to Antarctica in preparation for International Geophysical Year, 1957, in the *New York Times*, January–March, 1955.

‡ Some 37 years after the discovery of the famous Kentucky Blind-fish, *Ambyloptis spelaeus*, whose origin the National Geographic Society states in 1955 ". . . is a mystery to naturalists".

** EDWARD WHYMPER, 1840–1911, English Alpinist and wood engraver, who found a route up the Matterhorn in 1865.

travels have carried him to Sun Valley and Florida. In 1955 the production of synthetic diamonds has been achieved, finally bearing out the statement in 1879 by NEVIL STORY MASKELYNE of the Mineral Department of the British Museum, "... that (this problem) will be solved, no scientific mind can doubt". In Boston on December 3, 1879, the *Atlantic Monthly* gave a party for the seventieth birthday of the "Autocrat of the Breakfast Table"; today it would be hard to rival the distinction of the gathering which included beside O. W. HOLMES these others: H. B. STOWE, J. G. WHITTIER, H. W. LONGFELLOW, R. W. EMERSON, MARK TWAIN, W. D. HOWELLS, and J. W. HOWE. The February 11th issue of the 1879 London *Times* carried the statement that, "Arrangements are being settled with the Société Générale d'Electricité for an experimental lighting of the reading-room of the Museum with the electric light". And the April 10th issue reported that communication by telephone was established between the Royal Institution and Burlington House, "... with Professor TYNDALL at one extremity of the wire and Professor HUXLEY at the other"; there was apparently much amusement among those present, and, "The feasibility of telephonic communication was clearly demonstrated, the voice being distinctly audible over the whole of a large room".

The London *Times* for 1879 also contains numerous articles on science and natural history and makes reference to many familiar names. Thus FRANK BUCKLAND* and SPENCER WALPOLE published a report on the Sea Fisheries of England and Wales about which it was written:†

On these very surfaces and in these very depths there rages, has ever raged, and ever will to the end of time, a warfare compared with which historical battles sink to the dimensions of street rows or family jars. It is an incessant and universal war carried on between greater numbers than can be told, more species than can be well distinguished one from another, and every order of existence, from the scarcely visible and scarcely animated fibre or molecule up to the lords of creation. . . . Fish engaged in a universal internecine war devour many times more than we can do.

FRANCIS DAY‡ read a paper to the Linnean Society on the instincts and emotions of fish. EDWIN RAY LANKESTER, founder of the Marine Biological Association five years later, was Public Examiner in Natural Science at Oxford. EDWARD COPE was appointed head of the department of organic material of the Permanent International Exhibition of Philadelphia. ALEXANDER AGASSIZ was chief of the scientific staff on the cruise of the *George S. Blake* through the West Indies. WILLIAM B. CARPENTER resigned as Registrar of London University; this was the man who had helped to induce the Admiralty, through the Council of the Royal Society, to place at his and WYVILLE THOMSON's disposal first H.M.S. *Lightning* (1868) and then H.M.S. *Porcupine* (1869 and 1870) for deep-sea exploration (THOMSON, 1873), and who was a prime mover with the Government for the *Challenger* expedition "... to explore and make known the conditions of life in the great oceans" (HERDMAN, 1923). HUXLEY received an honorary LL.D. from Cambridge in company with ROBERT BROWNING. And at younger levels, WILLIAM HERDMAN received his B.Sc. and the

* Author of *The Natural History of British Fishes*, London, 1880.

† London *Times*, December 6, 1879, p. 9.

‡ Author of *The Fishes of Great Britain and Ireland*, two volumes, London, 1880-1884, and of *British and Irish Salmonidae*, London, 1887.

Senior Bursary in anatomy and physiology from Edinburgh, while the Junior Mackenzie Bursary went to one D'ARCY WENTWORTH THOMPSON for "... the greatest industry and skill in the particular anatomy work during the winter session". FRANCIS MAITLAND BALFOUR, 1851-1882, had just published his monograph on the *Development of Elasmobranch Fishes*.^{*} German carp were introduced in southern United States waters, and the previous year the U.S. Fishery Commissioners had "... made a present of a million ova of the California salmon ... to the Government of New Zealand", about 95% of which were reported to have produced "healthy fish".[†] Over 100,000 individuals were employed directly or indirectly in the Scottish fisheries, and the Herring Board stated that:

With the exception of the occasional and uncontrollable influences of the weather which cause temporary fluctuations in the catch, the sea fisheries of Scotland and the herring fisheries in particular, are beyond the reach of any power to impair their abundance.

The British Association Meetings for 1879 opened in Sheffield on August 20th, and Professor G. J. ALLMAN chose for the subject of his presidential address, "An Account of the Most Generalized Expression of Living Matter". He made particular reference to the grey gelatinous material which appeared in preserved samples of the deep-sea dredgings made from the *Porcupine* at depths of 5,000-25,000 feet, and of the fact that it had appeared to be "... obviously endowed with life". He recounted how it had been examined by HUXLEY, who declared it to consist of protoplasm and envisaged this living slime as extending over wide areas of the sea bottom as a sort of pabulum on which the animals living at these depths fed in the absence of plant life. HUXLEY had named the material *Bathybius haeckelii*, and HAECKEL had fully supported HUXLEY's conclusions. ALLMAN went on to state that the reality of *Bathybius* had not been universally accepted and that the *Challenger* did not find it. It remained for J. Y. BUCHANAN, *Challenger* chemist, to prove that the material was an inorganic precipitate owing to the action of the preserving fluid, alcohol. HUXLEY, in thanking ALLMAN at the conclusion of his address, admitted that he had christened *Bathybius*. "He had hoped, indeed, that his young friend Bathybius would turn out a credit to him, but he was sorry to say as time had gone on Bathybius had not verified the promise of his youth" (London *Times*, August 21, 1879).

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THIS WAS the great early period of oceanography. WYVILLE THOMPSON's cruises on the *Porcupine* and the *Lightning* in the North Atlantic had destroyed EDWARD FORBES' conception of the azoic zone. In 1870 THOMPSON, now forty, and having spent seventeen years teaching in Ireland, succeeded ALLMAN in the Chair of Natural History at Edinburgh. The *Challenger* expedition followed, with Thomson as director of the civilian scientific staff on board. As MURRAY (1895) reports, "After circumnavigating

^{*} Macmillan and Co., London, 1878; reprint of papers in the *Journal of Anatomy and Physiology*, 1876-1878. The present-day classics on Elasmobranchs are by BIGELOW and SCHROEDER (1948 and 1953).

[†] At the same time the question of introducing California salmon into British waters was the subject of much debate in England. One writer, Sir ROSE PRICE, emphasized the "... extremely risky nature of the experiment", and claimed these fish would not take a fly and had no flavour. He concluded by stating, "The mortality among salmon in California is simply incredible" (London *Times*, April 16, 1879).

the globe, and carrying on deep-sea and other investigations in many regions of the ocean, the *Challenger* returned to England in May 1876, and the crew was paid off after the ship had been in commission for over three years and seven months". Then came the question of how best to work up and publish the results. Quantities of data in all branches of oceanography had been recorded, and the collections, which had been sent back to England from the expedition's different ports of call or brought back on ship-board, were wonderful in their extent and variety. There was extensive correspondence, in which members of the Royal Society, the Admiralty, the British Museum, and the Treasury all had a hand. MURRAY (*loc. cit.*) again writes, "It was further determined that the records of the various observations and marine collections should remain in the meantime in the hands of those who had taken part in the Expedition, and that a temporary Government department, with a small annual grant, should be created, the duty of which should be to direct the discussion of the physical and biological observations, the examination of the collections, and the publication of the scientific results, so far as these had a bearing on the science of Oceanography". Her Majesty's Stationery Office was to publish the results, and the "typical collections" were eventually to be deposited in the British Museum. In 1877 WYVILLE THOMSON was appointed Director of the *Challenger* Expedition Commission, with headquarters in Edinburgh and JOHN MURRAY as first assistant. WYVILLE THOMSON fell into ill health shortly thereafter, and he lived only five more years—to the age of 52. In that time he settled the style of the publications and sent "a considerable part" of the collections to the specialists* who were to examine and describe them. In fact, by 1882, the year of his death, 22 of the *Challenger* Memoirs were in print, the first having appeared in 1880. It remained for MURRAY to see the job through; the last of the "Fifty large Royal Quarto Volumes" appeared in 1895.

THOMSON'S letters to GÜNTHER† resulted in three memoirs: on the shore fishes (1880), on the deep-sea fishes (1887), and on the pelagic fishes (1889). The correspondence, not all included here and in a most unhappy long-hand, provides fair evidence of the tremendous pains to which Sir WYVILLE went, of his attention to detail, of his ability to prod the contributors to the *Challenger* Reports when occasion demanded, and of his insatiable desire to see the whole series done to the highest degree of perfection.

University—Edinburgh
March 17, 1877

Dear Dr. Günther:

We have now gone over the greater part of the "Challenger" spirit collections and the Fishes are nearly ready to be handed over to you if you are inclined to take them up.

There are two distinct sets—those from the shallow water and from the marshes. This collection is not large as such a collection might easily be made with more time but I have no doubt there are many undescribed forms from the more remote places.

The other set is from deep water and many consist of a couple of hundred specimens (more or less) of forty or fifty species of which a large proportion are undescribed. They are mostly allied to the deep-water things which have come home from about Madeira.

* The completed *Challenger* Reports contain contributions from 76 authors.

† Published with the permission of the Trustees of the British Museum. We here express our best thanks to the several persons who helped us with the original letters of C. WYVILLE THOMSON in the B.M.N.H., particularly Mr. MUGFORD of the Mineralogical Department Library.

If you undertake the Fishes the arrangement approved by the Treasury and by the Trustees of the British Museum is the following.

"That the fishes be sent to Dr. Günther for determination and description and that Dr. Günther be requested to select a complete set for the British Museum including all unique specimens and two specimens of all species of which there are more than three; the remaining duplicates to be returned to me for distribution with the sanction of their Lordships."

There is one point with regard to the deep-sea fishes especially which I must mention. Mr. Murray has had charge of these and has devoted special attention to the circumstances under which they have occurred making careful notes in each case. No description would be complete particularly in its bearings on physical geography without such information and I think it would be very desirable that Mr. Murray should be associated with you in the description of this section; this is a matter, however, which I must leave in your hands.

I should wish all new species and all species which have not already been well figured in readily accessible publications to be fully illustrated with any necessary anatomical details. Of course I am prepared to defray the expense of illustration. I should like, if possible, to have some at all events of the plates done during the next financial year and I would be greatly obliged to you if you would, when you see the specimens, give me a rough estimate of the number of plates which will be required and of the approximate costs.

In the meantime, will you kindly let me know your views generally on the matter and when you would wish the Fishes sent.

I enclose a proof of a list of observing Stations and will send a corrected copy with the chart shortly.

I send a rough proof of one of the plates to give the size.

Yours faithfully,
C. WYVILLE THOMSON

*Bonsyde
Linlithgow, N.B.*
July 10, 1877*

Dear Sir:

I do not think that there is the slightest objection to your publishing the Kerguelen Fishes in either way you prefer—Annals or Phil. Trans. The deep-sea series I should think of course to form a part—or volume if need be—of the official report. Would you be good enough to give me so far as you can a rough estimate of the amount which you expect to be able to undertake—plates and letter-press, during the current financial year, and the total expense for this year—the plates on the stone and the letter-press ready to go into the printer's hands.

I am glad that you are finding so many new and interesting forms. I think you may depend upon the condition of the specimens being good, for certainly no care has been spared either in that or any other group of marine forms.

I am yrs faithfully,
C. WYVILLE THOMSON

*University of Edinburgh
18 October, 1877*

Dear Sir:

I now enclose a plate as a sample of size and style that we may have the whole series as nearly uniform as possible. The tinting, the additional expense for which has been sanctioned by the Stationery Office, gives a great advantage in brightening of the figures by the use of white.

The exact size of the tinted portion of the plates, well within which the figures must be kept, is 10 × 8 inches. It would be well to keep the lettering the same as on the sample plate, altering

* THOMSON's ancestral country home, where he was born and where he died. The centre window of the apse of the parish church of St. Michael of Linlithgow was done in 1885 in memory of Sir WYVILLE; the subject is a representation of the 104th Psalm, God's manifestation of Himself in the Works of Creation, and in the lower parts of the window are illustrated the "great and wide sea".

the legend on the right hand upper corner as required, e.g., Foraminifera Pl. III Ostracoda Pl. IV.

I should like that two proofs of each plate should be sent to me before the requisite number of impressions, which will probably be 525 are printed off.

The paper will be supplied by the Stationery Office. I am, sir,

Yours faithfully,

C. WYVILLE THOMSON*

Edinburgh

November 13, 1877

Dear Dr. Günther:

I have written to Spence Bate.† Under all the circumstances it may perhaps be as well to allow the Brachyura to stand over for the present.

Will you kindly let me know for the information of the Stationery Office how you propose to have your plates lithographed—through what firm, and at what cost—the plates to be of the same size as the pattern plate sent and the number of copies probably about 730. The Stationery Office supplies the paper, so it is merely the use of the stones and the printing.

Thank you for your interesting account of our Japan species. What a number of new forms there seems to be. Believe me.

Yrs. faithfully,

C. WYVILLE THOMSON

Edinburgh

May 4, 1878

Dear Dr. Günther:

I should think that there cannot be the least doubt of the advantage of the course you propose. The abstract of the description in the Annals should be "published with the permission of the Lords Commissioners of the Treasury". I have heard nothing about fishes from Agassiz. He has got a fine haul of invertebrates.

Let me know what arrangement you make when you begin the plates so that we may be all square with the Stationery Office.

Yours faithfully,

C. WYVILLE THOMSON

University

Edinburgh

July 5, 1878

Dear Dr. Günther:

Thank you for the signed list. It keeps things all square.

I am very glad to know that the illustrations of the Fishes are going on.

I am glad also that the condition of the Fishes pleases you. Murray took a great deal of trouble.

Yrs. faithfully,

C. WYVILLE THOMSON

* This letter is not in THOMSON's own hand, though the signature is clearly his.

† See *Challenger Report on the Crustacea Macrura*, Vol. 24 (Zool.), Pt. LII, 1888.

Edinburgh

October 12, 1878

Dear Dr. Günther:

I am delighted to see the plates. They seem to be excellent. We have a contract with Mintern's so all you have to do is to order from him is to order (*sic*) 750 copies of each plate on the terms of his contract for the Challenger work. I think the best plan would be to leave all the plates at Mintern's except 20 copies of each which are allowed for editorial purposes, and which I should like to have sent to me. I do not care to have all the plates stored in one place. It concentrates the risk too much. I suppose Mintern's people have a fire-proof store. The faster the plates come in now the better. I fear it will be *impossible* to complete the whole work within the time I gave*—but—we are doing our best.

I send a copy of Lyman's synopsis of the first division of the Ophiuroids so you see what you have to expect in the way of new forms. I have not yet got the type specimens of the Echinids but most of the plates are done so you will get them soon.

Believe me

Yrs. faithfully,

C. WYVILLE THOMSON

Edin.

December 31, 1878

Dear Dr. Günther:

Of the enclosed documents those marked I and II were returned to me from the Treasury on the grounds that Plates 3 and 6 had been charged twice.

I had signed both accounts supposing that the double marks referred to the two series—shore and deep-water fishes. Mintern's people seem to be careless in these matters. If this is the second time a mistake has occurred, would you mind asking them to send their accounts to you and initialing them if you find them correct?

Yrs. in this

C. WYVILLE THOMSON

Edinburgh

January 25, 1879

Dear Dr. Günther:

Will you very kindly try and fill up the accompanying sheet. I am anxious to make out as clearly as possible where I am and what I may expect.

Yrs. faithfully,

C. WYVILLE THOMSON

Bonsyde

Linthgow, N.B.

Nov. 12, 1879

Dear Dr. Günther:

I am now going on with your report and I will send you some proofs in a few days. It is somewhat different in form from the others. I thought the plates had been printed off. I suppose Mintern had better send to me a demand for the paper they require and I will send it up to the Stationery Office.

Will you kindly let me know to what the *numbers* attached to the species of shore-fishes refer.

* MURRAY (1895) writes, "In the year 1889 Her Majesty's Treasury declined to ask Parliament to renew the annual grant for the continuation of the work relating to the scientific results of the Expedition, the time estimated for the completion of the publications having expired. However, after some correspondence, in which I offered to finish the Report at my own expense, the Government agreed to set apart the sum of sixteen hundred pounds for the completion of the official publications in the same style as that in which they had hitherto appeared. This sum has been the only payment from Government funds in connection with the Challenger Expedition during the past six years. . . ."

As to the pelagic fishes if you think they would be better on woodcuts I have no objection. If you can employ Mr. Cooper 188 Strand to cut the blocks it would be convenient as we shall have an account with him at all events.

I shall be very glad to see the deep-sea fishes. Of course in this report the interest centres on the distribution and the bathymetrical range of the forms, and I should like it to be as complete in this respect as possible so as to form a basis for future work.

I would be glad if you would kindly give very full lists of the deep-sea fishes which have been described hitherto, and if you would cause to be figured anew any species taken by us, which have been only described and not figured, which have been badly figured, or which have been figured in not easily accessible books. You are no doubt aware that Agassiz's deep-sea fishes are in Steindachner's hands and now well advanced. As the abyssal fauna is very uniform many of our species are in that series.

I have heard from several of your London acquaintances that you are in some way dissatisfied with the form in which you are receiving the British Museum Series of specimens. I do not know what the cause of complaint is, but if there be any it would be better perhaps to refer it to myself. I send a proof which happens to be lying before me to show you the form which the reports are taking.

Yrs. faithfully,
C. WYVILLE THOMSON

Bonsyde
Linlithgow, N.B.
Nov. 17, 1879

Dear Dr. Günther:

Thank you so much for your note. You have not however told me to what the nos. attached to the Shore-fishes in your list refer. Please let me have a post-card as soon as you can.

I assure you if I had only heard of your supposed dissatisfaction casually or from one source I should have said nothing about it. Since, however, there seems to have been some mistake there is no use in taking further notice of the matter.

I consider it perhaps the principal part of my duty in connection with the working up of the "Challenger" collection to place the *type specimens* and whatever else seems necessary for full illustration, of every species, in the British Museum. And this I will carry out to the best of my power. As I told you at the time the specimens which you got from Agassiz belong to known species, and to a few new species of which many samples were found—possibly some of them are unnamed, and I sent them to you just as they came as I am aware that each transfer however carefully managed does some little damage, and I did so mainly that some pretty things such as *Coelopleurus*, *Salenia*, *Asthenosoma*, etc., might be seen at once.* You will get the type specimens whenever they are figured and described.

Thank you for your kind reference to my late illness. I fairly broke down with over-work, but I am now nearly as well as ever.

Believe me

Yrs. faithfully,
C. WYVILLE THOMSON

Bonsyde
Linlithgow, N.B.
Feb'y 13th, 1880

Dear Dr. Günther:

I send you at last a proof of your report on the Shore-fishes. I thought you would have had it long ago but some other things occupied us very fully for a time. As it turns out however this delay has been of no consequence for it will be a month yet it seems before your plates are printed off.

What I send you, then, is a first-proof, corrected as far as we could manage it, but still needing

* See *Challenger* Report by A. AGASSIZ, Vol. 3 (Zool.), Pt. IX, 1881.

to be put into shape in certain respects. The Geographical list* I propose should come first—as an elaborate Table of contents. Then the descriptions and the systematic list at the end. There are several mistakes and among them a few which ought to be corrected. For example the fresh-water fishes from the Mary river were not presented to us but caught with some labour by a little party consisting of Murray, Lieut. Aldrich, and myself, who squatted on the bank of the river for a fortnight in the hopes of getting young *Ceratodus*. We took two of the mature *Ceratodus* however and it should have been in your list. The specimens were not sent to you as they were not put up with the rest of the fishes. I know you had plates of it so I suppose you do not wish them. If you do you can have *one*. I should like to keep the other here as a memento of a pleasant holiday trip.

To save you trouble it would be better perhaps that I should add when necessary a note indicating anything special about the fishes—such as the mode of preserving them at different places. The account is rather bald without a few such details.†

Would it not be as well to substitute some other specific name for *Sancti pauli*.‡ The French are just describing the fauna of the other St. Pauls which is so much better known.

In the introduction of your preliminary notes on the Deep-sea fishes you make some remarks as to the extent and condition of the collection of fishes. I suppose you have no objection to these remarks being repeated here.

I send you two copies of the proof. If you want additional copies please send me a line—also if it is necessary to send the Mss. I retain a copy and will add such additional notes as I think are necessary, and then, when I get your corrected copy, I will have a clean proof drawn and send it to you before printing off, in case you have any further alterations.

I will be glad of the deep-sea fishes whenever I can get them. The first spurt is about over and we shall need as much material as we can get to go on with.

You will get the type collection of the Echini very shortly now. I hear from Agassiz that he is very nearly done. I hope to be able to be in London in March but I am not quite strong yet and am shirking the journey as long as possible.

Yrs. faithfully,

C. WYVILLE THOMSON

Bonsyde

Linlithgow, N.B.

February 24, 1880

Dear Dr. Günther:

I am afraid it was trespassing altogether too much upon your time to ask you to take charge of the Report on the Challenger Fishes, but I followed the principles I tried to work on as far as I could, and applied to the most distinguished Ichthyologist I knew. I must ask you however to allow me to bring your list as nearly into the form which has been adopted after much consideration for the report, as its nature will allow.

I am taking the utmost care that the type collection of everything goes to the British Museum in its thorough completeness but I do not mean to make the Challenger Report a Museum Catalogue in any sense. The data I mean to publish are those which have reference to the Expedition. No doubt all the letters and references to specimens in and out of the Museum will appear in your own catalogues when these Fishes are added to them. Such a list as you send me should be published by the Museum if it is required.

I suppose that the Shore-Fishes are not of much importance but I do not wish to publish matter which from my point of view is wholly irrelevant, and I must add a few notes about the

* No geographical list as such appears in the printed version; the descriptions are made under broad geographic headings, Atlantic, Temperate Zone of the South Pacific, etc.

† To make the account of *Ceratodus* less "bald", Sir WYVILLE, who evidently felt strongly about these fish, wrote what must surely be one of the longer footnotes in ichthyology—almost a thousand words (GÜNTHER, 1880).

‡ GÜNTHER apparently disregarded Thomson's suggestion, for *Holocentrum sancti pauli*, n.sp. appears on page 4 of his Report on the Shore Fishes (1880).

Ceratodus and means by which the fishes were procured—to do my duty fairly as Editor. I have not time for many, but what are added you will see before they are printed off. The report on the Shore-Fishes might be as good as that on the birds which will give all the information we have. I will send you tomorrow the Mss.—and you will see that we have taken no little trouble correcting spelling, adding authorities, etc., etc. I would have certainly left out that long Geographical list altogether. It seems little more than a repetition of the main list. I will leave it out yet if you have no objection for I do not think it improves the appearance of the paper.

I have not the proof at hand—it is at the Office in Town but I will see it tomorrow and write again what I think had best be done.

Yrs faithfully,
C. WYVILLE THOMSON

Bonsyde
Linlithgow, N.B.
March 10, 1880

Dear Dr. Günther:

I daresay your plates are now nearly finished and the rest of the volume is ready. All you need to do is to correct any errors in spelling and so on in the text, and I would like to have it as soon as convenient.

Yrs. faithfully,
C. WYVILLE THOMSON

Bonsyde
Linlithgow, N.B.
March 22, 1880

Dear Dr. Günther:

I must apologize for having entirely forgotten to send *Ceratodus*. I suppose you have been waiting for it before sending the corrected proof. I will be glad of the proof whenever you are ready for we are anxious to set the type free.

There is another little matter which I ought to mention. I see you have communicated a paper to the Linnaean Society on some of the deep-sea fishes. If any report or abstract of that paper is published I would be greatly obliged if you would add to the heading "Published by permission of the Lord Commissioners of the Treasury".

Of course in making this request I am only obeying my own instructions from the Treasury.

Yrs faithfully,
C. WYVILLE THOMSON

29 March 1880

Dear Sir Wyville:*

The specimen of *Ceratodus* arrived safely on Saturday last, and I return it today with the proof sheets.

The proofs are corrected with the exception of 1. The Geographical List which you propose to leave out. I see no objection to it and only regret that it was set up in type, time and expense being thereby saved. 2. Of the enumeration of the specimens of each species which I have left as you have had it set up.

With regard to my discourse at the Linnaean Society, it referred to results of examinations made by myself long ago or others more recently independently of the Challenger Collections.

* This unsigned letter, much emended, appears to be the first draft of GÜNTHER's answer to THOMSON's of March 22, 1880.

Bonsyde
 Linlithgow, N.B.
 April 1, 1880

Dear Dr. Günther:

Many thanks for the corrected proofs. They will be put in hand immediately and I will send you a second proof before the paper is printed off. I see most of your corrections refer to matters of *form* rather than *Ichthyology*. I do not suppose you attach much importance to the relative positions of *n* and *sp*! Our way of putting it was adopted after an amount of consideration sufficient for the subject, I think. It means either "new species" or "nova species" as you choose. On what ground it should be inverted, unless it came in as part of a Latin sentence, I am not aware. The single *i* terminating proper specific names ending in a consonant is in accordance with the "Strickland Code" and is I believe correct.

The first Zoological volume will now be out at once. I have not yet got your plates from Mintern's however—but I suppose they are ready.

I suppose you will have no difficulty in arranging the account of the deep-sea fishes zoologically and putting the report into the same form as the others. It will save a deal of trouble. The sooner I can get the reports, the materials for which have been long in the hands of the authors, into print the better—for there will be a great accumulation towards the end.

Yrs faithfully,
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow, N.B.
 May 4, 1880

Dear Dr. Günther:

I hope this will answer now. I have, as you suggested, taken out the reference to the B.M. Catalogue, and have made the Report more comparable in shape of the rest.

I trust you will not find it to require much more correction—and that you will be able to let us have this Mss. proof at once, for the *succeeding* volume is almost finished and (we) are greatly pressed to put the first out of hand.

Yrs faithfully,
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow, N.B.
 May 6, 1880

Dear Dr. Günther:

I think the addition of the paging to the systematic list would be a great improvement. I would have had it done here but our hands are *very* full.

Delighted to hear that we shall soon see some deep-sea fishes.

Yrs faithfully,
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow, N.B.
 July 5, 1880

Dear Dr. Günther:

I was unlucky in missing you the last time I was in London.

You wrote me some time ago that I might expect within a very short time some of the plates of the deep-sea fishes. Could you drop me a line when you think these will be ready. I wish to arrange for the next set of volumes and I want to know when your memoir will come in—as one of very great interest.

Have you unpacked or incorporated or done anything with the set of Echinoderms I sent you? I find that they were sent in a certain sense by mistake, and I could select your full set much

more satisfactorily if I had them back again. I have had no official receipt for them. They were only meant in a provisional lot in case anyone wished to see them and if they are not exhibited or entered if you wish to send them back to me I will send you the type lot complete.

Yours faithfully,

C. WYVILLE THOMSON

*I am sorry that there has been any mistake about the preliminary set of Echinids; but, re-reading from letters, I must acquit myself of any share in the error.

The specimens have not only been put into different bottles, but have been registered, incorporated and reported to the Trustees; and by them to the House of Commons.

It is now, therefore, impossible for me to acquiesce in your request that they should be returned. It seems to me that the best thing to do will be to send me the type-series, when I will have them compared with what have been already sent, and, if I find that it is possible to return any of the freshly sent specimens, or finding that the characters and distribution of the species collected is already well enough represented by the previous series, I will certainly do so, in order that they may form a part of a good set for the museum, which has the second claim on this National collection.

So far as the specimens already sent are concerned, I may add that the assistant in my Department who is especially charged with the care of this group has engaged himself to remain in London until the end of August, and I may safely promise for him that he will spare no trouble in giving all assistance in his power to the artist (2) or the describer (1), if they are desirous of having another examination of the specimens already in the British Museum.

Bonsyde

Linlithgow, N.B.

July 10, 1880

Dear Dr. Günther:

I am greatly obliged to you for the proofs which are already in the printer's hands.

Yrs faithfully,

C. WYVILLE THOMSON

Bonsyde

Linlithgow, N.B.

July 15, 1880

Dear Dr. Günther:

Thank you so much for your note and for the first deep-sea fish plates. I suppose in these plates you will simply put the name of the Fish beneath as we have done in the other groups without locality or anything further. Either the generic name only or the generic and specific as you think proper.

It is all right about the Echinoderms. I thought it very possible you had incorporated them. I daresay you could without much trouble send me a list of the species already sent. I think I kept a duplicate list but I have changed my Secretary since, and I cannot at this moment lay my hands on it. I want to be sure that you get every species the old as well as the (*sic*) those not previously described.

Yrs faithfully

C. WYVILLE THOMSON

P.S. Can you readily send me by return the date when you got the shore-fishes and the date when you returned me the Mss? It has been suggested to me that these should be published in all cases and I did not think of it at the time.

C.W.T.

* This letter, unsigned and undated, but in the same hand as that of March 29, 1880, is apparently a first draft, GÜNTHER to THOMSON.

Bonsyde
 Linlithgow, N.B.
 October 1, 1880

Dear Sir:

I have forwarded your note to Dr. Sclater* and see no reason why you should not enter the birds in your forthcoming volumes.

The Pteropods are not even commenced. They are not so numerous as might be expected in the Collection and, as they are greatly scattered on slides and in bottles of tow-net matter, it will be some time before they are ready. We must get through with the *bigger* things first.

You will get probably tomorrow or next day, a lot of fishes from the deep water off the Faroes (?) some of the spoils of the *Knight-Errant*.† I will be greatly obliged to you if you will simply add them to the Challenger things . . . (?) That is look them over keep what you require for the Brit: Mus: and return us the remainder named. Only it would be a great favour if you would keep this lot separate, send us a specimen of all of those of which there are two in the same condition, and let me have a separate short report on them for a paper on the Faroe Channel which I am going to read at the R.S.E.

You will get lots of things in other departments by degrees from the same cruise, but I am having them all named and worked up with the Challenger things in the mean time.

Yrs faithfully,
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow, N.B.
 October 25, 1880

Dear Dr. Günther:

Dr. Sclater promises to send you the birds as soon as possible after his return home.

I am looking out most anxiously for the plates of the deep-sea fishes. They are now pressing me to finish my work on the Collections and leaving such a crush of printing for the end that I hardly see how I can manage it.

I would prefer having, as in other Memoirs, the name of the Fish only on the plate. I would especially rather not have the depth—for although of course the depth of the sounding is given in the station for the Fish, we can seldom be absolutely sure that the fish actually came from that depth—particularly in the case of using the trawl.

Yrs faithfully,
 C. WYVILLE THOMSON

‡The bathybial Fish-fauna which surrounds the British Islands was hitherto almost unknown. Beside the stray specimens which now and then were found thrown ashore or floating on the surface no further evidence of the existence of this fauna was obtained, except on two occasions, viz. on a dredging-excursion of Dr. Gwyn-Jeffreys in 1867 from a depth of from 80 to 90 fathoms;* and during the cruise of H.M.S. Porcupine in 1869 from a depth of from 200 to 500 fathoms.†

*See Ann. & Mag. Nat. Hist. 1867, xx, p. 287.

†*Ibid.*, 1874, XIII, p. 138.

* See *Challenger Report* by P. L. SCLATER, Vol. 2 (Zool.), Pt. VIII, 1881.

† The cruise which led to the deliniation of Wyville Thomson ridge; see HERDMAN, p. 55, 1923.

‡ This letter, unsigned, undated, and much emended, is in the same hand as that of March 29 and the one identified by footnote *, p. 86, and is apparently another first draft, GÜNTHER to THOMSON.

Neither of these two contributions can compare as regards interest and number of specimens with the series obtained during the cruise of the "Knight-errant"; and it would seem as if now only the rich spoil which I ventured to indicate in 1867 as resulting from an exploration of the Deep Sea round the British Islands, were being gathered. Six out of the ten species obtained, are new to the British Fauna; and of course represent but a small fraction of the actual number of Brit. deep-sea fishes. Much, therefore, remains to be done. The laws which govern the bathymetrical distribution of Fishes, are still obscure; and it is evident that a series of continued methodical observations, such as can be made in a limited oceanic district like that round the Brit. Islds., whose hydrographic conditions with its surface and coast fauna are so well known, is most likely to reveal a chain of facts which cannot be recognized in disjointed observations made at distant localities. Besides, there are not a few obscure points in the life-history of our food-fishes which may be well expected to be cleared up by the deep-sea-dredge, such as the unaccountable disappearance from certain parts of the coast of fishes like the Haddock, the change of habitat of many fishes according to the season, a change which evidently much more frequently takes place in a vertical than horizontal direction, etc. It is therefore to be hoped that the present successful expedition will be followed by equally well conducted efforts.

The collection submitted to my examination contains a much greater proportion of arctic forms, than of southern; and in this respect differs entirely from that made by Mr. Gwynn-Jeffreys at a less depth. The only southern form is *Haloporphyrus lepidion* which we knew previously from the Mediterranean and Japan. Singularly, again, no trace of a *Trachypterus* or *Regalecus* was obtained; and we can account for their absence only by the supposition that it is difficult to enclose these long snake-like fishes in the dredge, and that young specimens from their extreme delicacy of structure are probably torn into fragments or lost long before the net reaches the surface. Some of the species have been previously obtained by the Scandinavian Expeditions in similar latitudes. As all the species will be fully referred to or described in my Report on the "Challenger" Deep-sea-fishes, only a few notes on them are appended here.

Bonsyde
 Linlithgow, N.B.
 Oct. 26, 1880

Dear Dr. Günther:

I had written you a note just the post before I got yrs. I am very much obliged to you for the report and greatly pleased that the fishes have interested you so much. I have been long looking forward to a careful overhaul of the Faroe Channel, and I have every hope that we may have another investigation this next summer under more favourable conditions.

So far as this years work is concerned I am at liberty to ask you to make what use you choose of the duplicity which I have much pleasure in doing (?)—only send me back what you can spare

Yrs faithfully,
 C. WYVILLE THOMSON

Nov. 1st (?)—no address

Dear Dr. Günther:

I have just received a list signed by you from Mr. Moseley. You will exercise your own discretion in selecting the Brit: Mus: set. Of course my prime object is to make that as complete as possible, but, that done, it would be a convenience for (me) to have as many species here for comparison as I can get.

I have a note from Dr. Sclater that he has handed over or is about to do so, the birds. I suppose you will send me a list. I expect to send off the Pennatulida the end of the week.

For some whale bones and seal bones you will have to wait till the part on the bottom deposit is finished. I am *anxiously* looking for the deep-sea fishes.

This is a most laborious job!

Yours faithfully
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow
 Nov. 2, 1880

Dear Dr. Günther:

From having heard nothing from you with regard to the Corals of the *Challenger* Expedition I suppose I am right in concluding that you have not received them yet from Mr. Moseley. As some difficulties have arisen in this department I have asked Mr. Moseley, to avoid any further complications, to send *the whole collection*, the type specimens, the second selected set, and the duplicates to you. I will be very much obliged to you if you will kindly select the first set according to the instructions sanctioned by the Treasury—and return the rest to me.

I am sorry to give you this trouble—but this is I think the only case. I will send you in the course of a few days the Ostracoda and the Pennatulida. I mean in all cases to send the specimens to the Museum as soon as possible after the Memoirs are published. It would be scarcely fair to do so much before.

I have been reading your book on Fishes with much pleasure, and I think I know more about them than I did before. It is a resumé which was much wanted.

Yrs. faithfully
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow, N.B.
 December 17, 1880

Dear Dr. Günther:

I know pretty well all about the advantages of complete collections for reference. I am only very glad that so much attention is now being paid to these minute (?) groups in the B.M.

My great object has been to make the collection from the "Challenger" in all branches in the National Collection as perfect as possible. Beyond a certain point I cannot force this but I will do the best I can.

Believe me yrs faithfully

C. WYVILLE THOMSON

P.S. I will send you today the whole of the remaining material returned by Dr. Brady as duplicates. I forwarded your letter and list to Dr. Brady.*

Bonsyde
 Linlithgow, N.B.
 January 16, 1881

Dear Dr. Günther:

It has been suggested to me that perhaps I ought to have let you know that it was in my power to offer a moderate honorarium for literary work in connection with the Challenger Report. To tell the truth I had some delicacy in doing so remembering the strong representation which the Brit. Mus. officers made on that matter to government. I do not see however that preparing such a report, especially as I distinctly objected to its being in the form of a Brit. Mus. catalogue, could be considered a part of your regular work.

If you desire it I will send in an account for the sum to which you are entitled under my instructions.

Will you very kindly let me know how the Deep-sea Fishes stand.

Yours sincerely
 C. WYVILLE THOMSON

* Either G. STEWARDSON BRADY on the Copepoda (*Challenger* Report, Vol. 8 (Zool.), Pt. XXIII, 1884) or HENRY BOWMAN BRADY on the Foraminifera (*Challenger* Report, Vol. 9 (Zool.), Pt. XXII, 1884).

Bonsyde
 Linlithgow, N.B.
 February 11, 1881

Dear Dr. Günther:

I am extremely sorry to hear that you are still on the sick list. I hope you will shortly be in condition to resume your work with comfort again. As to future arrangements I will be glad to meet your wishes in every way, as far as I can.

Yrs faithfully
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow, N.B.
 March 1, 1881

Dear Dr. Günther:

Let me introduce to you my Secretary Dr. W. A. Herdman, F.Z.S.—from whom I think you have heard from time to time.

I will be very much obliged to you if you will let him overhaul your *Ascidians*. He is doing ours and I know that he is thoroughly up to them. If you can help him in any way you will do me a great favour. Also on all "Challenger" matters talk to him as to myself.

I sincerely hope that you are now all right again. I hope to be in Town in about a fortnight or so.

Yrs faithfully
 C. WYVILLE THOMSON

Bonsyde
 Linlithgow
 December 4, 1881

Dear Dr. Günther:

I am getting very anxious about your paper on the deep-sea Fishes and would be very glad to see some of the work. Both the Royal Society and the Treasury are expressing some impatience and I may be landed in difficulties if some of the promised memoirs are much longer delayed.

I would be greatly obliged to you also if you would send me a receipt for the Echinoidea sent by Agassiz according to his Memoir.

There are several other Memoirs which will be ready for delivery shortly.

Believe me
 Yrs faithfully
 C. WYVILLE THOMSON

MURRAY (1895) speaks of the fact that the *Challenger* Reports cover ". . . about twenty-nine thousand five hundred pages, illustrated by over three thousand lithographic plates, copper plates, charts, maps, and diagrams, together with a very large number of wood-cuts". He goes on to say, "From beginning to end the history of the Challenger Expedition is simply a record of continuous and diligent work". In a sense it is just that. But who, most of all, had the perspective and pertinacity to initiate this first real study in deep-sea research? If THOMSON were alive today, it is fair to speculate that he would be astounded at the developments in oceanography since 1879. His was an unusually broad, inquiring mind—to which his writings and editing testify abundantly; his was the imagination that resulted in the *Challenger* Expedition; and his was the guiding hand that led to the foundation of the modern science of oceanography. In mute testimony, his name appears on the title page of

all *Challenger* volumes—whether produced before or after his death—"Prepared under the Superintendence of (the late) Sir C. WYVILLE THOMSON, Knt., F.R.S., &c. Regius Professor of Natural History in the University of Edinburgh, Director of the Civilian Scientific Staff on Board".

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