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SIR C. WYVILLE THOMSON'S LETTERS TO STAFF-COMMANDER
THOMAS H. TIZARD, 1877-1881

By

DANIEL AND MARY MERRIMAN

*Bingham Oceanographic Laboratory
Yale University, New Haven, Connecticut*

ABSTRACT

These original letters from Thomson to Tizard are concerned with the publication of the results of the CHALLENGER Expedition, as well as the study of the Faroe Channel and the eventual delineation of the Wyville Thomson Ridge with its diversity of "cold and warm area" bottom fauna. They also provide evidence of Thomson's indefatigability as well as certain historical sidelights.

INTRODUCTION

Quite by chance, Sir Henry Tizard, whom we had never met, spent the night of 6 November 1951 in the Fellows' guest suite of Davenport College, Yale University. At breakfast in the Master's House the next morning we talked about the history of oceanography in the second half of the 19th century—in detail about the voyage of H. M. S. CHALLENGER, Sir Charles Wyville Thomson, Sir John Murray, and other pertinent matters which had interested us as an avocation over the past three or four years. After some time Sir Henry queried, "Does my name mean anything to you?" We replied that the only other Tizard we knew about was the one of CHALLENGER, KNIGHT ERRANT, and TRITON fame in oceanographic work of the 1870's and early 1880's. "My father," announced Sir Henry.

He then stated that he was quite sure he had some original letters from Wyville Thomson to his father. It was disappointing to learn some months later that he had not been able to find them. On 2 September 1957 we were Sir Henry's guests for lunch at *The Athenæum*. Three weeks later he wrote, "Another hunt has brought to light about 50 letters from Wyville Thomson to my father. They had been put away many years ago so carefully and methodically that I couldn't find them for a long time!" Most graciously, and with apprehension, he sent 52 such letters across the Atlantic. Nineteen

of them, the most interesting, form the basis of this article. Writing about Thomson's long-hand letters, Sir Henry noted, "I shudder to think of the trouble you will have in deciphering them!" As indicated in earlier writings on this subject (1), Sir Wyville's hand is most unhappy. We herewith acknowledge our great gratitude to Sir Henry Tizard and his family¹.

THE BACKGROUND

Her Majesty's ship CHALLENGER returned to England on 24 May 1876 from the last leg of her three-and-a-half year voyage around the world (2). In the course of traversing a track of 68,930 miles she had occupied 362 oceanographic stations. As Huxley pointed out at a dinner in honor of the CHALLENGER staff in Edinburgh on 7 July 1876, "... the peculiarity of the *Challenger* Expedition was that in her case the cruise became secondary and the scientific object primary; that she was, in fact, fitted up and instructed with the view of obtaining certain scientific data which were requisite for the further progress of natural knowledge. In her case the duty of geographical exploration was reduced to *nil*, and the duty of scientific investigation had become paramount" (3).

In the summer of 1876 Sir Charles Wyville Thomson, who had been Director of the Civilian Scientific Staff of the CHALLENGER during her entire voyage, was instructed by Her Majesty's Government "to prepare a detailed Report on the scientific results of the expedition" (4). Actually Thomson is at some pains to show that he never would have undertaken the scientific direction in the field without an understanding that he would have charge of "the working out of the results in the department under my direction"; on this subject as well as on the planning for the disposition of specimens, estimated costs, *etc.*, there was considerable correspondence between Thomson and the Admiralty² in 1874 and 1875 while the CHALLENGER was in midvoyage (5). Subsequently, in September 1876, arrangements for publication and "disposal of collections" were transferred from the Admiralty to the Treasury, and the CHALLENGER Expedition Commission under Thomson's direction was established in Edinburgh. It was mainly the work of getting under way the *Challenger Report* (which resulted in the 50

¹ 23 August 1855 - 8 October 1959.

² Specifically with the Hydrographer, Capt. Frederick Evans, and with the Secretary, Admiral Robert Hall.

large royal quarto volumes [6] that form the main outlines of modern oceanography) as well as the resumption of his duties as Regius Professor of Natural History at the University of Edinburgh that occupied Thomson for the next five years; in the latter part of 1881 he was forced to resign his educational duties because of ill health (7). He died on 10 March 1882 in Linlithgow, where he had been born 52 years before, almost to the day.

The Navy List for April 1873 (8) shows that Thomas Henry Tizard was Navigating Lieutenant aboard the *CHALLENGER* during her oceanographic voyage, but in the Report he is consistently referred to as Staff-Commander. There is abundant testimony as to his skill as navigator, surveyor, and scientific observer, as well as to the respect in which he was held by all hands—see, for example, Swire (9), Spry (10), and the Admiralty Digests in the Public Record Office in London. Under Captain George S. Nares (1872-'74) and then under Captain Frank T. Thomson (1875-'76), he had charge of the hydrographic, magnetic (with Commander J. F. L. P. Maclear), and meteorological work; indeed, he contributed major sections to the *Challenger Report* (11) (12). He was later Captain of the *KNIGHT ERRANT* (1880) and *TRITON* (1882) on expeditions to the Faroe Channel with Sir John Murray³ to survey and study the bottom fauna on the two sides of the Wyville Thomson Ridge (see below). Captain Tizard and Sir Wyville became close friends; the letters here printed contain more intimacies than most we have seen.

THE LETTERS

This correspondence deals chiefly with two matters: the preparation and publication of the early *CHALLENGER* volumes and the exploration of the Faroe Channel. It is, to the best of our ability, arranged in chronological order.

Bonsyde
Linlithgow, N.B.
July 16th

My dear Tizard,

I should have written you long ago to thank you for your kindly sending me the article from the *Standard*, which was certainly more pleasant than some other newspaper articles have been lately. I have been waiting however from day to day for instructions from the Treasury & the Stationery Office, & they have come in some shape at last. I scarcely know whether

³ Young naturalist on the *CHALLENGER*, and successor to Wyville Thomson in the direction of the work of the *CHALLENGER* Office in Edinburgh, which he completed in 1895.

they are satisfactory or not. In the first place the Treasury say that all printing & all engraving, and all such work must come through the Stationery Office, and if that order is pushed to the extreme it will put off an enormous amount of time. In the second place they inform me that all costs for printing, engraving, paper etc., etc., of that kind are not included in my grant of £ 4000 a year, which is meant purely for the Scientific work. That is a great relief.

My next move must be to get a full explanation from the Stationery Office. I am given to understand however that they will sanction and pay any reasonable & economical way of doing what is evidently necessary.

There is a rule at the Stationery Office that the whole mss: of any volume must be sent in before it is printed. I wrote that I thought there would be no difficulty about that if they chose to pay the printing—and if they printed Vol 2 before Vol 1. We shall however evidently require to send in the whole mss of Vol 2 at once, and they do not want it until the new contract in Scotland begins—that is till about October or November.

Will you, before you go off, let me know in a form which I can put to the Stationery Office how many plates & charts will be needed for the first two Vols and how you propose getting them done and what would be the probable expense.

I have not yet gone over fully the charts. It seems to me that they are all right. I will send them back to you in a day or two.

The instruments arrived this morning. Tait has gone over to St Andrews but he will be back in a few days to a meeting of Science Faculty and we will then tackle the question. The instruments are all right I should think, but I have not unpacked them.

What we have to do then seems to me to put the 2d Vol completely into form in the first place, and to ask instructions from the Stationery Office what is to be done with it—to send in to the Stationery Office a detailed statement of the number of Charts & plates we require for the first two Vols and the way we propose to get them done and the probable expense. If you will give me material for this latter I will see it carried through—Charts—and temperature sections—and any plates of curves which may be useful in generalizing any of the observations magnetic, or meteorological.

I shall not be in London unless there is some special reason for it until the last week of August at soonest. I shall be abroad in the first half of September & after that at work either in London or here. So it will suit capitally for you to take your outing now.

Towards the end of September if the second Vol is ready you might run down here perhaps & we could set the printers to work & settle about type & form.

Lady Thomson & Miss Dawson send their kind remembrances. Miss Dawson says she has a debt to pay you, which she incurred on the Hopeton Hunt, when you come back. I saw Jock Murray in great form today. He is expecting Campbell down & they are coming out to us for a day.

Yours vvyty

C. Wyville Thomson

The reference to the Treasury helps to fix the year of this letter as 1877 (p. 348). Sir Wyville may have "been waiting from day to day for instructions", but he was certainly keeping himself occupied⁴. Moreover, he had indicated in a letter from Valparaiso as long before as 22 November 1875 that it would take a full year with staff after landing to get " . . . the collections roughly arranged and put into a condition for distribution to experts, on the 1st May 1877, but not before that date" (5).

The reference to his grant of £ 4000 a year also harks back to his letter from Valparaiso (xi.22.'75) in which he states, "I do not think that the account of the voyage could be fully published and the whole matter closed in less than five years⁵ from the 1st of May 1877. During these five years the expenses might be estimated at £ 4000 a year, one year with another, supposing the printing to be done at the Government printing-office" (5).

In the third paragraph of the letter dated 16 July, Thomson refers to ". . . printing Vol 2 before Vol 1." These volumes form the narrative of the voyage; the second, consisting of the *Magnetical and Meteorological Results* (12), appeared in 1882, while the first, dealing with the *Narrative and General Account of the Scientific Results of the Expedition* (11), did not appear until 1885. Actually the first *CHALLENGER* volume that appeared was in the *Zoology* series in 1880 (4); it was succeeded by five others in the years 1881 and 1882.

The instruments in the sixth paragraph are the *CHALLENGER* thermometers; P. G. Tait, Professor of Natural Philosophy at Edinburgh, worked on the possible error introduced by the effect of pressure in the deep-sea temperature readings taken on the expedition (20) (see letter of 4 December 1877 and accompanying annotation).

Later Thomson speaks of going abroad in September—the oc-

⁴ In September 1876 at Glasgow Thomson "shared 'lionship' . . . (his) address on the Results o (*sic*) the *CHALLENGER* Expedition was very successful" (13). He lectured at the Birmingham and Midland Institute on 12 March 1877 (14); also in Glasgow on 23 November 1876 "On the Conditions of the Antarctic" (15). He received a Royal (Society) Medal on 30 November (16), and on the same day he was made a member of the Council of the Royal Society of Edinburgh (17). He gave the Rede Lecture in the Senate-house at Cambridge on 25 May (18), and in the University of Edinburgh "session 1876-1877 (his) lectures were attended by upwards of 400 students" (19).

⁵ It took 17½ years.

casation when he went to the tercentenary of Uppsala as a representative of the University of Edinburgh, and when he was created a Knight of the Royal Order of the Polar Star by the King of Sweden (21) (22). Earlier in the summer he had received the degree of Doctor of Philosophy, *Honoris causa*, at the University of Jena (23). The original diploma⁶, at the Department of Zoology, The Ashworth Laboratory, University of Edinburgh, appears to be signed on the right margin by Ernst Haeckel⁷ and bears, in long-hand underneath, the date 27 July 1877. It seems that Thomson took the degree *in absentia*.

In the final paragraph Sir Wyville speaks of Lady Thomson and Miss Dawson. Lady Thomson's younger sister was Frances, undoubtedly the Miss Dawson referred to above. Jock Murray is of course Sir John Murray. Campbell is Sub-Lieutenant Lord George Campbell, son of the Duke of Argyll, author of a popular book, "Log Letters from the *Challenger*"—not originally written for publication, but for which purpose he rounded "off only the most ear-breaking angularities" (25).

Bonsyde
Linlithgow
August 17th

My dear Tizard,

I hope you had better weather for your holiday than we have been getting here. We have had one fine day during the last six weeks. At least I am told there was one, for I happened to be in London at the time.

I ran up for a few hours and saw the Treasury and Stationery Office people and had a long talk with them, and on my return I wrote a letter, to which I got the inclosed reply. Please read it & note its contents & send it back to me.

There is no objection to our following the plan we propose. I would rather not suggest that part of the printing be done in London. It seems to me better to keep it all together in one job with the same types & the same style, and we can easily send the Tables by post for correction. There is no objection to the second vol being commenced within a couple of months. Neill & Co are enlarging their premises & would rather not begin for a little.

⁶ The gift of Mrs. Andrew A. N. Buchanan, niece of Frank Thomson, Sir Wyville's and Lady Thomson's only child.

⁷ The author of four contributions to the *Challenger Report*; among these the Radiolaria (24) is perhaps the most famous of the CHALLENGER volumes—two parts text (2155 pp.), one part plates (140 and one map). Haeckel was clearly responsible for Thomson's honorary degree at Jena.

The engraving will be put as you see into Mr. Maltby's (*sic*) hands. Perhaps you would see him & find out what he thinks of stone versus copper. Let us have the clearest and best method. . . .

Could you, do you think, during the next fortnight or so get some notion of the order of the second volume, & get the first part of it into sufficient shape to have a sample sheet printed. I am going off for a run on Friday next. To Upsala and perhaps on to Munich. I have to make some arrangements about the the (*sic*) Crustacea etc. with one or two people. I cannot depend upon being back much within a month. I send you back the charts & diagram.

Yours vy ty

C. Wyville Thomson.

This letter was also written in 1877, since he refers to Uppsala in the last paragraph (see above). In the third paragraph mention is made of Neill & Co., an Edinburgh printing firm which apparently got the contract; the CHALLENGER volumes all read PRINTED FOR HER MAJESTY'S STATIONERY OFFICE on one page and PRINTED BY NEILL AND COMPANY, EDINBURGH on the next. Later, comment is made about engraving and "Mr. Maltby", which Thomson often misspelled for Malby; examination of early and late volumes of the *Challenger Report* shows that the charts and diagrams were engraved by Malby & Sons on copper. There is a note, presumably Tizard's, on the back of this letter which says: "Suggested to Sir W. T. that some plates should be engraved on copper & some on stone as appears to be most suitable in consultation with Mr. Malby."

University
Edinburgh
Nov. 12th

My dear Tizard,

Many thanks—I will send back the plans in a few days, but it will take a while to go over the letter-press & beside I suppose I should do so with a view of combining all I have to say.

The printers are going on with the 2d vol but it takes a lot of correcting before they get into the way of setting up the tables.

I have heard nothing more from your friend the photographer and he has a lot of the most valuable of the Challenger negatives. I must try & get them back somehow through the Stereoscopic Co. or otherwise. The last thing I heard of Thorpe was getting my own set utterly bedevilled & being told that proofs of the others would be sent immediately. I hope nothing has befallen the plates.

I have been thinking over the beginning of the first chapter but I have not had time yet to get it into shape. I have to correspond with about

forty people as to the details of the Nat Hist work and also with the Stationery Office & the Treasury. Through the marvellous arragmts of the latter two, I have usually to write to the rest that I have "no authority" to authorize them to do anything! So I do not exactly see how I am to get on.

With kind regards in which my wife & Miss D. join.

Believe me

Yrs vy tly

C. Wyville Thomson

P.S. Tell me when next you write what appntmt Nares has got & when he leaves. I had a note from him some little time ago but he said nothing about it.

From its contents, this letter was almost certainly written in 1877. The *Challenger Report* was still in its initial stage, and a letter dated 15 February (no doubt in 1878, see below) contains further acid comments on the CHALLENGER negatives.

The art of photography was still in its early days in this period, the first successful daguerreotype having been taken only 40 years before Thomson wrote this letter (26); but the Narrative contains 35 photographic reproductions. The original CHALLENGER negatives—some 456 in number—are still preserved in the John Murray Room at the British Museum of Natural History.

The postscript refers to Sir George S. Nares, K.C.B., F.R.S., ". . . under whose direction the whole system of observation was carried out during the first two years of the voyage" (27; also see above).

Dec. 4th.

My dear Tizard,

I like the sketch charts very much. They will of course look better when they are more filled up. The account of Kerguelen Island & the South also seems all that can be desired from your point of view. I have not had time yet to consider fully how your notes are to be incorporated with the other matters. I do not see any great difficulty however. I have been going carefully over the Southern work again and writing my notions about the Southern ice—like you. I wonder if we shall agree.

I suppose you saw the lecture I gave last winter in Glasgow on it—in 'Nature'.

Some more experiments have been made on the Thermometers and although we have not . . . to the bottom of the business, one thing is certain that we had no right to apply the correction we did. Some error may creep in through pressure of the portion of the tube below the bulb & above the mercury but such error must be very slight. We are making preparations for experiments on a large scale to test this and I hope to be able to give you

some results ere long. Now the question is what we are to do about the Temperature Tables. There seems no doubt that the former corrections must be cancelled however much trouble this may take. The only doubt is whether we should wait to see whether they should be replaced by another correction on another principle. I think myself that this is unnecessary. The correction if there be one must be infinitesimal—quite within the limits of error of observation. It might be mentioned that there is such a slight correction but I think it would be nonsense to put it in throughout and that the pressure error should be left out & the calibration error only needed. I suppose this will give an awful amount of bother but the only plan seems to be to tackle it at once. I am still in difficulty with the Stationery Office about the plates & printing etc., etc. but I have some hopes of being allowed to go on smoothly in the course of a week.

Believe me

Yrs vyty

C. Wyville Thomson

This letter was written in 1877; the lecture he gave in Glasgow was on 23 November 1876 (15).

Tait's writings on the pressure errors of the CHALLENGER thermometers are extensive (28, 29, 30, 31, and 20). Thomson had been told by Captain J. E. Davis of the Admiralty to apply a correction of at least half a degree F. heating for every mile of depth. Tait wrote (20):

Half-a-degree Fahrenheit per mile of depth may seem to be a matter of very little consequence; but when we recollect that some of the Challenger soundings were made at depths nearly approaching six miles, we find that we have sometimes to deal with a correction of 3° F., enough to modify seriously our theories of ocean circulation. For it can never be too strongly impressed on the student of science that there is no such thing as greatness or smallness in itself; what is very small relatively to one class of quantities may be very great relatively to another and different one. All the temperature differences, except near the surface of the sea, though important in their consequences, are very small relatively to differences of temperature in the atmosphere; but, just because they are so small, small errors in the determination of their values are important:—thus it was imperative to decide whether the corrections assigned by Captain Davis are necessary.

Tait concluded after much experimentation that "if the Challenger thermometers had had no aneurisms, the amount of correction . . . would have been somewhat less than 0.05° F. . . for every mile of depth. All the [Challenger] thermometers which have large aneurisms have had special calculations made for them, but in no case does

the correction to be applied to the minimum index exceed 0.14° or about $\frac{1}{4}$ th of a degree per mile of depth." Sir Wyville's comment that "The correction if there be one must be infinitesimal" seems to have been reasonably accurate. Murray (32, Part III-Introduction) wrote: "These temperatures were plotted on the squares, as represented on each Plate, by Staff-Commander Tizard, R.N., simply as observed and corrected for instrumental errors." No correction for pressure appears to have been included in the *Challenger Reports*.

Edin. Jan 19th

My dear Tizard,

I send you Buchanan's 'Laboratory Book' with all the Specific Gravities corrected. I do not know what you intend by the 'Results he sent to the Royal Society'. If you mean the gas determinations I have not got them. The only thing I have is a short notice in one of the late numbers of Nature. (some months ago now).

Yours vy ty

C. Wyville Thomson

This letter was written in 1878. J. Y. Buchanan, chemist and physicist on the CHALLENGER (11), published a short article in *Nature* (33), 26 July 1877, which discusses the amount of oxygen at different depths. Thomson, at the writing of this letter, had apparently not seen *Nature* (34) for 27 December 1877, in which Buchanan crossed swords with Sir Wyville and defended his position "that between 200 and 400 fathoms there is a great consumption of oxygen going on, and, as it is difficult to conceive its being consumed otherwise than by living creatures, the conclusion is forced on us that animal life must be particularly abundant and active at this depth."

Bonsyde

Linlithgow, N.B.

Feby 15th

My dear Tizard,

I have not yet got any intimation of your departure for the Golden Horn so I suppose you are still all right.

We here have no faith in war. We are just as sure that the cloud will blow over as we are sure of anything, but that may be overconfidence.

There are two little matters I want to ask you about. 1st. Do you remember on what data you gave me the approximation in my book to the equivalents of velocity & pressure of the wind? I forget. You remember you gave me the material for a scale, and I have been asked where it came from. Can you recall the circumstances? 2d. About Mr. Thorpe—about a year

ago I sent him a box of Challenger negatives. Most unluckily some of value as they were from the Admiralty Islands. I at the same time sent him a set to mount for me which he botched. I have written to him twice about them once & last a fortnight ago asking him to return the negatives, if he has done nothing with them but there has been no answer. What shall I do? I have no doubt that the Stereoscopic Co. will say that they are not responsible, and I fear the photos are lost. It is very provoking. Do you ever see the man? Or has he gone into forced retreat somewhere?

The printing is getting on woefully slowly. I hope there is some little chance of a spurt shortly.

Ever trly ys

C. Wyville Thomson

This letter was also written in 1878. The Golden Horn, an inlet of the Bosphorus, as used here is synonymous with Constantinople (now Istanbul). Turkish resistance to the Russians had failed fast in December 1877; British interests now became sufficiently involved so that Parliament was summoned before the usual time, on 17 January 1878. The fleet was then ordered into the Sea of Marmora (35).

Bonsyde

Linlithgow, N.B.

March 3^d

My dear Tizard,

I should have answered your note sooner but had to think the matter over. Certainly the map should not be over crowded and I think the points we require most are

- 1 depth, may I think be done by tints, and contour lines, so we are relieved of that.
2. Nature of the bottom must go in for every station.
- 3 Number of station, must go in.
- 4 Surface-water movement (surface current) ought to go in as far as possible.
5. Temperatures. The surface temperature should be given when there is room I think, and here & there where the stations are close, and the bottom temperature in like manner, with some distinguishing kind of type or bracket. I think that is about all we can have except the line of drift ice & a dotted line for the extent of gulf weed.

About the bottom temperatures. In the tables you have prepared you stop at 1500 fathoms. There are several points about the tables & temperatures which I think we had better talk over. Can you arrange to run down here for a week or two—say about the first week of April? We hope to have something like spring weather then and I hope to be strong enough for a reasonable amount of work . . .

Yrs vy ty

C. Wyville Thomson

This letter was quite certainly written in 1878; in content it fits well with the preceding and succeeding letters whose dates are definitely established. The invitation from Thomson to Tizard to visit him in Scotland is only one of a number that have come to our attention. Thomson's hoping "to be strong enough for a reasonable amount of work" would seem to indicate that Sir Wyville had been sick—one of the earlier of a series of recurring bouts of illness which were to plague him for the balance of his life.

April 29th
1878

My dear Tizard,

I hope you get the Mss all right. The magnetic work is taking an enormous amount of time. If we get on no faster than we are going now I do not see when we can expect to be finished. The delay is partly with the printers and chiefly at the Hydrographic Office. We are not half through yet. I think it might be well for you in case of accidents to send me the Meteorological work with titles, etc. all ready for the printer and at the same time to send me some notes as to how & where you wish to arrange the accounts of the instruments, methods etc. In fact you might send a rough 'contents' of the 1st & 2^d Volumes according to your notion & we can see whether any question arises.

It is certainly safer to put in the temperatures uncorrected. Have you gone into the question of the history of Thermometers? I have heard nothing further about Maltby's (*sic*) account. It will be all right however. I do not expect any strain on the finances this year. I earnestly hope that there may be no "service to the East", but things do not seem to be looking better.

My wife & Miss Dawson unite with me in kind regards.

Believe me
Yours vy tly
C. Wyville Thomson

This is one of the few letters in this correspondence which is fully dated. The "service to the East" is of course a further reference to the crisis that led to the Congress of Berlin (see letter of 15 February 1878).

Bonsyde
Linlithgow, N.B.
Sunday

My dear Tizard,

I think it would be far better for all the difference in price to do the sections on copper

I have not had time yet even to look at the Temperature Chapter & the account of the thermometers. I will do so however as soon as I can &

let you know what I think of the line you have taken. I have very decided opinions myself on the subject. I think the Instrument makers deserve very little credit. The ideas are not theirs and the instruments are as a rule very carelessly made! I will go carefully over these weather charts & see which will answer my purpose best, and then we can see about the corrections. There are only three or four I think which will be needed.

I am very sorry that you have not got the arrangement made at the Admiralty which you wished. At all events I hope you will not go off before the 1st Vol is put into shape.

I have like a fool arranged to give the address to the Geographical Section this year and it is hanging round my neck like a millstone. With kind regards

Yours vy ty

C. Wyville Thomson

This letter was certainly written in 1878, probably in June or July. The 27 June 1878 issue of *Nature* (36) announced that at the Forty-eighth Annual Meeting of the British Association, which was held in Dublin in August of that year, Thomson would be President of the Geography section. And the 22 August issue (37) carried in full the address which had been hanging round his neck like a millstone. Sir Wyville frequently complained to his intimates about the preparation of lectures; it is apparent that he was at great pains to have them as perfect as possible.

During these same meetings the honorary degree of LL.D. was conferred on Thomson at Trinity College (38). Dr. Webb, Regius Professor of Laws, presented him with the following citation (39):

*Praesento vobis Wyville C. T. Thomson,
equitem auratum, Neptuni Provocatorem.
Hic et Nereidum domos invasit, et ab
ipso Proteo arcana extorsit.*⁸

Edin

Sept 24th
1878

My dear Tizard,

I have been off duty & in the country for a short time—not very well—only a bit knocked up & now nearly all right again.

I am very sorry there is a chance of your leaving. I consider however that we are most fortunate in your having been with us so long. If you have to go I must simply combine your Hydrographic work with the rest of the general account as best I can. There was a little difficulty in fitting

⁸ "Knight, Challenger of Neptune. This man invaded the very home of the Nereids, and wrested from Proteus himself his secrets."

in the introductory notes about the Meteorology. I think it is all right now and you will probably get a proof tomorrow. In the mean time they are making progress with the Tables to the best of the power of the printers which does not seem to be great.

We are getting on however. A lot of information is coming in with regard to the fauna & to Chemical affairs

You saw I daresay the notice I gave of our progress at the Brit: Ass.:

I am not sure that our printing in Edinburgh was very wise. As it is I do not see how we can go on faster.

Believe me
Yrs vy try
C. Wyville Thomson

This fully dated letter and letters to follow continue to refer to his ill health. Tizard's leaving the Hydrographic Office for other duty is obviously a matter of deep concern to Thomson. The next to last paragraph must refer to an article in *Nature* for 12 September 1878, which says: "Some causes of delay have occurred, and there has been the regulation amount of friction inseparable from the working of a complicated piece of machinery, but my feeling is that on the whole things are going on wonderfully well" (40).

Bonsyde
Linlithgow, N.B.
Sunday

My dear Tizard,

I need scarcely say that this severe illness putting a stop to all my work was a great shock to me & a source of great vexation.

I had not been quite right for some time. I doubt if I was careful enough in hot places. You may perhaps remember that at Cape York I had something like a slight sun stroke which laid me up for a day or two. I have never felt quite comfortable about the nape of the neck since. This may be the last of it. I am much better though the doctors still prescribe absolute rest. They say however that shortly I may commence again gently.

I scarcely remember precisely which of the illustrations you proposed to use. Many of Wilds sketches of animals will do for the naturalists but I fear the diagrams of temperatures etc. etc. will not do, and besides they are virtually repeated in the plans. I think you had better write & tell me your notion in brief. I have the wood-blocks absolutely at my disposal, so you can have what you require. The figures of the dredge & trawl & the water-bottles & other bits of apparatus will no doubt answer. They were carefully done.

I will see that you get a copy of the short book at all events.

I suppose I shall have to go abroad somewhere. The Nile I fear is too hot, but I must wait a little yet before doing anything. With best regards from all of us

Yrs very truly
C. Wyville Thomson

This letter was written in 1879, probably in either July or August. Herdman (7: 55, 56) says that Thomson had an attack of paralysis in June 1879. As vice president of the Royal Society of Edinburgh, Thomson was in the chair on 2 June (41). But the 19 June issue of *Nature* (42) states that he "was last week compelled, from sudden indisposition, to relinquish his course of lectures at the University of Edinburgh. . . . His large class of between 400 to 500 students has accordingly been entrusted to Prof. Alleyne Nicholson, of St. Andrews." A week later the same journal (43) reported, "It will be some time before he can attend to business letters. In the meantime all communications connected with *Challenger* matters should be addressed either to Mr. John Murray or his Secretary."

The "copy of the short book" may refer to Volume I (Zoology) of the *Challenger Reports* (4), published in 1880—the first of the entire lot to appear.

Nov. 28th 1879.
Bonsyde

My dear Tizard,

I think you rather misunderstood my question. I was perfectly aware that your work about the Specific Gravities had been arranged & was important but I had forgotten what it was precisely—and when I happened to notice the sp. g. columns in the 1st Table I got puzzled a little.

The form of these tables is I think excellent. I will have the additional sheets printed off. Since we have this material I have no doubt it ought to be published, but I confess I have a great doubt of the value of the greater part of it. I am glad to hear you say that you think the surface sp: gs: of so much value. I have spoken to several men who ought to know, and they thought them of no value whatever, depending on local accidents, chiefly weather (sun and rain) entirely, that is except in such cases as the South with the melting ice. If you have time I wish you would tell me a little in detail on what your conviction rests.

If we had no analyses of the waters the bottom and intermediate sp: gs would be of great value, and they are of some importance as it is.

Some of the deepest might be corrected for pressure. It would be interesting to know what the density of the water in which the deepest fishes live, really is.

It is fortunate that Buchanan has already written what I think is ample about the Hydrometers, for after some representation he made to the

Treasury, they sent me very sharp orders that he was not to be employed again. No use talking about this. I do not think he is up to much but it would have been very convenient if it had been possible to get him to finish up some things which no one who was not with us can do so well.

I wish I could get rightly at the first Volume. Of course my illness put me off a bit, but the main thing is the time it takes to get in the lists of the animals from the stations. I hope to have it well in hand however after Xmas, & to be a little stronger.

I think St Pauls Rocks look well. I shall have about 30 such plates. I will get you to come down if you can spare the time as soon as I see my way to go to press.

If the sp: gs: are correct what is the conceivable use of the columns about the immersion of the Hydrometers?

With kind regards.

Yrs vy truly

C. Wyville Thomson

P.S. I enclose one of the lists I got Wild to make out for me from Buchanan's books. I have the whole in this form. Those from the Atlantic are in my book.

Thomson's health was improved by late 1879; the 13 November issue of *Nature* (44) reports, "We are pleased to hear that Prof. Sir Wyville Thomson is now much better, and able to conduct the correspondence in connection with the *Challenger* work."

It appears that Tizard stayed on at the Hydrographic Office working on CHALLENGER material pretty well through 1879.

Buchanan, chemist and physicist of the CHALLENGER Expedition, was author of the resultant work on the specific gravity of samples of ocean water (45). Subsequently he became associated with the Prince of Monaco in the latter's extensive oceanographic explorations over the turn into the twentieth century.

In the post-script "my book" refers to Thomson's two volumes concerning the voyage of the CHALLENGER in the Atlantic (8); the matching work for the Pacific was never published.

Bonsyde

Linlithgow, N.B.

Dec. 19th

My dear Tizard,

I very heartily congratulate you on having got a berth which suits you so well. I am getting steadily better and I hope ere long to feel sure enough of myself to write to the Hydrographer about finishing up that very neat Hebridean point next summer. It should give us a nice pocket test for all those temperature questions.

I am not convinced yet that those extremely critical (?) determinations of surface sp. G. are other than a loss of time. They must be published however since we have them. I only roughly tested the thing once between Monte Video & Tristan. We ran that section in 18 days—9 fine & 9 wet. The mean of the surface Sp. G. on the wet days was something like 1.025-91 and on the dry 1.026-39. Now this being the case what can be the value of extreme accuracy & a figure in the fifth decimal place I fail to see! I see your reasons for putting in these columns. They may be of some use in connection with the behaviour of glass.

You have not sent me a blank sheet of the Table paper. If you have one you might send it.

I hope to see you here long before you have to go to sea. We all join in best regards and wish you a happy Xmas.

Yrs ever ty

C. W. Thomson

P.S. Will you give my kindest remembrances & best wishes of the season to the Hydrographer. Tell him that I mean to write to him very shortly but that it does not come quite easy to me yet.

References to Thomson's health, to Tizard's sea duty, and to the Hebridean point, date this letter in 1879.

This and the remaining letters, except the last, deal with the exploration of the Faroe Channel by Thomson, Tizard and John Murray. In the course of the LIGHTNING and PORCUPINE Expeditions under the direction of W. B. Carpenter, Gwyn Jeffries and Thomson in 1868 and 1869, contiguous areas having widely different temperature conditions were discovered in the deeper water between the northwest tip of Scotland (Cape Wrath) and the Faroe Islands (46). In 1869 Carpenter described this phenomenon as follows, "two very different Submarine Climates exist in the deep channel; a *minimum* temperature of 32° being registered in some parts of this channel, whilst in other parts of it, *at the same depths*, and *with the same surface-temperature* (never varying much from 52°) the *minimum* temperature registered was never lower than 46°, thus showing a difference of at least 14°" (47). In discussing this peculiar situation in 1872, Thomson wrote,

The cold water abuts against the warm—there is no barrier between them. What prevents the cold water from slipping, by virtue of its greater weight, under the warm water off the Butt of the Lews?⁹ It is quite evident that

⁹ The northern tip of the Hebrides.

there must be some force at work keeping the warm water in that particular position, or, if it be moving, compelling it to follow that particular course (48).

Eight years later he wrote (thinking now of the problem of the deep-water circulation of the great ocean basins),

... during the cruise of the *Challenger*, Staff-Commander Tizard and I had often in our minds the singular instance of contiguous areas of widely different temperature conditions which had been examined by Dr. Carpenter and myself (49).

Thomson had at first thought that the Faroe Channel phenomenon was

... an indraught of cold water, passing southwards from the Spitzbergen Sea, [which] was met at its mouth and banked in by the north-easterly extension of the Gulf Stream, forming along the line of contact and partial mixture a 'cold wall'. This view presented many difficulties, and on reconsidering the matter it now seemed certain that if our generalization with regard to the cause of great differences in bottom temperatures within short distances be correct, a submarine ridge rising to within about 200 fathoms of the surface must extend across the mouth of the channel between the coast of Scotland and the Faroe banks.

Hence his desire for a test of the very neat Hebridean point.

Wednesday

Morley's
Trafalgar Square

My dear Tizard,

I had a long talk with the Hydrographer today. He was fully up in the question and was personally most anxious to do everything in his power, but he said it was absolutely impossible for the present year at all events to arrange for any other vessel, or in fact to do anything which would have to appear on paper. As the result of a long chat this scheme was proposed—that you should take your Knight-Errant up to Stornoway during the good weather, and sound out the supposed ridge so far as you can with the resources of your ship and what assistance you can get. Murray would go with you with the necessary trawling gear—for now I come to the most tragical part of my story. The doctors put an absolute veto on my going any distance to sea without a surgeon on board, so I should have to stop at Stornoway & take a run out when I could get a chance.

It would certainly be of great importance that we get this bit of information this summer and on the principle of a half loaf being better than no bread I suppose we should do what we can.

The Hydrographer suggests that you should find out about the little engines of the Challenger launch & barge & apply for what you can discover—for your own sounding exigencies. We leave for home on Saturday probably.

Yrs vy tly
C. Wyville Thomson

Bonsyde
Linlithgow, N.B.
June 3d

My dear Tizard,

I will be ready for you any time about the middle of July which will suit you best. After I have made some further inquiries I will write in form to the Hydrographer.

The inquiries are in the direction of overcoming the engine difficulty. I would be very sorry to lose all chance of one or two hauls on each side of the ridge, and will not for the sake of a few pounds.

I wish you would write me a line for my use in writing to the Hydrographer—indicating the minimum scheme for the present summer. When I was in town the other day I pointed out to him the supposed line of the ridge, and suggested too that zigzagging across that for perhaps a fortnight of fine weather from about Cape Wrath to the Faroe Banks might answer our purpose. I suppose that is not far from it.

I will write to you again when I have more definite news about the engine. I suppose you have room to screw down or lash a small steam winch on the deck.

Yours vy ty
C. Wyville Thomson

These letters and the succeeding ones, until otherwise noted, were all written in 1880. Thomson wrote *in form* to the Hydrographer on 16 June, and his reference to not losing a chance of trawling on either side of the ridge¹⁰ for the sake of a few pounds is explained in his official letter of application: "As remarkable differences in the distribution of marine animals accompany these differences in temperature, I should greatly regret if we had not a few casts of the trawl on each side of the line, but any additional expense involved for this purpose I will gladly meet" (49). The letters that follow show Thomson's determination to get samples of the bottom fauna from the contiguous cold and warm areas; it

¹⁰ Note that he no longer calls it a "supposed" ridge; so certain was he, that hypothesis had practically turned into fact.

is evident that he was at some pains to install a donkey engine for this purpose on board the KNIGHT ERRANT, a ship "quite unsuitable for such work" (49).

Monday

My dear Tizard,

I am very glad that arrangements are so forward. We shall easily manage details I have no doubt.

1st as to the Engine. What is the tonnage of the Knight Errant? Is there space on her deck for an engine and boiler measuring 10 ft by about 3 ft 6, for if so I can get one easily. If not would there be any difficulty in connecting the main boiler with a small donkey engine? In either case I have no doubt the thing can be easily managed.

2 As to rope & gear, I have written to Admiral Richards about the wire dredging rope and will see to having some of it. In case of accidents however would they give us do you think a thousand fathoms or so of whale line?

3 What became of the dredges on board the Challenger? Could we not get some of them out of that? I have written to Plymouth to Heardon (?) for a couple of 10 ft beam trawls, ready for use, and if we can't get the old ones I will set to work at once and have some new dredges made. The dredge-bags are the great difficulty. I wish we had some of the old 'Challenger' ones. I will take care and not have a troublesome quantity of spirit Of course I look upon the dredging in this case as purely secondary.

4. I have plenty of thermometers and I am at present getting Tait to give me the exact pressure error of half a dozen of them. I have about 20.

The Hydrographer told me that he meant to send one of Sir W. Thomson's wire sounding affairs, so I have done nothing about that.

What I would like to ask for is a little additional dredging rope, and some of the old dredges with their bags. All the rest I think I can manage myself.

The strain will not be great at these small depths, but on hard ground there is always the chance of losing the dredge or trawl. I would like one or two of our large light dredges, as well as some small ones. Had we not better also get some of the water-bottles? I doubt if the results are worth much at these depths, but it would be well not to lose them.

Yours vy tly

C. Wyville Thomson

The "Sir W. Thomson" mentioned above is Lord Kelvin (1824-1907), British mathematician and physicist, professor at Glasgow; while known particularly for his studies in electricity, he is perhaps less well remembered for his part in laying the Atlantic cables (50) (51) and for devising a sounding apparatus.

Bonsyde
Linlithgow, N.B.
Monday

My dear Tizard,

I have written to Heardon (?) for two trawls, and I will do nothing about dredge ropes till I hear from Capt Evans. As to Hydrometers we have still those used by Buchanan on board the Challenger, and we have also his apparatus for boiling out the gases. I do not know if we can by any possibility perform that operation. I would like to have it done if possible, and I have sent Frank to Dr. Crum Brown to practice a bit. I am not sure that he is up to the work however.

Thanks many about the cots. Suppose you let me know by telegraph whenever you arrive and I will see you at once at Greenock. Say Saturday morning. I would not be sorry if you had to put off till the beginning of the next week for I shall have enough to do to get ready. At all events I will run through whenever you arrive & see how everything looks. Then you might come here for a day, if you could leave the Knight.

Yours vty
C. Wyville Thomson

"Frank" in this letter is Sir Wyville and Lady Thomson's only child, who subsequently entered the Indian Medical Service (52). Thomson, writing about the Faroe Channel cruise of the KNIGHT ERRANT, says, "... the civilians who accompanied Capt. Tizard were Mr. Murray, our indefatigable assistant Mr. Frederick Pearcey, with my son as a supernumerary" (49). Alexander Crum Brown is the well-known Scottish chemist of the period.

Bonsyde
Sunday

My dear Tizard,

The little chart seems in every way excellent. Your demand for a name for the ridge stumped us a little, but after a little hunting I have got a name which I think will do The "YMIR" ridge. "YMIR" was a giant of the Scandinavian Mythology who after his death was cut up into the earth & the sea, and the heavens but during his life he had the peculiarity of having one side always hot & the other side always cold, hence the propriety of the use of him as a God-father.

Did not we agree that it would be well to have another Table giving all the temperatures from 1500 fathoms to the bottom? I do not suppose that much importance goes with this but I suppose all the observations of all kinds should be printed.

So far as I see we have only the temperatures down to 1500 for the whole course and the bottom temperatures.

I am getting on with my work about the Faroe Channel and I hope to have it done by Xmas. Heavy snow Bar: 28.5 in.

Yrs vy ty

C. Wyville Thomson

You will get the chart back from Murray by next post if you have not got it already.

The cruise of the KNIGHT ERRANT was over, the ridge separating the cold and warm areas had been established, and Tizard and Murray were preparing to write their paper (46) on the subject—hence the request for a name (see below).

Sir Wyville had joined the ship at Oban on 22 July, had proceeded with her to Gairloch and thence to Stornoway; save for his return to the mainland this was Thomson's last sea voyage. He did not go with the KNIGHT ERRANT on her four traverses of the Faroe Channel between 24 July and 20 August, although he did remain at Stornoway to direct operations. Herdman (7) writes: "The results completely justified Sir Wyville Thomson's prediction, and showed that a ridge rising to within 300 fathoms of the surface runs from the N.W. of Scotland by the Island of Rona to the southern end of the Faroe fishing banks."¹¹

The dredging operations were not very successful, "owing to the boisterous weather and insufficiency of the vessel" (49). However, in the summer of 1882, after Thomson's death, Tizard and Murray undertook a further exploration of the area on H.M.S. TRITON, "which was very fruitful of zoological results." Thomson's concern about getting "... a few casts of the trawl on each side of the line ..." were more than borne out. "The warm area was found to have 216 species, while the cold had 217, and of these only 48 species were common to both ... a notable example of the effect of the environment on the distribution of marine forms of life" (7).

Thomson's suggested name for the ridge is most apt. Carlyle in 1840 wrote as follows: "The Gods, having got the Giant Ymer slain, a Giant made by 'warm wind,' and much confused work, out of the conflict of Frost and Fire,—determined on constructing a world

¹¹ There is a nice modern account of the hydrography of the Faroe Channel by Tait (53).

with him. His blood made the Sea; his flesh was the Land, the Rocks his bones; of his eyebrows they formed Asgard their Gods'-dwelling; his skull was the great blue vault of Immensity, and the brains of it became the Clouds. What a Hyper-Brobdignagian business!" (54).¹² Despite the propriety of Ymir as a name, Tizard and Murray (46), in a paper communicated on 15 May 1882 to the Royal Society of Edinburgh, chose to call the submarine elevation Wyville Thomson Ridge—the name it bears to this day (53).

Bonsyde
Linlithgow, N.B.
Dec. 1st 1881

My dear Tizard

In the first place let me congratulate you heartily on the cause of your visit to London & pray give my respects to Mrs. Tizard whose acquaintance I hope to make later on.

Next I do not quite see why Mr. Malby has changed his plan. I was just going to write you about this chart, for now that I have given up other work I need the sheet very shortly. Only I think it might be done in this way. Let Malby cast off say 20 copies Let us see these and go over them at once (send some to you and some to me) and then at once go on to the 750. I will however write to the Controller if necessary & see if this plan is approved if you think it necessary—at all events 750 copies will be required or perhaps 800. I will ask the Controller about that.

What about the printing off the remainder of the diagrams. I do not think we have got them yet.

I suppose you have been getting the volumes as they appeared Is not the last one Vol III a beauty?

Yours very truly
C. Wyville Thomson

This letter was written a little more than three months before Thomson's death. He was well enough to have been in the chair at a meeting of the Royal Society of Edinburgh on 6 June 1881 and to have communicated a paper on the physical and biological conditions of the Faroe Channel on that date (56). However, he had not met with his classes at the University for several sessions, and Prof. Alleyne Nicholson of St. Andrews conducted them on his behalf during the summer (57). The 3 November issue of *Nature* says that "Sir Wyville Thomson has not yet resigned the chair of Natural

¹² YMER was also the name of a Norwegian expeditionary vessel during the period of these letters (55).

History in Edinburgh University, though we regret to learn that he is likely to do so in a few days" (58); hence the reference in this letter to having given up other work. However, it is evident that with great gallantry he tried to continue on with the CHALLENGER work to the last, and it was not until after his death that John Murray "was entrusted by the Government with the direction of the whole of the work" (11).

The content of the first paragraph has to do with Captain Tizard's marriage. Born in 1839, he was married in 1881 to Mary Elizabeth, daughter of W. H. Churchward, C. E. Tizard died in 1924.

CONCLUDING REMARKS

These letters illustrate the vast extent of Sir Wyville Thomson's correspondence. His accomplishments between 1876 and 1882, despite ill health much of the time, were remarkable, and the compass of his publications is not generally appreciated. Herdman, who knew him through the eyes of a younger man, was moved to write of him in 1923:

It is unfortunate that the man of science has so frequently to make a choice between the necessary work of administration and original research. Let us trust that he does not invariably select the work for which he is least fitted. Sir Wyville Thomson was given little time for either. In the few years of work that remained before his health gave way, he was so occupied with his many and varied duties as director of the Commission and editor of the reports, that there was little time for the original work he had planned to do in connection with the collections of Stalked Crinoids and of Hexactinellid Sponges—the two groups that he had reserved for his own investigation, and upon which he was an acknowledged authority. . . . He was a man of handsome presence and genial nature, with great personal charm of manner. His general culture, large fund of information on many subjects, his aptness and humour in conversation all contributed to make him a social success in Edinburgh and the beau-ideal of a host in his country home, where he gathered round him a large circle of friends by no means confined to scientific men.

He had a quaint way of occasionally bringing in old Scots sayings, or snatches of poetry, as for example, when he thought a question unimportant:—

Twenty peacocks in the air. I wonder
how they all got there. I don't know—
and I don't care!

or—more briefly, when with friends who understood him, simply—"Twenty Peacocks." (7).

It is a source of great pleasure to write for the Thomas G. Thompson Anniversary Volume. When the senior author arrived at the University of Washington in September 1932, the first person he met was Dr. Thompson; through two years in Seattle, "Tommy" Thompson kept a weather eye on him, academically and otherwise. There could have been no better mentor.

We cannot conclude without acknowledging the help of many Yale colleagues in preparing the details of this article, particularly: Lewis P. Curtis, C. Beecher Hogan, Anne R. Kinloch, Herman W. Liebert, Robert F. Metzdorf, Yngve H. Olsen, and Rulon Wells.

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