

Mrs. Edwards. Will you kindly also remember me to your father.

The following is in answer to a letter that cannot be found :—

FROM DARWIN

DOWN, BECKENHAM, KENT,

June 1, 1871.

MY DEAR MR. AGASSIZ :—

Very many thanks for your kind letter and curious facts about the fishes. What an extraordinary number of complex and wonderful structures have been developed in relation to sex!

I am also particularly glad to hear about the pedicellariæ of the Echinodermata, the homologies of which I did not in the least know. I must now find out the homologies of the “Birds-beaks” and serrated bristles of the Bryozoa, which I remember watching in old days with astonishment.

I am thinking of bringing out a new and cheap edition of the “Origin ;” and if so I should give a chapter to answering, as far as I can and space permits, Mivart’s very clever book. I have no doubt the book will produce a great effect on many ; and you will think it blind prejudice when I say it has had none on me. There is not one new point in it, though many are admirably illustrated. Mivart never racks his brains to see what can be fairly said on [the] opposite side, and he argues as if I had said nothing about the effect of use or the direct action of external conditions : though in another part of his book on these points, almost every illustration is taken from my writings and observations.

But I will not bother you with more remarks on this head.

Pray give my most sincere respects to your father. What a wonderful man he is to think of going round Cape Horn; if he does go, I wish he could go through the Strait of Magellan.

With very kind remembrances from all of us to Mrs. Agassiz, and with many thanks from myself,

Pray believe me,

Yours very sincerely,

CH. DARWIN.

Professor Agassiz sailed in the *Hassler* for a dredging expedition around South America in December, 1871. This time during his absence the work of the Museum management did not all fall on Agassiz's shoulders, for Mr. Thomas G. Cary, the brother-in-law of the elder Agassiz, had charge of the finances.

TO DARWIN

CAMBRIDGE, March 4, 1872.

Many thanks for the copy of the new edition of the "Origin of Species," which I have just received from you. There are several points, especially in Embryology, which I shall take some other occasion to write you about, which may be of general interest. I am getting on toward the end of the Report on Echini from the deep sea of Florida, and hope to be able to send you a copy before long. The number of young I have been compelled to examine has led me to modify my views of the nature of genera, species, and in fact of all subdivisions. I cannot find anything that *is stable*, the greater the material in space and number (age) the

when fully expanded. The Chinamen used to get them very often, of all sizes, in their nets and then cut them up and sell them to unsuspecting Frenchmen who mistook the species for frogs' legs. Now if Ralston has left any Chinamen in San Francisco, can you speak to a promising specimen of Mongolian and ask him to cling to a good specimen, if the species does not freeze to him. Then by a judicious cutting open of his lower side, so as to let alcohol into his insides, put him into a keg of alcohol and ship him, *via* Panama, to your humble servant, who will receive him with open arms.

Should you be in want of any beast from this side, call on me. I hope one of these days to get over to San Francisco and renew my pleasant associations of old days.

In August, 1880, Agassiz delivered an address before the American Association for the Advancement of Science, using his knowledge of the Echini to show the extreme difficulty, if not impossibility, of ever obtaining a complete record of the development of even a single group. In acknowledging the receipt of a reprint, Darwin writes:—

“I read your address with much interest. However true your remarks on the genealogies of the several groups may be, I hope and believe that you have overestimated the difficulties to be encountered in the future. A few days after reading your address I interpreted to myself your remarks on one point (I hope in some degree correctly) in the following fashion:—

““Any character of an ancient generation or intermediate form may, and often does *reappear* in its de-

scendants after countless generations, and this explains the extraordinary complicated affinities of existing groups.'

"This idea seems to me to throw a flood of light on the lines, sometimes used to represent affinities, which radiate in all directions often to very distant sub-groups — a difficulty which has haunted me for half a century. A strong case could be made out in favor of believing in such reversion or atavism after immense intervals of time. I wish the idea had been put into my head in old days, for I shall never again write on difficult subjects."

Agassiz's attitude about this time toward evolution is perhaps best shown in the following extracts from a letter to his uncle Alex Braun : —

"I must frankly acknowledge that my leaning is towards evolution with general sense, but as to swallowing all that the Darwinists and extreme Haeckelists wish us to take down, I have not the least idea of doing that. I don't know that my position is of any particular value, but I am claimed equally by the extreme evolutionist and the most ardent Cuvierian, so that I must have expressed myself much like the Delphian oracles to suit all parties so well."

And again in speaking of Karl von Baer : —

"The account he gives and the estimate he makes of his own work is capital, and I hope the whole article will have a wide circulation. It will do much to kill the present mania for extremes, and will I hope lead the younger men who are indulging in such high flights to

tracing the growth of the reefs and the formation of the Peninsula, I have come across no signs of any elevation. Everything, on the contrary, tends to show that the immense plateau which forms the base upon which the Peninsula of Florida is formed, was built up by the débris of animal remains,—Mollusks, Corals, Echinoderms, etc. (after it had originally reached a certain depth in the ocean), until it reached the proper height for corals to flourish. This here is not much deeper than seven to eight fathoms; generally six fathoms marks the limit. To the westward of this group of reefs is a coral reef starting on a bank at a depth of seven fathoms.

I expect to publish a small map of the distribution of the corals of the Tortugas as soon as I return home, in my report of work (not done) to the Superintendent of the Coast Survey. I shall, however, have first to finish reading the proofs of the Challenger Echini, the last pages of which I expect to find awaiting my return home, and I trust you will see that Memoir out during the summer.

To this Darwin replied in a letter characteristically full of courtesy and open-mindedness, qualities not always conspicuous in scientific discussions. It has already been published in "More Letters of Charles Darwin," but a few passages may not be out of place here:—

"You will have seen Mr. Murray's views on the formation of atolls and barrier reefs. Before publishing my book I thought long over the same view, but only as far as ordinary marine organisms are concerned, for at that time little was known of the multitude of min-

ute oceanic organisms. I rejected this view as from the few dredgings made in the *Beagle* in the South Temperate regions, I concluded that shells, the smaller corals, etc., etc., decayed and were dissolved, when not protected by the deposition of sediment; and sediment could not accumulate in the open ocean. . . . I have expressly said that a bank at the proper depth would give rise to an atoll, which could not be distinguished from one formed during subsidence. . . . Lastly, I cannot understand Mr. Murray, who admits that small calcareous organisms are dissolved by the carbonic acid in the water at great depths, and that coral reefs, etc., etc., are likewise dissolved near the surface, but that this does not occur at intermediate depths, where he believes that the minute oceanic calcareous organisms accumulate until the bank reaches within the reef-building depth. But I suppose that I must have misunderstood him. Pray forgive me for troubling you at such length, but it has occurred to me that you might be disposed to give, after your wide experience, your judgment. If I am wrong, the sooner I am knocked on the head and annihilated, so much the better. It still seems to me a marvelous thing that there should not have been much and long-continued subsidence in the beds of the great oceans."

Murray at the time does not appear to have made his point clear to either Darwin or Agassiz that the formation of a bank by the deposit of the shells of small pelagic animals falling to the bottom, was merely a question of their accumulating faster than they dissolved. Before reaching great depths, the shells would, in falling slowly through the water, be dissolved faster