

connections of the corner or edge rods to the iron columns are made at several points lower down, by passing one-half and three-quarter inch copper rods through holes drilled in the stone-work of the pyramid. At the bottom the earth connection is made by four heavy copper rods, which project several feet into a well of moist sand, at the bottom of which water is always standing.

Owing to the unrivalled height of this monument, its protection from damage by lightning is a matter of scientific as well as of practical interest, and the efficiency of the plan now being carried out will doubtless be questioned in some quarters; but it is a problem which time alone can satisfactorily solve. Z.

Washington, D.C., Oct. 26.

BOSTON LETTER.

ALTHOUGH the removal of *Science* to New York is greatly regretted here, the many friends it has made in the place of its birth continue to express their great interest in its success, and their appreciation of the efforts made toward its constant improvement. Its weekly reception, too, on the very day of its publication in New York, makes a very favorable impression, since this was by no means the case when printed here; it lessens, to some degree, the regret at losing it as one of the scientific attractions of the community.

The publication of the 'Life of Agassiz' is most favorably commented on in our scientific circles. It awakens anew the enthusiasm toward our great naturalist which was always manifested in the most lively manner whenever he made a public appearance. We are all glad, moreover, to possess a clearer and fuller account of his university life, when he was laying the foundation of his remarkable career. The unity of his whole life, the persistency of his mental and moral characteristics, can here be traced as never before, while the successful outcome of his early aspirations lend a completeness to the picture, and are a source of inspiration to any reader.

No clearer case can be pointed out than his connection with Harvard, of the utmost importance to a university of securing men in its scientific posts who are not merely excellent teachers, but are also thorough and active investigators, imparting to their pupils their own ardor in scientific research. The band of students who flocked to his standard is scattered all over the country, most of them teachers in colleges, and everywhere leaders in scientific work and thought. No other such band of disciples in any science has ever appeared in our country; and his presence at Harvard raised the standard of its scientific department

to a height of excellence and renown, as nothing else could have done.

It may not be known to all your readers that the designer of the Puritan has made his mark already in quite another field of science, being favorably known for many years as an entomologist. His memoirs on the anatomy of Lepidoptera and other orders of insects, and his minute technical knowledge of Diptera, easily won for him a place in our Academy of sciences. His friends in the scientific club here are very enthusiastic over his new success, and propose to give him a dinner in recognition of their appreciation of it, at which it is hoped that he will relate some of the points which have made the Puritan the fastest known yacht in the world. Yet they have some doubt whether he will consent even to this private honor; for, though the most genial companion in the world, Mr. Burgess is modest to a fault.

The bequest of the late Robert Treat Paine was mentioned in *Science* last July, when it was stated that Harvard college observatory would receive nearly three hundred thousand dollars, one half at once, the other on the death of his widow. This was particularly opportune, for the increased work of the observatory in later years had been due to an annual subscription raised by its friends for a limited period, then recently past. Unfortunately, it now transpires that the will is contested in the courts by the heirs-at-law, who claim that he "was not of sound and disposing mind and memory." Under the laws of Massachusetts, the costs of legal action of this sort are chargeable to the estate, so that there is danger that, even if the will is not broken, the amount finally received by the observatory may be somewhat diminished, and, in any event, delay must ensue; so that the observatory is now working on a sadly diminished income, for which even the zeal and ingenuity of the indefatigable director cannot wholly atone. Y.

Boston, Oct. 24.

LETTERS TO THE EDITOR.

** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Cruise of the *Arethusa*.

THE yacht *Arethusa*, having on board an expedition to Newfoundland, previously noticed in *Science*, returned September first to Annisquam, Mass., after a successful trip of three months.

The scientific party consisted of Prof. Alpheus Hyatt, curator Boston society natural history; Dr. E. G. Gardiner and Mr. George Barton, instructors in the Massachusetts institute of technology; Dr. Howard M. Buck, of Boston; Sidney R. Bartlett and C. L. Burlingham, students of the Institute of technology.

The weather while going and returning was not upon the whole favorable, but while on the coast of Newfoundland and Labrador, from June 17 to about

August 10, it was very fine, and greatly facilitated the work of the shore parties. The prevalence of high winds made opportunities for dredging exceptionally rare, and very little was accomplished in this direction. The shores proved, also, excessively barren; the pools were infrequent and not rich in species. From Cape Ray to St. John's Island, for the space of two hundred and fifty miles on the western coast of Newfoundland, the principal mountain ranges, whose general course is north-east-south-west, approach the sea more or less closely. They are so arranged that they present their ends to the sea on the south coast, and are seen more from the side on the west coast. From St. George's Bay to St. John's Island, on the western coast, they form a series of steep cliffs, cones, and domes, which also greatly enhance the beauty of the deep and branching fiords of Bay of Islands and Bonne Bay. The climate, vegetation, and lovely harbors, made the trip along this part of the route a series of delightful surprises.

The only population on the west coast consists of small settlements of fishermen, with very few persons of a higher grade. Besides these permanent inhabitants, there are several fishing settlements of French, who come only for the summer. They still have fishing privileges on and off this coast, but are not allowed to erect permanent habitations. These rights and the islands of the St. Pierre group on the south coast, where their flag flies, are the remnants of the once extensive territories of the French nation on this continent.

Hotels, boarding-houses, and travelling accommodations, do not as yet exist. The steamer which runs from St. John's to Bonne Bay is so uncomfortable that only the hardiest males would be repaid for attempting to force a passage even in summer as far as Bonne Bay. The officers of this vessel were exceedingly polite and obliging, but the owners have sadly neglected their duty in all that relates to the steward's department.

Fossils were collected at various localities along the west coast from near Cape St. George to Cape Norman, the northernmost point of Newfoundland, and at the Atlantic entrance of the straits of Belle Isle. These fossils fairly represent the faunas of the formations called Quebec and Point Levis groups by the Canadian survey, and the Trenton and lower carboniferous of the Newfoundland survey.

The facilities for acquiring fine specimens of fossil cephalopods far exceeded the most sanguine anticipations. Several well preserved specimens of the imperfectly-known and curious, primitive form, *Piloceras*; fragments of orthoceratoids allied to *Endoceras*, which are more than two feet long and four inches in diameter at the living chambers; a number of large cyrtoceran shells, and a considerable number of more or less perfect, close-coiled and lituites-like Nautiloidea are among the principal acquisitions. The latter include all the species originally described by Billings from Newfoundland, and probably some new species.

It may be provisionally stated that *Piloceras* is a curved or cyrtoceran form of *Endoceras*, and that *Actinoceras* also had a curved shell in some species, which was not less than thirty inches in length.¹

¹ This is a strong confirmation of the author's views that the same group of Nautiloidea and Ammonoidea may have straight, bent, or cyrtoceran, and even close-coiled shells.—*Science*, Nos. 52-53, 1884, and *Proc. Am. assoc. adv. science*, vol. 32.

Two fine specimens of the latter with very long, living chambers, were dug out near Point Rich.

The limestones of the Quebec group form a continuous and unbroken series of conformable strata, which are particularly well shown at Port au Port. The large numbers and prevalence of gasteropod shells of the genera *Maclurea*, *Pleurotomaria* and *Murchisonia*, fragments of *Isotelus* and *Asaphus*, and the abundance of *Endoceras*-like orthoceratoids and *Actinoceras*, together with transversely-ridged species like *Orthoceras vertebrale*, give the fauna of the uppermost of these limestones at Port au Port a Lower Silurian aspect. These resemblances, however, are counterbalanced by marked differences. Thus there is a comparative scarcity of Brachiopoda, and there are no massive corals which can be considered as having materially aided in the accumulation of the rocks. The presence of ancient forms like *Archeocyathus* and *Calathium*, which are probably sponges, and of *Piloceras*, and the comparative abundance of the coiled forms and partly-coiled Nautiloidea with open umbilici and cylindrical whorls, indicates a primitive assemblage of organisms more ancient than the Lower Silurian, and evidently introductory to that fauna.

At Port au Port, also, the actual contact of the Levis slates with limestones of Quebec was studied. These rocks contain *Lingulæ* in abundance, and also trilobites, already described by Billings. It cannot be questioned that they lie above the limestones and are conformable, though having an entirely distinct fauna.

Above this lies the so-called Sillery conglomerates and sandstones, a series of unfossiliferous strata. As described by Richardson of the Canadian survey, and Murray and Howley of the Newfoundland survey, they are also conformable, but overlies the Levis slates.

A fault, already traced by Murray and Howley, separates the northern horizontal outcrop of the Sillery at Long Point, Port au Port, from Murray and Howley's Trenton limestones.

The fauna of these last is certainly like that of the Trenton of New York, but it has a decidedly Newfoundland facies, and its only visible contact is along the perpendicular fault above mentioned. It contains a great abundance of Bryozoa, Brachiopoda, and reef-building corals, which remind one constantly of the aspect of the Trenton fauna, and has altogether a more modern aspect than the Quebec faunas. It is not yet ascertained whether the *Endoceratites* found are true *Endoceras*, but fragments of an undoubted *Gonioceras* were collected in considerable numbers in the lower series of these rocks. It seems, therefore, very probable that Murray and Howley are correct in considering the strata at the end of Long Point as the equivalents not only of the Trenton proper, but also of the Black River and Bird's Eye faunas.

All of the rocks in this part of the island dip away from the mountains in a south-westerly direction, passing out of sight under the waters of the Gulf of St. Lawrence. Thus the outermost strata are, in a general way, more recent than those lying inland or nearer the mountains. The geological position of the Trenton at the end of Long Point, Port au Port, is not far out to sea, but the well-marked fault which occurs between it and the Sillery to the south, or the same narrow point, shows that it is a fragment of an overlying formation, which, having fallen to its

present level, has been preserved, together with the older rocks immediately adjoining.

The immediate contact of the Quebec limestones and underlying sandstones and quartzites was seen but not closely examined. There can, however, be but little doubt that the quartzites of Bonne Bay, on the east shore of the east arm, lie as described by Richardson and mapped by Murray, directly underneath the Quebec limestones, and are conformable. Whether they are the equivalents of the Potsdam or not, can only be determined from Richardson's observations and collections.

Collections were made at Anse au Loup and Amour Cove in the so-called Potsdam sandstones and limestones of the Canadian survey. The observations made at these points indicate a fauna quite distinct from those of any of the limestones or slates of the west coast of Newfoundland. The absence of Cephalopoda and the prevalence of primitive forms of Archeocyathus show the rocks to be probably older than those of the Quebec group at Port au Choix and other localities. The primitive sponges, or Archeocyathi, have here replaced corals completely, and may be described as reef-builders, since numerous hummocks and masses and parts of the strata are formed entirely of their remains. Immediately below these limestones, and conformably with them, lie the red sandstones, several layers of which are perforated with Scolithus burrows.

The geological evidence brought forward by Sir William Logan in the report of Canadian geological survey, 1863, to prove that the straits of Belle Isle have been partly formed by a synclinal valley, appears to us to be very defective. It is more in accord with the evidence to consider that the whole of northern Newfoundland was once much more elevated, and has been sunk by faulting until at the straits the Quebec has been brought down to the same level as the red sandstones of the opposite Labrador shore. The origin of the straits would in that case be considered as due to the changes of level produced by one or more of the same great series of parallel faults already traced by Richardson, Murray and Howley along the west coast. These run parallel with the axis of the straits, and seem to account fully for all the phenomena.

Observations were made upon the raised beaches and terraces which occur along the shores of Newfoundland and Labrador; and here, as well as at Anticosti and the Mingan islands, the marks of the recent elevation of the land are abundant.

ALPHEUS HYATT.

An archeologist in trouble.

I am writing a book on American archeology, and as I cannot reconcile the accounts that are given of some of the most noted earthworks of the Mississippi valley, I naturally turn to you for help. Thus, for instance, I find that, according to one authority, Cahokia mound covers an area of fifteen acres; another puts it at twelve; whilst a third is content with six. All these gentlemen were practical explorers, and as they took the measurements 'carefully,' some of them even with mathematical instruments, there can, of course, be no mistake in the figures. In regard to the Serpent mound in Adams county, Ohio, there is a similar state of affairs. One practical explorer, who is nothing if not thorough, tells us that it is 1,415 feet long; another says it is 1,116; whilst

a third, too wise to commit himself to any precise figures, merely says that, if extended, it would not be less than one thousand. To any but a practical explorer, these discrepancies may seem large, and, no doubt, they will deter a mere historical student from using these figures in any statement that aims at accuracy; but in reality they are not of much importance, since it is possible, by a judicious use of the system of averages, to arrive at conclusions that are certainly as near the truth as are most of the original measurements. One thing, however, does bother me, and that is the 'frog' which a recent explorer has discovered in front of the so-called 'egg' that lies between the serpent's jaws. It is 61 feet long, exclusive of the hind-legs, and is said to be in high relief (three feet); though another practical explorer, who visited the same work at about the same time, saw nothing of a frog, either jumping or sitting still, but does speak of a cow-path which may enclose an area of about that size. Now, Mr. Editor, what am I to do? I cannot go out there myself and 'step off' these distances; and if I did, some long-legged fellow would be sure to come along with his pair of mathematical instruments, and prove that my measurements were all wrong. Besides, I don't intend to give up that frog—it adds too much to the picture I am having prepared—and yet, I do not see how I am to average it so as to keep my measurements accurate.

R. R.

The spectrum of γ Cassiopeia.

Using a high dispersion, and the same precaution with regard to the eye as described upon a former occasion, in addition to the hydrogen lines, there are seen in the spectrum of γ Cassiopeia two lines and a dark space between C and D₃, five bright lines and three dark ones between D₃ and H _{β} , one bright line between H _{β} and H _{γ} , and perhaps another between H _{γ} and H _{δ} , with a dark space near H _{δ} . Changing the scale readings of these lines into wave-lengths, we obtain practically, with one exception, the same values as those of the bright lines observed in a solar protuberance in a total eclipse.

These lines apparently do not necessarily all appear at once, and afford an excellent field for study.

O. T. S.

New Haven, Oct. 21.

The care of pamphlets.

Mr. Goode asks, in *Science* of October 16, for the experience of others in regard to the care of pamphlets in scientific libraries. I give below a quotation from the publications of the Washburn observatory, vol. ii., which describes my plan, which was originally described in the *Library Journal* for June, 1880.

"The pamphlets are kept in large drawers immediately below the book-shelves, and a drawer is devoted to a subject. As soon as a pamphlet is received, it is catalogued under its author's name, and placed in the drawer devoted to its subject. All the pamphlets on a given subject can therefore be at once consulted in one place; and all the works of a given author are to be found together in the card catalogue. I have used this plan for keeping pamphlets for [thirteen] years, in my own library, in the library of the U. S. naval observatory, and here, and I consider it to be an entirely satisfactory solution of the