timbers such as oak, elm, ash, maple, &c., but these have to be supplemented by foreign woods of a more ornamental character, and of these mahogany, rosewood, ebony, satinwood, and such like are the best known. From amongst Indian timber trees a long list might be made of woods which are now almost unknown out of their native country—such, for instance, as the East Indian cedar (*Cedrela toona*), which is a reddish-coloured wood with a splendid wavy or feathery figure; the tree is also found in Australia, where the wood is highly valued; the padouk (*Pterocarpus indicus*), the deep-red-coloured wood of which attracted so much attention at the Edinburgh Exhibition last year; the Malabar Kino tree (*Pterocarpus marsupium*), also a finely-marked deep-red wood, several species of *Terminalia*, durable woods of a brown colour with darker brown markings. Many others might be mentioned, but the most beautiful of all the Indian woods for its ornamental character is the Chittagong wood (*Chickrassia tabularis*). This is of a brown colour, with transverse lighter silvery-brown wavy markings, which impart to it a varying depth of light and shade, which, when polished, imparts a peculiar and charming lustre. All these woods take a high polish, and would be invaluable for cabinet-work. Fine specimens of these and many others are in the collection of Indian timbers exhibited in the No. 3 Museum at Kew.

On the question as to the durability of the Scotch fir (*Pinus sylvestris*) Col. Pearson gave an opinion which is worth quoting. He says:—"I think myself that as the value of the foreign imported timber increases, as it must do as the quantity diminishes, people will come to appreciate more the Scotch fir, because I know many barns which have been boarded with Scotch fir for twenty years, and which are standing perfectly well: but it is convenient to get the imported boards ready sawn out, and where the people can get them cheap they do not pay attention to the Scotch and home-grown timber. But, speaking for myself, I should say that Scotch fir is a perfectly good wood as long as it is sufficiently mature, and I think, as foreign wood becomes dearer, as it will in a few years, English timber and Scotch timber will become of a value which it has not now."

On the general subject of the proposed Forest School Col. Pearson expressed himself in favour of a Chair of Forestry at the Edinburgh University, but he further stated that he had no actual faith in lectures in the school unless illustrated by practical instruction. "If," he says, "you tell a man in the lecture room that such and such consequences will take place, and do not show him the consequences on the spot, he does not believe anything about it; it goes in at one ear and out at the other; he will think it all nonsense; but if you want to impress your teaching upon him, you must take him out into the forests and show him the operations of Nature." Regarding the extent or scope of the School, Mr. Thiselton Dyer, in reply to Sir Edmund Lechmere whether he would not make the School of Forestry applicable to India and the Colonies as well as to our own country, said, "I should like to get all the fish possible into the net, and if we had such a school, to make it as useful as possible. I think it is surprising, considering how large is the interest of the English race in forestry, that except in India we have taken no kind of active interest in the subject: although we own more forests in the world than any other race, we are at present, except in the most piecemeal fashion, absolutely washing our hands of the whole business." Mr. Dyer, in his evidence, further pointed out by way of illustration a few of what are usually called the minor industries of forest produce, which in the aggregate become of considerable national importance.

It is to be regretted that the Committee was not nominated at an earlier period of the session. The first sitting was on July 14, and at the two subsequent sittings on July 21 and 24, witnesses only were examined. The report of the Committee refers to the impossibility of concluding their investigations during the Session, and "recommends that a Committee on the same subject should be appointed in the next Session of Parliament."

JOHN R. JACKSON

## OBSERVATIONS ON THE RECENT CALCAREOUS FORMATIONS OF THE SOLOMON GROUP, MADE DURING 1882-84[1]

On account of the treacherous character of the natives of the Solomon Group, no extensive geological observations have ever been made in these islands from the period of their discovery by the Spaniards three centuries ago. For this reason my excursions in these regions were not free from personal risk; in many places they were considerably curtailed, and in some islands they had to be abandoned altogether.

This archipelago includes seven or eight large islands, some of which are from seventy to eighty miles in length, and the highest from 8000 to 10,000 feet in height. Besides these, there are a great number of smaller islands and islets, some of volcanic and others of recent calcareous formations. Restricting my remarks to those islands which are wholly or in part composed of these calcareous rocks, I may observe that, although only able to become acquainted with a small portion of the Solomon Group, the islands which I examined represent the different types of islands that there exist.

In this, the largest of the Pacific groups, I not only found existing fringing-reefs, barrier-reefs, and atolls, but I discovered pre-existing reefs of these three chief classes which have been recently elevated to a height often of several hundred feet above the sea. My observations on these recently-elevated reefs and their foundations have enabled me to approach the problem of the formation of coral reefs by the inductive rather than by the *a priori* method: for it is evident that in passing from the consideration of a probable cause of the formation of existing reefs to the examination of ancient reefs that have been raised with their foundations above the sea, we enter a domain of greater certainty. I purpose in this abstract to state concisely the principal characters of the islands which are wholly or in part of calcareous formations; then to draw four limited inferences from these facts of observation without reference to any particular views that may be held on the subject of the origin of coral reefs; and finally to compare such conclusions with the prevailing views on that subject.

In the first place there are numerous small islands and islets less than a hundred feet in height, which are composed in mass of coral limestone. Of this class Stirling Island may be taken as an example. In the bold cliffs, which form the weather coast of this small island, there are numerous imbedded masses of the reef-building corals, many of them measuring four feet across, the majority of them in the position of growth, but some of them inverted.

The island of Ugi, which is six miles in length and about 500 feet in height, may be taken as a type of the next class. Its geological structure may be briefly described as composed in bulk of a soft earthy bedded deposit, possessing the characters of the "volcanic muds" of the *Challenger* soundings, containing numerous Foraminifera, and encrusted near the coast by coral limestone, which almost disappears in the higher regions. The greatest thickness of the coral limestone that I found in this island was between 90 and 100 feet. As one ascends the higher slopes of the island the coral limestone thins away, and

[1] By H. B. Guppy, M.B., F.G.S., late Surgeon of H.M.S. *Lark*. [Abstract of a paper read before the Royal Society of Edinburgh, on June 15th, 1885, being communicated by Mr. John Murray.]

only occasional fragments occur in the red argillaceous soil. The greatest elevation at which I found the coral rock was about 425 feet above the sea. The soft Foraminiferous deposit, which forms the mass of the island, is regularly bedded, the dip varying usually between 10° and 15°, but it may rise to as much as 35°. Entire shells are rarely found in these beds, the Foraminiferous tests being usually the only organic remains visible to the naked eye.

The island of Treasury affords an example of the next type of island. It is oval in shape, has a length of nine miles, and rises about 1150 feet above the sea. Here we have exposed the nucleus of volcanic rock which has been covered over by soft bedded deposits that resemble, like those of Ugi, the muds found in the *Challenger* Expedition to be at present forming around oceanic volcanic islands, whilst the coral limestone only attains any thickness near the coast, and is wanting altogether in the higher regions of the island. At elevations exceeding 400 feet above the sea the coral rock generally disappears from the surface. Above this height it is only found occasionally, 900 feet being the greatest elevation at which I found a fragment. The thickness of the coral limestone does not exceed 100 feet. The soft deposit, which is regularly bedded, the dip varying between 10° and 30°, displays a greater variety in its characters than the similar deposit in the island of Ugi. As a rule it presents to the naked eye no other conspicuous organic remains than the white specks of the more minute Foraminiferous tests and the larger microscopic tests of such species as *Cristellaria calcar*, *C. mamilligera*, and others; but in some localities this deposit becomes highly fossiliferous, when it assumes a more compact texture, and displays to the eye fragments of corals with Pteropod and Lamellibranchiate shells. As shown in the accompanying diagram, the structural history


Ideal section of an island displaying the originally-submerged volcanic peak, the overlying soft deposits, and the encrusting coral limestone.

of this island of Treasury may be readily inferred. An ancient submerged volcanic peak, having been covered by a thickness of some hundreds of feet of deposits, for the most part resembling the muds now being formed around volcanic islands, has by this means and by the movement of elevation been brought up to the zone of reef-building corals. After the coral reefs had become established, the whole structure experienced an upheaval of nearly 1200 feet.

In the island of Alu, the principal of the Shortland Islands, another type of structure is exhibited. This island, which has a breadth of eleven or twelve miles and an elevation of about 500 feet, is composed in its north-west portion of ancient and originally deep-seated volcanic rocks (mostly quartz-diorites), while the greater part of it, together with the off-lying lesser islands and islets, is made up of more recent calcareous formations. In describing its structural history I shall be describing its structure. We have the original land of volcanic formation in the north-west part of the island, from which, as from a neucleus, line after line of barrier-reef has been advanced in a south-easterly direction based on a foundation of Pteropod and Foraminiferous muds, and forming ultimately, as the upheaving movement continued, the large island of Alu, which yet preserves in the ridges of its interior these ancient barrier-reefs now removed far from the coast and elevated some hundreds of feet above the present sea-level. The soft deposit underlying the elevated reef-masses contains in abundance the shells of Pteropods and bivalves, the otoliths of fish, the tests of pelagic and bottom-living Foraminifera, and some simple corals of deep-sea genera. The overlying coral limestone sometimes assumes a chalk-like character, and in the interior of the island it may give place to a Foraminiferal limestone. The characters of these different rocks are described in the second part of this paper. The thickness of the coral limestones in this island is probably under 100 feet. When it caps the upraised island barrier-reefs it does not exceed forty feet; but these regions have been subjected to great denudation.

In the small island of Santa Anna, which is two and a half miles in length, we have an upraised atoll that displays within the small compass of a height of 470 feet the several stages of its growth. There is, in the first place, the originally submerged volcanic peak; then the investing soft deposit which, according to Mr. Murray, has the characters of a deep-sea clay; and over all the ring of coral limestone that cannot far exceed 150 feet in thickness. The interior of this upraised atoll is a closed basin containing a fresh-water lake, the bottom of which lies about a hundred feet below the present sea-level: so the island may be roughly compared to a bowl of fresh water floating on the sea. In the vicinity of the locality where the deep-sea clay was exposed, Lieut. Malan observed a concretionary block of manganese peroxide between one and two cubic feet in size, which, according to Mr. Murray, who examined a typical fragment, is quite similar in characters to the smaller masses obtained in deep-sea soundings. The structural history of this island may be briefly summed up. A submarine volcanic peak, having been invested by a deep-sea clay, was brought up by upheaval to the coral zone. An atoll was established on it, and the wholewas subsequently raised to a height of nearly 500 feet above the sea.

Lastly, I come to the large mountainous islands, of which St. Christoval may be taken as the type. This island is more than seventy miles in length, and about 4100 feet in height. It is composed in mass of ancient volcanic rocks, which are flanked on their lower slopes by recent calcareous formations. A fawn-coloured crystalline limestone, containing reef débris, lies directly on the volcanic rock, and is itself overlain by the coral limestone. I did not find these calcareous rocks above 500 feet above the sea; so great has been the denudation of this island that these calcareous formations constitute a much thinner crust than that which came under my notice in the smaller and more recent islands.

Such being the facts, I come now to the four general conclusions, which are as follows:—

1. *That these upraised reef masses, whether atoll, barrier-reef, or fringing-reef, were formed in a region of elevation.*

This is self-evident. The last upheaval that occurred, of which I found proofs in different parts of the group, was to the extent of about five feet; but at the present day there are signs of this movement being still in operation, and, for the purposes of future observation, I have established datum-marks in different islands. This, therefore, being a region of elevation, it is apparent that that portion of Mr. Darwin's theory of coral reefs which ascribes the formation of atolls and barrier-reefs to a movement of subsidence cannot be applied to the islands of the Solomon Group, since we here find upraised atolls and barrier-reefs associated with existing reefs of the same description. This conclusion accords with the results obtained by Prof. Semper in the case of the Pelew Islands, and by Prof. A. Agassiz in the case of the Florida reefs.

2. *That such upraised reefs are of moderate thickness, their vertical measurement not exceeding the limit of depth of the reef-coral zone.* Amongst the numerous islands which I examined I never found one that exhibited a greater thickness of coral limestone than 150 feet, or 200 feet at the very outside. In fact, so great has been the denudation of these islands, where, according to my own

observations, there is an annual rainfall at the coast of 150 inches, that I rarely came upon a thickness of a hundred feet of coral limestone. One of the corollaries of the theory of subsidence is concerned with the great thickness of atolls and barrier-reefs. My observations in this region—and it is such regions that can alone afford such evidence—show that atolls and barrier-reefs can be formed with no greater thickness than they would possess in accordance with the depths in which reef-corals thrive, the vertical thickness of the reef not exceeding the depth of the reef-coral zone. . . . The only objection worthy of attention that had been advanced against the atoll-theory of Mr. Darwin was, in the opinion of Sir Charles Lyell,[1] the circumstance that, as far as was known, no bed or formation of coral of any thickness had been discovered. This objection, which was proposed by Mr. Maclaren in 1842, derives additional force at the present day in the light of my observations in the Solomon Islands.

3. *That these upraised reef-masses in the majority of islands rest on a partially consolidated deposit which possesses the characters of the "volcanic muds" which were found during the "Challenger" Expedition to be at present forming around volcanic islands.*

4. *That this deposit envelops anciently submerged volcanic peaks.*

These two latter conclusions corroborate in a remarkable manner the views, based on the observations of the *Challenger* Expedition, which Mr. Murray has advanced. I will cite the structures of two islands to illustrate these views. In the small island of Santa Catalina I found that the elevated reef was based on volcanic rock with the intervention of a thin brecciated conglomerate. In the island of Treasury I found the volcanic rock covered by a soft, partially consolidated volcanic mud, which attained a thickness of some 300 or 400 feet, and was itself incrusted on the lower slopes of the island by the elevated reef-mass. In the one island, the volcanic peak had been exposed to breaker-action before the reef-corals established themselves. In the other island, the submerged volcanic peak was first brought within the reef-coral zone by the deposition of layers of "volcanic mud" upon it, assisted by the movement of elevation.

With reference to my own bias on this subject, I may here add that during the first eighteen months I passed in the Solomon Islands I was only acquainted with the theory of subsidence, and that after having failed to make my observations harmonise with the theory of Mr. Darwin, I collected my facts with a very confused idea of the direction towards which they were tending. It was therefore a cause of great satisfaction to myself when I first became acquainted with the views held by Mr. Murray.

These calcareous rocks, in the examination of which Mr. Murray used the methods he employed in the case of the deep-sea deposits, may be grouped into two chief classes, according to the proportion of volcanic débris they contain.

The *first class* comprises those rocks which, being largely composed of volcanic débris mixed with the tests of Foraminifera, Pteropods, and other Mollusks, have a composition very similar to that of the volcanic muds at present forming around oceanic volcanic islands in the Pacific. These rocks contain both pelagic and bottom forms of Foraminifera, and four prevailing kinds of them may be distinguished.

1. A friable rock, containing from 5 to 20 per cent. of carbonate of lime, and displaying to the eye only the white specks of minute Foraminiferous tests, with a few of microscopic size, entire Molluscan shells being rarely embedded. The carbonate of lime consists of Coccoliths, Rhabdoliths, Gasteropod, and Lamellibranchiate shells, Echinoderm fragments, calcareous Algæ, and many pelagic and bottom forms of Foraminifera. The residue consists for the most part of the minerals felspar, magnetite, augite, hornblende, fragments of pumice, scoriæ, and other volcanic rocks, with many glassy fragments, and of a fine argillaceous matter which forms about a third of the rock-substance. Rocks of this character form the masses of Treasury and Ugi Islands.

2. A very friable rock, containing from 30 to 35 per cent. of carbonate of lime. These rocks resemble in their general composition the rocks of the previous group, but they differ in the circumstance that they inclose in great numbers the entire shells of Pteropods, Gasteropods, Lamellibranchiates, together with simple corals of deep-sea genera, and the otoliths of fish. There are contained in the residue, in addition to the mineral particles and fine argillaceous material, a great many glauconitic-like casts of Foraminifera. Rocks of this character largely compose Alu, the principal island of the Shortland Islands, and are exposed in the low hills in the rear of Choiseul Bay.

3. A hard, grey fossiliferous limestone, containing usually about 60 per cent. of carbonate of lime and much volcanic débris. Such a rock, which is exposed in the lower courses of the Treasury streams, is chiefly composed of the broken-down fragments of corals and Lamellibranchiate shells, with calcareous Algæ and a few Foraminifera.

4. Coarse-grained rocks composed of the fragments of volcanic and coral rocks in rounded grains. Occasionally larger fragments, together with shells, are imbedded. Such rocks occur on the northern slopes of St. Christoval near the coast.

The *second class* includes those rocks which are largely composed of coral, Molluscan shells, Foraminiferous tests, and calcareous Algæ, with but a small proportion of volcanic débris. The share that each of these four principal constituents takes in the building up of the rock differs widely, and on this basis the following groups have been made. Whether the rock is mainly formed of the massive corals, or whether it is composed of the fragments of such corals broken off by the waves and mixed with shells and other organisms in varying proportions, such a rock as must be forming on the outer slopes of reefs, or whether it is composed of the consolidated calcareous muds and sands which are found at the bottom of lagoons, it has in all cases the same coral origin. The variety in character exhibited in the following groups of coral limestones may be thus in a great measure explained.

1. Coral rocks, properly so-called, which are merely the massive reef-corals in different stages of fossilisation.

2. Coral rocks, which are chiefly made up of calcareous Algæ, fragments of Molluscan shells, corals, and Echinoderms, the interstices being filled up by the tests of Foraminifera and other small calcareous organisms. In the composition of such rocks, which form *the majority of the so-called coral limestones* in the Solomon Islands, coral fragments take only a secondary part. The percentage of carbonate of lime in these rocks varies between 90 and 95, the residue consisting of the common volcanic minerals, siliceous casts of Foraminifera and a fine argillaceous matter.

3. Chalk-like coral limestones, which contain about 95 per cent. of carbonate of lime, and are chiefly composed of the fragments of Molluscan shells, Echinoderms, corals, calcareous Algæ, and Foraminifera. These rocks, therefore, in their general composition resemble the rocks of the second group of coral limestones; but they differ conspicuously in their chalk-like appearance and in being more friable. They occupy the usual surface position of other coral rocks, although not being of common occurrence. I found them overlying the soft Foraminiferous and Pteropod deposit in the Shortland Islands, and they may be sometimes found forming the central elevated portions of existing reefs. One of the specimens of coral this rock contained, according to a determination made

[1] "Principles of Geology," 12th edit. vol. ii. p. 612

by Dr. Leonard Dobbin, a considerable amount of magnesia, and thus approaches a magnesian limestone.

4. Compact fawn-coloured crystalline limestones of a homogeneous texture, in which sometimes reef débris may be observed. These rocks, which are of common occurrence on the lower slopes of the large island of St. Christoval, where they overlie the volcanic rocks of the district, are apparently formed by the consolidation of the ooze found at the bottom of lagoons inside coral reefs.

5. Foraminiferal limestones, which are hard and compact in texture, and are chiefly made up of pelagic and bottom-living Foraminifera, and contain occasionally a few simple corals of deep-sea genera. They contain generally from 75 to 85 per cent. of carbonate of lime, the residue being formed of the common volcanic minerals, siliceous casts of Foraminifera and fine argillaceous matter. These limestones are found at the surface, and in the island of Alu they may be seen to overlie the soft Foraminiferous and Pteropod deposits.

Such are the calcareous formations which are of most frequent occurrence in the Solomon Islands. Three other highly interesting rocks came under my notice, but in each case only in one locality.

(*a*) A Rhynconella limestone. In one of the islets of the Shortland Islands I found a hard grey limestone composed of numbers of Brachiopod, Gasteropod, and Lamellibranchiate shells, with many simple corals of deep-sea genera, embedded in a calcareous matrix largely made up of the tests of Foraminifera (chiefly pelagic forms). The Brachiopod shells belonged to the same species of Rhynconella. Mr. Davidson is inclined to look upon it as the same as *R. Grayii*, a species hitherto represented by a single specimen discovered in the British Museum amongst other natural history objects from the Fiji Islands (?) collected by Mr. J. M'Gillivray more than thirty years since.[1] The simple corals, as Mr. Quelch informs me, belong to the deep-sea genera, Leptocyathus, Stephanophyllia, Odontocyathus, Flabellum, &c. The Gasteropod and Lamellibranchiate shells are, as I learn from Mr. E. Smith, of shallow-water habit. This limestone contained 75 per cent. of carbonate of lime, the residue being made up of the common volcanic minerals, reddish siliceous casts of Foraminifera, and fine washings.

(*b*) A friable earthy rock, which, from the small size of the minerals, the absence of bottom-living Foraminifera, and the scarcity of pelagic forms, resembles a deep-sea clay, and contains a thin coating of manganese between the small layers or folds of the rock. This deposit, which contains about 20 per cent. of carbonate of lime, occurs in the upraised atoll of Santa Anna underneath the elevated reef-mass. On the reef-flat in the vicinity of this deposit there was observed by Lieut. Malan, as already observed, a detached concretionary block of manganese peroxides, one to two cubic feet in size: a typical fragment that I brought home is, according to Mr. Murray, quite similar to smaller masses dredged by the *Challenger* and *Blake*.

(*c*) A hard Foraminiferal limestone, chiefly composed of pelagic Foraminifera. Of this rock, which was found at the surface in Treasury Island, Mr. Murray observes that the organisms, together with the minerals, are similar to those found in deposits of modern seas near volcanic islands at depths of from 500 to 800 fathoms. The Foraminifera are identical with those found in the surface-waters of the tropics at the present day.

With such data as the foregoing at my disposal, it might appear an easy matter to gauge the amount of elevation that has occurred in these regions in recent times. But so great has been the sub-aërial denudation in these islands that although the elevatory movements have brought up to our view a deep-sea clay, with its concretion of manganese, and a Foraminiferal limestone that was probably formed in a depth of from 500 to 800 fathoms, two rocks which occur in islands at opposite extremities of the group, yet, notwithstanding this great upheaval, the calcareous envelopes usually disappear from the slopes of the volcanic islands at heights of 500 or 600 feet above the sea, and never came under my observation in such islands at greater elevations than 900 feet. The rainfall in the elevated interior of the large islands cannot be much under 300 inches in the year, since my own observations place it at about 150 inches at the coast. Of the rapid degradation of the surface which these calcareous districts undergo during a heavy fall of rain, of as much as two to three inches in the same number of hours, I was a frequent witness. In a few minutes the whole hill-slope discharges a continuous sheet of muddy water, the rivulets swell to turbid streams, and the water rushes down the permanent courses with the roar of a mountain torrent. After the rain-storm has passed away, the band of muddy water that fringes the whole length of the coast, to a distance of one-quarter or one-third of a mile from the shore, indicates the loss of material which the land-surface has sustained.

From the general character of these calcareous formations it may be safely inferred that they will be found wherever there has been elevation during the recent period in regions where coral reefs are flourishing. Amongst other localities we may look to the West Indies, the Indian Archipelago, New Guinea (more particularly the south-coast), New Britain, New Ireland, the Santa Cruz Group, the New Hebrides, the Loyalty Islands, New Caledonia, and the Fiji and Tonga Groups, as likely to possess at the sea-border formations of a similar character. In the Solomon Islands, many other islands, such as Ulaua and Ronongo, will be probably found to be counterparts of the islands of Ugi and Treasury.

NOTE.—A reference should be made to the occurrence of worked flints of the palæolithic type in the soil of the cultivated districts of these islands. The natives say they have fallen from the sky, which reminds one of a similar superstition prevalent in the country districts at home as to the source of celts. I was never successful in finding where they came from originally, and would recommend future visitors to this group to pay attention to this point. They are said to occur together with a chalk-like rock on the beaches of Ulaua, an island which I was unable to visit. (For further information on this subject, *vide* some notes of my own read by Prof. Liversidge before the Royal Society of New South Wales, *Journal* for 1883, vol. xvii. p. 328.)

[1] Vide *Annals and Magazine of Natural History*, vol. xvi. p. 444.

## *TRACING A TYPHOON TO EUROPE*

AT the meeting of the Royal Meteorological Society held on November 18, a paper by Mr. Henry Harries, on "The Typhoon Origin of the Weather over the British Isles during the second half of October, 1882," was read. The author had prepared daily charts of the North Pacific Ocean from September 26 to October 10, and by permission of the Meteorological Council the charts of the area between the western coast of America and Eastern Europe were utilised. The earliest evidence of the formation of the typhoon was on September 27, some distance east-south-east of Manilla. At first the movement was towards north-west, 5 miles an hour, but on September 30, when the storm-area extended to 1300 miles north-west of the centre, it curved towards north-east, crossed the south-eastern corner of Japan at 33 miles an hour, and attained a maximum rate of 51 miles per hour on October 2 to 3, after leaving the Japanese coast. In the neighbourhood of the Aleutian Archipelago the progress was very slow until the 9th, when it rapidly increased to 35 miles an hour, and entered Oregon on the 10th. The Rocky Mountains proved to be no obstacle to the progress of the typhoon, which crossed the range at $36\frac{3}{4}$ miles an hour, and, maintaining this rate, passed