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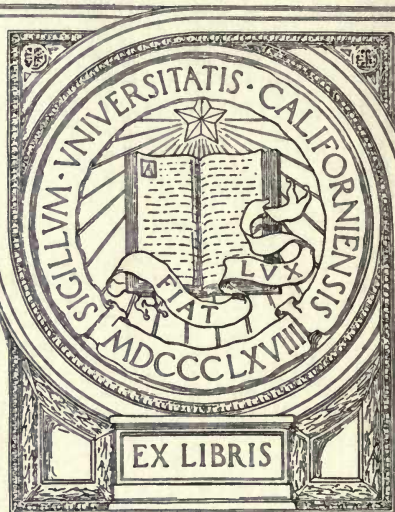
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IN MEMORIAM
George Davidson
1825-1911



Professor of Geography
University of California

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Gen David P. Todd

American Eclipse Expedition to Japan, 1887.

Apr 11/88.

Preliminary Report (Unofficial)

ON

The Total Solar Eclipse of 1887,

BY

DAVID P. TODD, PH. D.,

Director Amherst College Observatory, and Astronomer in Charge
of the Expedition.

AMHERST, MASS.
PUBLISHED BY THE OBSERVATORY.
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NOTE.

Early in the year 1887, the Trustees of the BACHE Fund of the National Academy of Sciences, Washington, made a grant to Professor SIMON NEWCOMB, U. S. Navy, Superintendent of the Nautical Almanac, for observing the total solar eclipse of the 19th August of that year. Professor NEWCOMB having determined the general lines of research to be undertaken, and decided upon locating the observing-station in Japan, appointed me to the charge of the Expedition. Already sufficiently aware that the chances of a cloudless August afternoon in that island country were by no means what an eclipse observer would like, I was the more anxious to undertake collateral work of such nature that, should the eclipse prove a failure, the labors of the Expedition might still accrue to the benefit of science. To this end, I invited Dr W. J. HOLLAND of Pittsburgh, to join the Expedition as naturalist: his preliminary report follows my own. Also, the season of the sojourn of the Expedition in Japan being the favorable period for ascending Fuji-san, the famous sacred mountain of that country, an arrangement was concluded with Professor EDWARD C. PICKERING, Director of the Harvard College Observatory, whereby I was enabled to conduct an astronomical reconnoissance from the summit of the mountain, 12,400 feet high, and obtain data-bearing upon its suitability as a site for astronomical observation. Only passing mention of this separate Expedition is made in the present paper, as the final report to Professor PICKERING will shortly be concluded.

D. P. T.

In memoriam
George Davidson
1825-1911.
Professor of Geography

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Preliminary Report of Prof. David P. Todd,

ASTRONOMER IN CHARGE OF THE EXPEDITION.

The collection and preparation of the instrumental equipment prior to the departure of the Eclipse Expedition from the United States occupied about three weeks—at Washington and Cambridge. The willing co-operation of a number of the offices of the Government is gratefully acknowledged, thereby enabling the Expedition to carry out extensive plans for eclipse-research which, without such aid, would not have been possible, through lack of the necessary instruments. Especially to be mentioned are the U. S. Naval Observatory, Capt. R. L. PHYTHIAN, Superintendent; the U. S. Geological Survey, Major J. W. POWELL, Director; and the U. S. Coast and Geodetic Survey, Mr F. M. THORN, Superintendent. Much needed information was abundantly supplied by His Excellency RIUICHI KUKI, the Japanese Minister Plenipotentiary at Washington.

I left Boston the 9th June for Japan, going by way of Montreal and the Canadian Pacific Railway to Vancouver, the coast terminus, and thence embarking for Yokohama in the steamship 'Abyssinia,' the first west-bound ship of the now regularly established trans-Pacific line owned by the Canadian Company. I desire specially to thank Mr LUCIUS TUTTLE, Passenger Traffic Manager of the Canadian Pacific Railway, who afforded the Expedition such facilities of transit as could only be furnished by the longest existing transportation line under a single management.

Yokohama was reached the 8th July, and steps were at once taken toward locating the instruments in the most advantageous spot. In this connection, I have much pleasure in recalling the highly valued services rendered to the Expedition by His Excellency R. B. HUBBARD, Minister Plenipotentiary of the United States to Japan, and by Dr W. N. WHITNEY, interpreter of the U. S. Legation at Tokio. Every facility desired by the Expedition was promptly afforded

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through the intervention of Count INOUE, the Minister of State for Foreign Affairs, and his courteous secretary, Mr T. SAMESHIMA.

Meteorological indications were only of the most general character, and far from precise. The stations of the Japanese Meteorological Service being all on the coasts, there was little to enable one to form even a fair guess as to what the chances in the interior might be. I have to thank the officers of this service for much assistance, especially Dr E. KNIPPING, the meteorologist of the Imperial Central Observatory at Tokio. On general grounds, he with others thought that the chances of a clear August afternoon were rather better on the west coast, near Niigata, say, than elsewhere. And thither I should doubtless have gone without farther enquiry, but that the means of sea-transportation were uncertain, while the journey by pack-horse over the mountains of western central Japan seemed, with the weighty boxes, in every way inexpedient.

As I had abundant time, I determined upon a hurried reconnoissance of eastern central Japan, along the line of the Japanese Railway Company, then extending northward from Tokio through Utsunomiya (65 miles) to Shirakawa (113 miles), and now open as far as Fukushima and Sendai. The President of the Company, the Hon. L. NARABARA, I have great pleasure in thanking for his courteous offices on this and subsequent occasions. And no less, Viscount M. ENOUE, the Chief Commissioner of the Imperial Railway Bureau. The region between Utsunomiya and Shirakawa was, in my judgment, very unsuited for an eclipse station, on account of its broken and hilly character, and the proximity of the mountain ranges lying west. I found Utsunomiya itself situate in a broad plain, and apparently very favorable meteorologically, but too far from the line of central eclipse; while Shirakawa was as nearly as desirable in the central line (some ten or twelve miles north of it), and twenty-five or thirty miles from the mountains to the west—far enough, it seemed, to be without the range of their perturbing effect upon the clearness of the sky.

At any rate, a careful balancing of the *pros* and *cons* for all likely stations led to my decision that Shirakawa was the best place for the location of at least the greater part of the instrumental equipment. Professor PICKERING, who provided the Expedition with most of its apparatus for specialized research upon the corona, desired me, if practicable, to place all or a portion of it on the summit of one of the mountain-peaks, of which there are several adjacent to the centre of

the shadow-path, notably Nantai-san, 8,500 feet high. Dr HOLLAND made the ascent of this mountain ; but his report of its difficulties, together with the highly probable cloudy condition of the summit at the time of the eclipse, led me to abandon the mountain project. The other peaks were too far away from the central station to permit of occupation, with the time and assistance at my disposal. The entire apparatus, therefore, was brought to Shirakawa, and the work of preparation actively begun four weeks before the day of the eclipse. For determining the longitude of the station, all necessary telegraphic facilities were courteously afforded by Admiral T. ENOMOTO, the Minister of the Department of Communications, and Mr IGARASHI, electrical engineer ; while the requisite exchange of signals was effected with the Naval Observatory at Tokio, through co-operation with Rear-Admiral N. YANAGI, Hydrographer of the Navy.

I was most fortunate in having from Lieut.-General Count OYAMA, the Minister of State for the Army, permission to establish my station on the ruin of the celebrated old castle occupied by the ABE family until the revolution of 1868. Count OYAMA also ordered the execution of a topographic map of the environs of the castle, and the survey was duly conducted by Lieut. YAJIMA. Throughout our sojourn at the castle, the greatest assistance was generously rendered us by the Hon. H. ORITA, the Governor of Fukushima-ken. Our main instrument was a horizontal photoheliograph of nearly forty feet focal length—the identical apparatus used by Professor NEWCOMB in 1882 at the Cape of Good Hope, in photographing the transit of Venus. Two weeks' time was quite sufficient for the substantial completion of this instrument, in so far as the parts required for photographing the partial phases of the eclipse were concerned. Of these we had planned to secure 100 pictures ; but I had determined also to attempt coronal photography with the same apparatus, hoping to obtain eight or ten negatives of the corona of such size that subsequent enlargement would be undesirable. At the focus of this telescope the sun's image has a diameter of four and a half inches, and dry plates 17 x 20 inches had been provided for this work ; and an extra mirror, finely silvered by BRASHEAR, was taken along for the heliostat, to replace the unsilvered reflector ordinarily employed, shortly before totality. Special modifications of the exposing-shutters and the plate-holders had to be made, and a light-proof tube or camera the whole length of the telescope had to be constructed, before the complete drill for the eclipse could begin, and this required a week or ten days more. As

was anticipated, too, we found on photographing artificial crescents—very slender ones—that no image of the plumb-line appeared on the plate: there was thus no initial line of reference for the measurement of position-angles. Mr HITCHCOCK, whom I had appointed photographer of the Expedition, undertook a variety of experiments to overcome this difficulty, and with entire success. The form of apparatus eventually adopted will be detailed in the final report of the Expedition.

To assist in the operations of the photographic house, we were fortunate in securing the services of Mr K. OGAWA of Tokio, a Japanese photographer of wide experience, and Dr Y. MAY KING of Amoy, also a highly skilled manipulator. For some minutes immediately before the beginning and after the end of totality, the partial phase exposures were to be made every 15 seconds; while the large plates for the corona, with exposures varying from 1 second to 15 seconds were to be handled as rapidly as possible. We found that there was a loss of about 5 seconds between the plates—or something like one-sixth the entire duration of totality. With so efficient a photographic corps, and the drill which we all underwent, I had the best of reason for anticipating complete success. As wet plates seemed in many ways preferable to dry ones for the partial phases, the photographers undertook a thorough series of experiments in preserving sensitized films, at first with glycerine, and subsequently more successfully with sugar. The results of this work make the wet plate, with its fine-grained film, as available for rapid manipulations in the photography of celestial phenomena, as the dry plate has hitherto been found to be. It was shown that the plates might with entire safety be removed from the sensitizing bath from two to four hours before exposure and development, if treated with the sugar preservative, and proper precaution was taken to keep the films from drying. The details of this process will be embodied in the definitive report of the Expedition. As an extreme test, we exposed, on the day after the eclipse, a box of plates which had been sensitized and preserved some twenty-six hours previously, and found that they gave sun-pictures photographically perfect.

Shortly before the Expedition left America, the Hon. W. C. WHITNEY, Secretary of the Navy, detailed two officers from the Asiatic Squadron, U. S. S. 'Monocacy,' to join me on my arrival in Yokohama. Lieut. W. H. H. SOUTHERLAND and P. A. Engineer J. PEMBERTON accordingly reported for eclipse-duty, and their services were

zealously and most effectively rendered. In addition to his work as executive officer, I placed Lieut. SOUTHERLAND in charge of the 9-foot coronagraph sent out by the PICKERINGS. The objective of this instrument was the $7\frac{1}{4}$ -inch CLARK glass of the equatoreal of Amherst College Observatory; while the dry plates, with the instructions for their manipulation, were identical with those furnished by the PICKERINGS to Professor YOUNG, who carried to his Russian station the $6\frac{5}{8}$ -inch MERZ glass, of the large transit instrument at Amherst. Through clouds at both Professor YOUNG's station and my own, the first serious attempt to obtain reliable evidence of rapid changes in the corona has come to naught: it will be many years before another eclipse occurs with two stations geographically so well placed for this special research as were Russia and Japan. Lieut. SOUTHERLAND also looked after the mounting of Professor PICKERING's double coronagraph—two five-inch lenses of about three feet focus, the operation of which was entrusted to Dr AMES, U. S. Navy; while Dr D. B. McCARTEE attended to the exposures with the 4-inch short-focus camera; and Mr C. R. GREATHOUSE, U. S. Consul General at Kanagawa (Yokohama), to the exposures of plate-holders for determining the actinic effect of the coronal light. I should have mentioned previously the important service of Mr PEMBERTON in rendering the photoheliograph less unwieldy for rapid work than I had found it formerly. I had long had the idea that, by means of a system of light rods, or of cords and pulleys, led from the heliostat into the photographic house, the chief astronomer making the exposures might have the reflecting mirror under his immediate and constant control, and thus dispense with the customary assistant at the heliostat pier for adjusting the mirror in right ascension and declination. All the devices for this rather complex system were practically executed by Mr PEMBERTON, and sufficed to give me perfect command of the mirror from the dark room. A very simple device made it possible to see the bright reflected image of the sun while at my post in the dark room, and adjust it accurately on the plate, without opening the exposing-slide.

The importance of NEWCOMB's and LANGLEY's observations of the outer corona in 1878, and attempted by LOCKYER in 1886, had not escaped me, and I had an occulting-disk mounted on a rod attached firmly to the gable of the photographic house, so that its shadow as cast by the eclipsed sun would fall about fifty feet away, in the area enclosed by the upper castle wall. Here I stationed Mrs. TODD, as-

sisted by Professor KIKUCHI, of the Imperial University, and provided with all the paraphernalia for seeing and sketching in their correct relations the faint, outlying streamers of the corona.

Of two $3\frac{1}{2}$ -inch BECK telescopes lent by Admiral YANAGI, one was reserved for the optical observation of first and fourth contacts, and the search for intra-Mercurial planets, while the other was committed to Dr HOLLAND with instructions to sketch as far as possible all the details of the corona adjacent to the solar poles.

Mr NAKAGAWA, Director of the Naval Observatory, with his assistant Mr SHIRAI, made a thorough series of meteorological observations throughout the eclipse period, following the system elaborated by VON BEZOLD, and recommended by the German meteorological conference for the observers in Russia. On the north-west corner of the castle wall I stationed Mr K. AÇINO, a student of astronomy in the University, and interpreter to the Expedition by the kind direction of President H. WATANABE, of the Imperial University: he was to make detailed and precise observations of the diffraction bands, and to observe, if possible, the sweep of the lunar shadow across the extensive rice-fields below; also, to observe the period of visibility of the corona after totality.

The purely eclipse-results of the work at Shirakawa were disheartening in the extreme. The forenoon gave us a perfect sky, with no indication whatever of approaching cloud: all were confident of entire success. But about an hour before the time of first contact, a slender finger of cloud began to rise from the west, coming at first directly above the summit of Nasu-take, a volcano about 25 miles away, and which had sprung into unwonted activity during the past night, belching forth for hours enormous volumes of smoke and steam. The sun was entirely invisible during the first half-hour of the eclipse, when a brief interval of partly clear sky gave time for adjusting the heliostat and making ten or twelve exposures. The sun being very faint, only five of these photographs are available for measurement, and these were the only pictures that could be taken with the photoheliograph. The dense clouds, leaving a large clear area most of the time about the zenith, lay over the sun until the eclipse was past, save only a moment shortly after totality, when there was a partial clearing, but too brief and the sun too faint to allow of the necessary adjustments of the silvered mirror, which had been put into position in the vain hope of getting the whole or a part of the total phase. As totality drew near, it suddenly occurred to

me that a good observation of second contact might be possible by watching for the approach of the moon's shadow among the clouds; but my attempt to do this failed, the light appearing to me too much diffused to permit of anything better than a rough approximation to the time of contact. I found subsequently, however, in Mrs. Todd's notes on the eclipse, the statement that totality appeared to her to come on, not evenly, but as if by jerks—a phenomenon which may, I think, have been due to the extinction of the sun's light from one cloud after another as the lunar shadow advanced over the north-western sky.

The weather-maps for the 19th August, which came to our station from Tokio the day after the eclipse, gave us some idea of the odds we had been laboring against: the sheet for 2 P. M. showed clouds at all stations of the Meteorological Service except one, and that far removed from the belt of totality. In general, the whole of the main island was obscured on the eventful afternoon; and a view of the eclipse was permitted only to those so fortunate as to be located in the line of the small apertures, here and there, through the general cloud area. These were numerous enough to enable voluntary observers, scattered all over the central portion of the belt of totality, and for whom I had prepared instructions, to obtain a goodly number of drawings of the corona. These instructions had been translated into Japanese, and printed and distributed through the co-operation of the Department of Education, and the Bureau of Topography of the Department of the Interior. Altogether there are something like a hundred such drawings, but their value is uncertain. Among the latter sketches of the corona was one made in western Japan by Mr S. ISAWA, of the Department of Education, and which has already been reproduced in *Nature*, for the 17th November last. I prepared also instructions for observers of simple duration of totality, hoping to obtain additional data for the position and direction of motion of the moon's shadow. These were amply distributed under like auspices to a large number of observers just inside the limits of the shadow-path.

Other expeditions in Japan fared ill also—some of them worse than my own. That sent out by the University in charge of Professor TERAO, and located a few miles south of Shirakawa, at Kuroiso, experienced not only heavy clouds but much rain during the eclipse, and no observations could be made. At Sanjo, on the central line and south-east of Niigata, Professor ARAI, Director of the Imperial

Meteorological Central Observatory, was able to make successful exposures for the corona with a small telescope; his negatives had not yet reached Yokohama on my departure, and had not been developed.* It was reported clear during the whole of the eclipse at Choshi, a point on the eastern coast near the southern limit of total obscuration; but there were no observers or instruments there for scientific work. It was reported cloudy throughout the whole eclipse at Niigata; while a party of observers who had ambitiously climbed to the top of Nantai-san, brought down a record of nothing but clouds and fog. On the whole, Japan appears to have been an uncanny spot to lead an eclipse-track across. This condition of things was apparently suspected by Mr MORIOKA, the President of the Nippon Yusen Kaisha (Japan Steamship Company,) who organized a large excursion party which sailed in the 'Nagoya-maru' for a point in the belt of totality off the east coast of Japan; but they were debarred from a view of all except the first part of the eclipse, and missed seeing totality completely, although possessed of the unique advantage of an observing-station variable in position at will.

Happily, however, there is much to retrieve the sorry fortune of the Expedition on the 19th August. As appears in the pages following, Dr HOLLAND was actively engaged in botanical and entomological research in fruitful fields, and has a good harvest to report upon. He has also valuable notes upon his ascent of Nantai-san, Asama-yama and Nasu-take, which will be embodied in the report on the ascent of Fuji-san. Finally, the Expedition to the summit of this latter mountain, which I had the pleasure to carry out under the auspices of the BOYDEN Fund of the Harvard College Observatory, and on which I had the valued co-operation of Dr KNIPPING, resulted among other things in the determination of its rare fitness as a site for astronomical observation. Preliminary to its occupation as such, however, it is most desirable, in the interests of both meteorology and astronomy, that a meteorological station should be maintained on the summit throughout the entire year if practicable. There is good reason for the hope that this may now be done, in connection with the recent extension of the field of operations of the Imperial Central Observatory, already well progressed.

*Prints from three of these negatives just received show abundant detail of the inner corona.—D. P. T. 18th January, 1888.

Preliminary Report of Dr W. J. Holland, NATURALIST OF THE EXPEDITION.

PROF. DAVID P. TODD,

In charge American Eclipse Expedition to Japan,

DEAR SIR:—

In pursuance of your request, I submit as early as possible a preliminary report upon the results of my labors as the naturalist of the Expedition.

It became evident to me shortly after our arrival in Japan that it would be advisable to restrict my efforts in the direction of securing specimens of natural history to the domains of botany and entomology. I was led to this conclusion by the fact that the authorities refused to allow me permission to use a gun outside of treaty limits, thus practically prohibiting all attempts to collect the birds and animals of those localities in the interior which I subsequently visited; and also by the fact that the vertebrate fauna of Japan has been already quite thoroughly explored by those who have had more abundant opportunity to collect specimens and study the habits of the living creatures than I could hope to have in the brief stay which we contemplated.

Acting upon this conviction, I secured, with the assistance of Mr E. H. R. MANLEY, and Mr H. PRYER, suitable native assistance, and addressed myself with diligence to the task of collecting the plants and insects of those regions which I visited. The work of the botanist went on almost daily—the work of the entomologist by day and by night. The gross result is a collection of fully 4,000 botanical specimens, representing nearly 800 species, and fully 6,000 entomological specimens representing about 1,200 species, mainly Lepidoptera and Coleoptera. In addition to these collections made under my own direct supervision, I obtained by purchase and exchange a number of desirable specimens from resident collectors. My most

notable acquisition in this way is the entire collection of the Pyralidæ of Japan made by Mr H. PRYER, representing the labors of nearly seventeen years, and containing nearly 4,000 specimens of more than 375 species, the larger part of them as yet undetermined and possibly new to science. I have been unable as yet to attempt even a rude classification of the insects of other orders which I have brought home with me, but have succeeded in roughly analyzing the collections of Lepidoptera. These are distributed among the following groups:—

(1) Rhopalocera (butterflies proper)	127	Species.
(2) Uraniidæ	2	“
(3) Sphingidæ	20	“
(4) Ægeriadæ	7	“
(5) Thyridæ	1	“
(6) Zygænidæ	6	“
(7) Bombycidæ	120	“
(8) Noctuæ	145	“
(9) Geometridæ	135	“
(10) Pyralidæ	377	“
(11) Tortricidæ	60	“
(12) Tineidæ	17	“
	<hr/>	
Total of Species	1017	

The Coleoptera represent fully 375 species. The Hemiptera, Orthoptera, Neuroptera and Hymenoptera amount to fully 75 species in addition. The grand aggregate of species contained in these collections is fully 1,450, and the total number of specimens over 10,000. There are abundant duplicates of many of the commoner species, but there are fully 100 species which are represented by only one specimen.

The collections I bring with me were made in the following localities:

- (1) Yokohama and vicinity.
- (2) Tokio and vicinity.
- (3) Nikko and the slopes of Nantai-san.
- (4) Usui-toge, Oiwake, and the slopes of Asama-yama.
- (5) Slopes of Nasu-take.
- (6) Shirakawa and vicinity.
- (7) Hakone Mountains and the slopes of Fuji-san.
- (8) Vicinity of Kobe, Osaka, Nara and Kioto.
- (9) Nagasaki and vicinity.

The collection of the Pyralidæ purchased from Mr PRYER covers the entire group of the Japanese Islands, including the Loo-Choo and Bonin Islands. It is arranged in accordance with the "Check-list of the Japanese Lepidoptera" published a few years ago by Mr PRYER in the "Transactions of the Asiatic Society of Japan," and contains typical specimens of many of the forms described in recent years by Mr A. G. BUTLER of the British Museum.

In this connection, permit me to suggest the desirability of promptly utilizing this precious material in the preparation and publication of a work upon the Lepidoptera of Japan. I believe that I might count with certainty upon the assistance of Mr PRYER in the preparation of a monograph of the Pyralidæ, if not of the other groups. Such a work has never been attempted hitherto. The close relationship which manifestly subsists between the insect fauna of the Eastern United States and of Japan would lend great scientific interest to such a paper, and its completion under American auspices might in a measure atone for the disappointment we have mutually felt on account of the somewhat meagre results, which, through no fault of yours, followed the astronomical labors of the Expedition during the eclipse.

As to my botanical collections, I am not prepared to speak definitely as yet; but in view of the very thorough manner in which the flora of Japan has been studied in recent years, I regard it as quite unlikely that I have brought with me any species new to science and hitherto undescribed. The wonderful affinity between the flora of the United States and of Japan is strikingly brought forth in these collections, which were mainly made upon the mountain slopes and more elevated regions of the country.

My attention having been attracted to the manner in which fruit-trees, and especially peach-trees, in Japan are subject to the depredations of insect pests, I took occasion just before leaving the country to lay before the Hon. R. B. HUBBARD, our Minister Plenipotentiary, a brief paper in which I pointed out the importance of having the attention of the Japanese authorities called to the enormous loss to which the agricultural community of the Empire must annually be subjected from this source, as well as to the sanitary evils which follow from the universal custom of gathering and marketing fruit in an unripe and unwholesome condition. It is alleged that this custom is due to the fact that fruit, if allowed to mature, is always destroyed by insects. I took occasion to point out certain simple precautions

against insect ravages, and to urge the passage of laws against the destruction of insectivorous birds. I farther urged the expediency of restricting, or of prohibiting, the importation of growing plants from Japan, as there is reason to fear that various species of insects hostile to our fruit-crops may thus be introduced into the United States. The receipt of this paper was courteously acknowledged by Mr HUBBARD, and the reception of a copy of it was later acknowledged by the Japanese Prime Minister, Count Ito, who stated that it had been transmitted to the Department of Agriculture for due consideration.

While at Nikko I succeeded in making a few highly interesting observations upon the habits of a species of frog which deposits its eggs at the ends of willow branches overhanging pools of stagnant water, enclosing them in a viscid secretion, in which they are hatched, and in which the tadpoles undergo their primary transformations. I am aware that the *Chiromantis Guineensis* of West Africa deposits its eggs in albuminous masses among the leaves of trees overhanging watercourses. During the dry season these masses are said to become quite hard, but upon the advent of rains, it is reported that they soften and fall into the water, where the tadpoles are then hatched forth and undergo their transformations. At Nikko the masses of frothy, viscid matter, which I found suspended upon the branches, were discovered upon opening to be filled, not with eggs, but with exceedingly vigorous and lively tadpoles, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length. My knowledge of the subject is not such as to justify the statement that this is a phenomenon hitherto unobserved; but in the course of extensive reading upon the subject, I have never as yet fallen in with an account of arboreal tadpoles such as those I have brought home with me.

In addition to my botanical and zoological labors, I had the pleasure of ascending four of the volcanoes of Japan, two of them, Nantai-san and Fuji-san extinct, two of them, Asama-yama and Nasutake active. The latter volcano I believe I have the honor of being, with one possible exception, the first foreigner to have scaled. I was assured by a number of the people residing at Yumoto,* from which the ascent is made, that I was the first foreigner who had ever visited the mountain; but upon my return to Tokio, I was informed by our mutual friend Dr KNIPPING that "somebody else had made the ascent a couple of years ago." There is at least a tradition to this

*Not to be confounded with Yumoto near Chlu-sen-ji.

effect preserved at Tokio, and in deference to it, I waive the claim to be the first explorer of this highly interesting peak.

As you will recall, my ascent of Nantai-san was made at your request, in order to ascertain its fitness as a location for the Eclipse Expedition. I was accompanied by our friend, Dr W. N. WHITNEY, the interpreter of the American Legation, whose services had been kindly placed for the time being at the disposal of the Expedition by the Hon. R. B. HUBBARD. We left Nikko the morning of the 18th July; passed the night at Chiu-sên-ji, and accomplished the ascent of the mountain upon the morning following, starting at 2 A. M. and reaching the summit at 7 A. M. It is not my intention here to give a detailed account of my observations; but it suffices to say that, owing to the difficulty of reaching the summit, the great risks which would in consequence have attended the transportation of delicate scientific apparatus to the spot, and the total absence of all supplies of water upon the mountain, my report to you was adverse to the location of even a part of our Expedition there. Results proved the essential wisdom of this decision, as the hopeful spirits who climbed the mountain upon the day of the eclipse found themselves even less favorably located than we were at Shirakawa, and were forced to content themselves with a bath in a black bank of fog.

I made the ascent of Asama-yama upon the 1st of August, starting from Oiwake at 7 A. M. and reaching the summit at 12:30 P. M. I was accompanied by my native assistant, TORA-SAN, and Mr H. SATOMI, an exceedingly intelligent young Japanese gentleman who is pursuing his studies at Tokio, and who, speaking German fluently, enabled me to acquire much information that otherwise would have been lost to me. In addition we were accompanied by several of the friends of Mr SATOMI, resident in Oiwake, and a number of coolies, who acted as guides and porters. We were favored with a cloudless sky during the afternoon, and remained upon the summit until 4 P. M. The time was spent in an examination of the crater, and in sketching its salient features. The drawing of the crater I have brought with me is, I have reason to believe, one of the first which has been attempted by a foreigner, and I know of none from the hands of any Japanese artist, though I made inquiry in the hope of securing such a drawing did it exist.

The excursion from Shirakawa to the summit of Nasu-take and return occupied four days, from the morning of the 12th of August to the evening of the 15th. The ascent of the cone took place upon

the 13th of August. The volcano is active, and from numerous vents near the summit vast bodies of steam and sulphur smoke are being discharged. An eruption of considerable magnitude occurred in 1880; and upon the north-western side are impressive evidences of the havoc and devastation occasioned by the event. I spent fully six hours about the cone, and brought away with me a series of six sketches conveying a general idea of the configuration of the crater and the solfataras, of which there are several upon the mountain.

Of the ascent of Fuji-san, made in your company, it is not necessary to say anything in this report.

In conclusion, I desire to express to you my sincere appreciation of your kind invitation to accompany the Expedition as its naturalist. I was thereby furnished with a forcible pretext for temporarily forsaking professional cares and duties, and given an opportunity of studying much with which I had become in a measure familiar through reading, but which, after the manner of those who rely only upon books, I did not thoroughly comprehend. While thanking you for the kindness experienced at your hands, I cannot fail also to express my sense of deep obligation to the host of friends whom we met in Japan, both natives and resident foreigners, who did everything in their power to make our stay pleasant, profitable and instructive.

I have the honor to be, dear sir,

Yours, most respectfully,

W. J. HOLLAND.

Pittsburgh, Penn., 15th December, 1887.

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