VARIOUS

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Содержание

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HOW MY NEW ACQUAINTANCES SPIN

The strictly professional man may have overcome his natural aversion to some of the most interesting objects of his study, such as snakes, and toads, and spiders, and vermin of all kinds; but people in general have always required that any attempt to force such abominations upon their notice should be preceded by a more or less elaborate and humble acknowledgment of their hideous aspect, their ferocious disposition, their dark and bloody deeds, and the utter impossibility of their conducing in any way to human comfort and convenience.

But, while admitting the truth of much that has been thus urged against spiders as a class, I must decline, or at least defer, conforming to custom in speaking of the particular variety which

we are about to consider, and I believe that it will need only a glance at the insect and its silk, and a brief notice of its habits, to justify my indisposition to follow the usual routine.

Without apology, then, I shall endeavor to show that in the structure, the habits, the mode of growth, and, above all, in the productions of this spider are to be found subjects worthy the attention of every class of minds; for to the naturalist is exhibited a species which, though not absolutely new to science, was never seen nor heard of by Professor Agassiz till the spring of 1865, and which is so narrowly circumscribed in its geographical distribution that, so far as I can ascertain, it was never observed by Hentz,—a Southern entomologist, who devoted himself particularly to spiders,—and is met with only upon a few low, marshy islands on the coast of South Carolina, and perhaps of other Southern States. Its habits, too, are so interesting, and so different in many respects from those recorded of other species, that the observer of living creatures has here an abundant opportunity, not only for increasing his own knowledge, but for enlarging the domain of science. And this more especially in America; for while, in England, Blackwall and others have been laboring for more than thirty years, spiders seem to have received little attention on this side of the Atlantic.

We have now, moreover, in our observation of these insects, an incentive of sovereign effect, namely, the hope of increasing our national wealth; for to the practical man, to the manufacturer and the mechanic, is offered a new silken material which far

surpasses in beauty and elegance that of the silk-worm, and which, however small in quantity at present, demands some attention in view of the alarming decrease in the silk crops of Europe. This material is obtained in a manner entirely new,—not, as with the worm, by unwinding the cocoons, nor yet, as might be suggested for the spider, by unravelling the web, but by *drawing* or *winding* or *reeling directly from the body of the living insect*, even as you would milk a cow, or, more aptly, as wire is pulled through a wire-drawing machine.

To the admirer of the beautiful and perfect in nature is presented a fibre of absolute smoothness, roundness, and finish, the colors of which resemble, and in the sunlight even excel in brilliancy those of the two precious metals, silver and gold; while the moralist who loves to illustrate the workings of God's providence in bringing forth good out of evil, by comparing the disgusting silk-worm with its beautiful and useful product, may now enforce the lesson by the still more striking contrast between this silk and the loathed and hated spider.

The statesman who, after a four years' war, sees few indications of a better spirit on the part of the South, and is almost ready to exclaim, "Can any good thing come out of Nazareth?" may now perhaps discern a spot, small indeed, but brilliant, on the very edge of the dark Carolina cloud; and it may not be too much to hope that, in course of time, the cords of our spider's golden and silver silk may prove potent bonds of union with the first of the rebellious States.

As to the mathematician who believes in the inborn tendency of mankind to variation and imperfection, and holds up to us, as shining examples of mathematical accuracy, the work of certain insects, and who—since Professor Wyman has shown that the hexagonal form of the bee's cell is not of original design, but rather the necessary result of difficulties met and overcome in the most economical manner, though by no means always with perfect exactness and uniformity—has fallen back upon the ancient and still prevalent belief in the precise construction of the spider's web, (which, as will be seen, really displays it no more than does the bee's cell,)—to this disappointed man of geometry and figures is now offered the alternative of either finding a new and truer illustration, or of abandoning his position entirely.

Let us, then, wait till we have seen this spider and heard his story. *His* story! That reminds me of another class which may possibly be represented among my readers, and whose members, in the contemplation of the domestic economy of these insects, will, I fear, discover many and weighty arguments in favor of the various opinions entertained by the advocates of Woman's Rights; for here is a community in which the females not only far exceed the males in number, but present so great a contrast to them in size and importance, that, but for absolute proof, they never would be regarded as belonging to the same species.

Here, then, is a life-size picture of our spider and of—I was about to say, *his* partner; but in truth it is *she* who is *the* spider, and *he* is only *her* partner. Such is the real physical, and, so to speak,

mental superiority of the female, that, even if we insist upon the legal equality at least of the masculine element, we can do so only in name, and will find it hard to avoid speaking of him as the male of the *Nephila plumipes*, thus tacitly admitting her as the truer representative of the species. Their relative size and appearance are shown by the figures; but it may be added that she is very handsome; the fore part of her body, which, being composed of the head and chest soldered together, is termed *cephalothorax*, is glossy-black and covered, except in spots, with white hairs; she has also upon six of her legs one or two brushes of black hairs;—while he is an insignificant-looking insect of a dull-brown color and half-starved look, with only a few scattered bristles upon his slender limbs. He does nothing for himself, leaving her to make the web and provide the food, and even to carry him on her back when removal is necessary; but she makes up for the imposition by keeping him on short allowance and at a respectful distance, excepting when the impregnation of her eggs is necessary; and even then she is mistress of the situation, and, *etiam in amoribus sæva*, may afterward eat him up. But of this contrast between the two sexes, of their functions and their relations to each other, more hereafter. It is sufficient to observe that, when this spider is mentioned, and the sex is not specified, the *female* is always referred to.

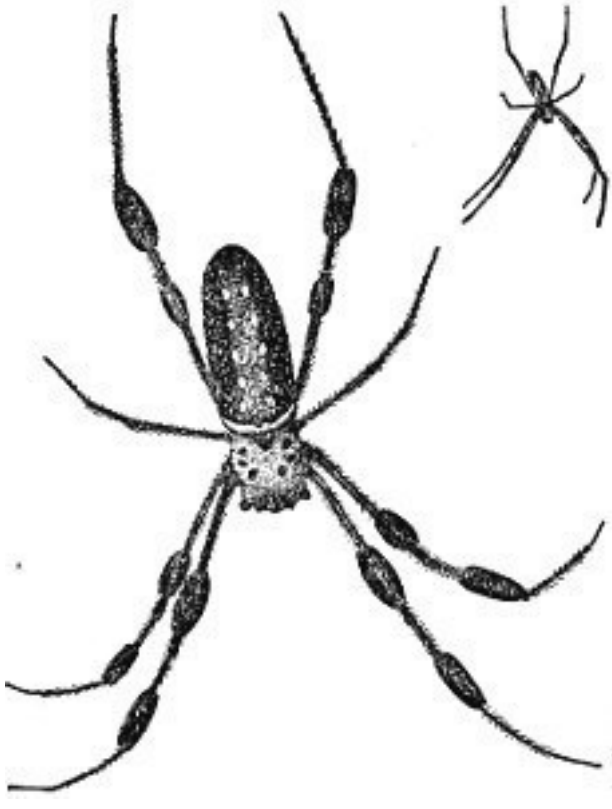

Fig. 1. Male and Female Nephila plumipes.

When, where, and how was this spider discovered? and why is it that we have never heard of it before? To answer these questions, we must go back three years, to the 19th of August, 1863, and to the camp of the Fifty-fifth Regiment of

Massachusetts Volunteers, on a desolate island a little south from the harbor of Charleston, South Carolina, and in sight of the fortress which Gillmore had just begun to strengthen by the addition of tons of Union shot and shell, till, from tolerably strong masonry, its walls became solid earthworks which nothing could pierce or greatly injure. There, at the north end of Folly Island,—scarce wider than our camp at that point, and narrower than the magnificent beach which, at low tide, afforded ample space for the battalion drill,—I found in a tree a very large and handsome spider, whose web was at least three feet in diameter.

Glad enough to meet with anything new, and bearing in mind the interest with which, when a boy, I had watched and recorded the operations of our common house and hunting spiders, I entangled him—I didn't then know it was *her*, so let it pass—in the web, and carried it to my tent. The insect was very quiet, and did not attempt to escape; but presently, after crawling slowly along my sleeve, she let herself down to the floor, taking first the precaution, after the prudent fashion of most spiders, to attach to the point she left a silken line, which, as she descended, came from her body. Rather than seize the insect itself, I caught the thread and pulled. The spider was not moved, but the line readily drew out, and, being wound upon my hands, seemed so strong that I attached the end to a little quill, and, having placed the spider upon the side of the tent, lay down on my couch and turned the quill between my fingers at such a rate that in one minute six feet of silk were wound upon it. At the end of an hour and

a half I estimated, with due allowance for stop-pages, that I had four hundred and fifty feet, or *one hundred and fifty yards*, of the most brilliant and beautiful golden silk I had ever seen.

During all this operation the spider had remained perfectly quiet, but finally put an end to my proceedings by grasping the line with the tip of one of her hind legs so that it snapped. I was tired, however, and contented myself with the quantity already obtained, which now formed a raised band of gold upon the quill. This specimen is now in my possession, but has been removed from the quill to ascertain its weight, which is one third of a grain.

It is worthy of notice, perhaps, that in all this was involved no new *fact*, but only a happy deduction from one known ages ago; namely, that a spider, when dropping, leaves her line attached, and so allows it to be drawn from her body. Nothing was more natural than to simply reverse the position of the fixed point, and, instead of letting the spider go away from the end of her line, to take the end of her line away from her. So natural, indeed, did it seem, that my gratification at having been (as was then supposed) the first to do it was, on reflection, mixed with surprise that no one had ever thought of it before, and I am very glad to find that at least *four* individuals have, within the last century, pulled silk out of a spider, though of these only one, whose researches I hope to make known, regarded the matter as anything more than a curious experiment.

I had never before seen such a spider, nor even paid attention to any geometrical species; though one large black and yellow

variety is, or used to be, common enough in our fields at the North. Neither had I ever heard of such a method of obtaining silk. But though my first specimen was not preserved, and a second was never seen on Folly Island, yet I was so impressed with its size and brilliant colors, and especially with the curious brushes of black hairs on its legs, that when, during the following summer, another officer described to me a great spider which was very common on Long Island, where he was stationed, I knew it was the same, and told him what I had done the year before, adding that I was sure something would come of it in time.

With leisure and many spiders at his command, this officer improved upon my suggestion, by substituting for my quill turned in the fingers a wooden cylinder worked by a crank, and by securing, at a proper distance, (between pins, I think,) one or more spiders, whose threads were guided between pins upon the cylinder. He thus produced more of the silk, winding it upon rings of hard rubber so as to make very pretty ornaments. With this simple machine I wound the silk in two grooves cut on a ring of hard rubber and parallel except at one point, where they crossed so as to form a kind of signet. Another officer now suggested and put in operation still another improvement, in the shape of the "gear-drill-stock" of our armorer's chest. This, being a machine for drilling iron, was rough in its construction and uneven in its action, but, having cog-wheels, a rapid and nearly steady motion could be given to its shaft. To this shaft he

attached a little cross of rubber, and covered it with silk, which was of a silver-white color instead of golden-yellow, as in other cases. The difference in color was then supposed to depend upon individual peculiarities, but the true explanation will be given farther on. With this gear-drill-stock, upon a larger ring, one inch in diameter and three eighths of an inch in width, in a groove upon its periphery one fourth of an inch in width, and across the sides of the ring in two directions, I wound *three thousand four hundred and eighty-four yards*, or *nearly two miles, of silk*. The length was estimated by accurately determining the different dimensions of the ring where wound upon, and multiplying by this the number of revolutions of the cylinder per minute (170), and this product again by the number of minutes of actual winding (285), deducting from the gross time of winding (about nine hours) each moment of stoppage for any cause.

This was late in the fall of 1864, and, our specimens being sent home, further experiments, and even thoughts upon the subject, were prevented by the expedition against the Charleston and Savannah Railroad, and the many changes of station that followed the disastrous battle of Honey Hill. But, when I was at the North in February, 1865, a friend expressed to me his confident belief that this new silken product could be made of practical utility, and advised me to make inquiries on the subject. So, before presenting it to the scientific societies, I tested the strength of the silk by attaching to a fixed point one end of a thread *one four-thousandth* of an inch in diameter, and tying the

other end upon the arm of an accurate balance: weights were then dropped in to the amount of *fifty-four grains* before the line was broken. By a calculation from this, a solid bar of spider's silk, one inch in diameter, would sustain a weight of more than *seventy tons*; while a similar bar of steel will sustain only fifty-six, and one of iron twenty-eight tons. The specimens were then exhibited to Professors Wyman, Agassiz, and Cooke, of Harvard University, to all of whom the species of spider was unknown, though Professor Wyman has since found a single specimen among some insects collected at the South; while to them as well as to the silk-manufacturers the idea of reeling silk directly from a living insect was entirely new. The latter, of course, wished to see a quantity of it before pronouncing upon its usefulness. So most of my furlough was spent in making arrangements for securing a number of the spiders, and reeling their silk during the coming summer. These comprised six light wooden boxes with sliding fronts, each eighteen inches wide and high and one foot deep, and containing six tin trays one above another, each of which, again, held twenty-four square paper boxes two and a half inches in diameter, and with lids closed by an elastic. Into these the spiders were to be put for transportation. Then I had made a costly machine for reeling the silk, which, however, proved of no practical value.

In March, with these and other real or fancied adjuvants, (some of which proved even less useful and trustworthy than the machine,) but, above all, with a determination to put this

matter to the test of actual experiment, I rejoined the regiment at Charleston, which had just fallen into our hands. It was not until April, however, that we were so situated that I could make any attempt to get spiders. Of course it was not expected that the full-grown ones should be found at that season, but the eggs or young should be abundant where the spiders had been in the summer.

Before recounting my adventures in pursuit of my spinster friends, it may be well to say a few words of the locality which they inhabited.

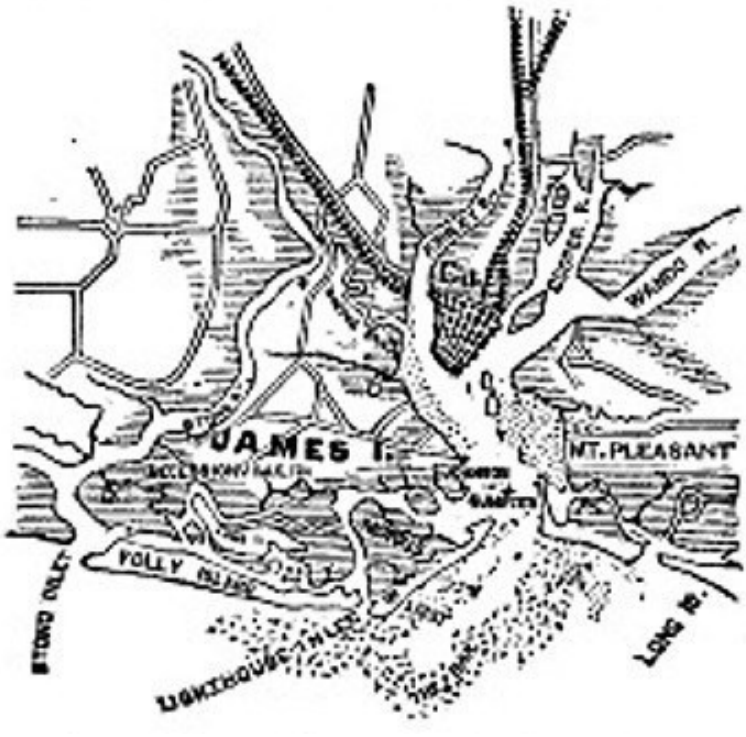

Fig. 2. Map of Charleston and Vicinity.

Charleston stands upon the extremity of a narrow peninsula, between the Cooper and the Ashley Rivers. Charleston Harbor, supplied by these and some smaller streams, lies between Mt. Pleasant and Sullivan's Island on the northeast, and James and Morris Islands on the southwest. One cannot but be struck with

the resemblance, so great as to be almost symmetrical, between the two sides of the harbor. Mt. Pleasant and James Island are quite high land,—high at least for the coast of South Carolina,—and are separated from the mainland, the one by the Wando River, the other by Wappoo Creek; while Sullivan's Island, where stand Fort Moultrie and other Rebel batteries, corresponds almost precisely to Morris Island, both being low and sandy, and being, as it were, bent inland from the sea, with sharp points looking toward the city, their convex shores forming a rounded entrance to the harbor. Extending southward from Morris Island, and separated from it by Lighthouse Inlet, is Folly Island; and in exact correspondence to the latter, north of Sullivan's Island, and separated from it by Breach Inlet, is a similar sand-ridge called Long Island. But now occurs a difference; for while between Long and Sullivan's Islands and Christ's Church Parish is an immense salt marsh intersected by creeks, but presenting an unbroken surface, in the midst of the corresponding marsh between Morris and Folly Islands and James Island is a group of low wooded islands, the largest of which lies opposite the upper or north end of Folly Island. To this no name is given on the maps, nor is it even distinguished from the marsh. It is, however, completely surrounded by water; and, though this is in the form of creeks neither wide nor deep, yet the peculiar softness of the mud, and the absence of any landing-place except upon the side toward Folly Island, render it almost inaccessible.

To this narrow strip of land, not three miles in length, was

given the name of Long Island,—perhaps by our own troops, who knew nothing of an island of the same name *north* of the harbor; and in case it is found that no other name belongs to it, we may properly avoid a confusion, and christen it *Spider* Island, in honor of the remarkable insects for whose especial benefit it seems to have been made, and which, with the exception of the mosquitoes, are its sole inhabitants.

As was said, the first spider was found on Folly Island on the 19th of August, 1863: it was also the last there seen. During the summer of 1864, many were found on Long Island (so called); and when, in the spring of 1865, our regiment was encamped on James Island near Wappoo Creek, it was toward Long Island that all my attention, so far as concerned spiders, was directed.

But first, as a bit of collateral history, and to show how easily and how far one may go astray when one of the links in the chain of argument is only an *inference*, let me relate that, while riding over James Island, I observed upon trees and bushes numbers of small brown bags, from half an inch to an inch and a half in diameter, pear-shaped, and suspended by strong silken cords. The bags themselves were made of a finer silk so closely woven as to resemble brown paper, and, when opened, were found to contain a mass of loose silk filled with young spiders to the number of five hundred or more. In certain localities, especially in a swampy field just outside the first line of Rebel works, they were quite abundant. I had soon collected about four hundred of them, which, by a moderate estimate, contained *two hundred*

thousand little spiders,—quite enough, I thought, with which to commence operations. But one hot day in June I placed them all on a tray in the sun. I was called away, and on my return found my one fifth of a million young spiders dead,—baked to death.

Prior to this catastrophe, however, I had become convinced that these were not the spiders I sought. Indeed, my only reasons for thinking they might be were, first, the abundance of these cocoons in a locality so near Long Island; and, second, my own great desire that they should prove the spiders I wanted. The young spiders, it is true, did not at all resemble their supposed progenitors, as to either shape, or color, or markings; yet all of these evidently changed during growth, and would not of themselves disprove the relationship.

One day in April, however, a cocoon was found in a tree on James Island, of a very different appearance from the others. It was of loose texture, and, instead of being pear-shaped, was hemispherical in form, and attached by its flat surface to the lower side of a leaf. This also contained young spiders, a little larger and a little brighter in color than the others, but really bearing no resemblance to the full-grown spiders of Long Island. This single cocoon formed the entering wedge of doubt, and soon it was clear that the only means of proof lay on Long Island itself.

But how was this to be reached? Easily enough while we were upon Folly Island and could row through the creeks to a wharf on the east side of Long Island. But now the case was altered; for between James and Long Islands was the immense marsh

already mentioned, intersected by creeks, and composed of mud practically without bottom, and ranging from eighteen to twenty-three feet in depth by actual measurement. Around or over or through this marsh it was necessary to go, in order to reach Long Island, the home of the spiders.

I could easily occupy the rest of my allotted space in recounting my various attempts to reach this El Dorado, which my fancy, excited by every delay, stocked with innumerable cocoons of the kind already found so abundantly on James Island. These I expected would furnish thousands of spiders, the care of which, with the reeling of their silk, would give employment to all the freed people in South Carolina,—for even then the poor creatures were finding their way to the coast. And perhaps, I thought, some day, the Sea-Island silk may be as famous as the choice Sea-Island cotton. This hope I still cherish, together with the belief that, under certain conditions, the spiders may also be reared at the North.

After riding miles and miles in all directions in search of the readiest point of attack; after having once engaged a row-boat to go around through Stono River and meet me at the nearest point of land,—on which occasion I dismounted to give my horse a better chance of getting over a bad place in the road, and the ungrateful beast left me in the lurch and went home much faster than he came, while I, being now half-way, walked on through the marsh, and had the pleasure of sitting on a log in a pouring rain for an hour, with Long Island just on the other side of a

creek over which no boat came to carry me,—after this and other disappointments, I at last made sure by going in the boat myself, and so finally reached the island. But now, to my discomfiture, after a most careful search, I saw only two or three cocoons of the kind I looked for, while the others, of loose texture, were quite abundant, and doubtless would have been found in still greater numbers but for their always being under leaves, and often at a considerable height. It was probable now that these latter cocoons contained *the* spiders, and that the former were a different species.

The regiment now removed to the interior of the State, and while there occurred the *coup de soleil* above mentioned. We remained at Orangeburg until the middle of August, and then, being stationed at Mt. Pleasant, I again made raids for spiders. Upon James Island, in the localities where during the spring the cocoons were abundant, I found many large geometrical spiders, all of one kind, but not of the kind I sought. They were bad-tempered, and their legs were so short and strong that it was not easy to handle them, while their silk was of a light, and not brilliant, yellow.

My first attempt upon Long Island was made by leaving Charleston in a boat, which, after touching at Sumter, landed me at Fort Johnson. Here I was joined by a sergeant and corporal of the Fifty-fourth Massachusetts, and we walked across to a little settlement of freed people not far from Secessionville, where a boat and crew were engaged. It would be tedious to relate how,

after sticking on invisible oyster-beds and mud-flats, and losing our way among the creeks, at two o'clock we found ourselves about one hundred yards from the north end of the island; and how, since it was too late to try to reach the wharf on the east side, even had we been sure of the way, the two Fifty-fourth boys and myself got out of the boat and essayed to cross upon the marsh. Such a marsh! We have marshes at the North, but they are as dry land in comparison. I had seen them at the South, had stepped upon and into them, but never one like this. It was clear mud, as soft as mud could be and not run like the water that covered it at high tide. Even the tall rushes wore an unsteady look; and the few oysters upon its surface evidently required all their balancing powers to lie upon their flat sides and avoid sinking edgewise into the oozy depths. In we sank, over ankles, at the first step, and deeper and deeper till we took a second; for our only safety lay in pushing down the rushes with the inside of one foot and treading upon them, till the other could be withdrawn from its yielding bed, and a spot selected for the next step forward. I say *selected*, for even this mud was more firm than a hole in it filled with water and treacherously concealed by a few rushes. A misstep into one of these pitfalls brought me to my knees, and well-nigh compelled me to call for help; but a sudden and determined spring, and a friendly bunch of rushes beyond, spared me that mortification. When two thirds of the way across, and while thinking we should soon reach dry land, we came upon the edge of a creek, not wide, it is true, but with soft, slimy,

sloping sides, (for *banks* they could not properly be called,) and no one knew how many feet of mud beneath its sluggish stream. Under ordinary circumstances I might have sounded a retreat; but, remembering that there was twice as much mud behind as before us, and feeling ourselves sinking slowly but surely in our tracks, we slid down the sides into the water. This received our bodies to the waist, the mud our legs to the knees; but we struggled through, and, after another terrible thirty yards of mud, reached Long Island. Leaving my faithful companions to rest, I struck off down the east side of the island, and soon found spiders in plenty. Stopping at the wharf, and returning upon the west side, I counted one hundred spiders in less than an hour. This was only a voyage of discovery, but I could not resist the temptation to capture one big fellow and put it in my hat, which, with the edges brought together, I was forced to carry in my teeth, for one hand was required to break down the webs stretched across my path, and the other to do battle in vain with the thousands of mosquitoes, of huge size and bloody intent, besetting me on every side. What with the extreme heat and my previous fatigue, and the dread lest my captive should escape and revenge herself upon my face while I was avoiding the nets of her friends, and the relentless attacks of their smaller but more venomous associates, it was the most uncomfortable walk imaginable. To complete my misery, the path led me out upon the marsh where I could see nothing of the boat or my companions, and whence, to reach them, I had to walk across the head of the island. Excepting

the dreaded recrossing of the mud, I hardly remember how we made our way back; but by one means and another I finally reached Charleston at nine o'clock, about as disreputable-looking a medical man as ever was seen.

However, all this was soon forgotten, and, being now assured of the presence of the spiders in their former haunts, on the 30th of August, 1865, I organized a new expedition, which was to proceed entirely by water, and which consisted of a sail-boat and crew of picked volunteers. Leaving Mt. Pleasant in the morning, we crossed the harbor, and were soon lost in the meanderings of the creeks behind Morris Island. *Lost* is appropriate, for, once in these creeks, you know nothing, you see and hear nothing, and, if you change your course, must do so by mere guess. But the most annoying thing is, after an apparent advance of a quarter of a mile, to find yourself not twenty yards from your starting-point, so tortuous are the windings of the creeks.

By dint of hard rowing (in the wrong direction, as we soon found), then by walking across Morris Island to Light-House Inlet, and still harder rowing from there to the wharf of Long Island, we succeeded in securing sixty spiders; but now arose a furious storm of wind and rain, which not only compelled our retreat, but drenched us to the skin, blew us back faster than we could row, and threatened to overturn our boat if we hoisted the sail; so slow was our progress, that it was eleven o'clock at night before we reached Mt. Pleasant. Thus ended my last and only successful raid upon Long Island.

It may seem that I have dwelt longer than was necessary upon the circumstances attending the discovery of this spider and its silk. If so, it is not merely because at that time both were new to myself and all to whom I showed them, and everything concerning them was likely to be impressed upon my mind, but also because I then hoped that the idea of obtaining silk directly from a living insect might be found of practical importance, as I still hope it may. The incidents illustrate, too, the nature of the obstacles daily encountered and overcome by our troops; for no one who has never seen or stepped into a Sea-Island marsh can realize how difficult it was for our forces to obtain a foothold in the vicinity of Charleston. This was appreciated by the old freedman whom we left in the boat while crossing the mud. "No wonder," he said, "the Yankees whipped the Rebels, if they will do such things for to catch *spiders*."

The sixty spiders so obtained were kept for several weeks in the little boxes in which they had been deposited when caught. Every day each box was opened, the occupant examined, and its condition, if altered, noted on the cover. They generally spun a few irregular lines on which to hang, and so remained quiet except when the boxes were opened: then, of course, they tried to escape. Half a dozen of the larger ones were placed on the window-seats and in corners of the room, where they speedily constructed webs. By preference these were stretched across the windows, illustrating one of the three principal instincts of this spider, which are, first, to *seek the light*; second, to *ascend*; and

third, to take a position with the *head downward*.

It was now a question how they were to be fed; not so much while there, where flies were abundant, but after their arrival at the North. So, remembering that the young ones had seemed to relish blood, I took the tender liver of a chicken, cut it into little pieces, and dipped them in water, not, I am sorry to say, with any view to supply them with that fluid for the want of which they afterward perished, but in order that the bits of liver should be more easily pulled from the pins by the spiders. To my delight they greedily accepted the new food, and now I felt assured of keeping them during the winter.

Deferring, however, a more particular account of what was observed at Mt. Pleasant, until their habits and mode of life are taken up in order, it should be understood that, during our short stay, my attention was chiefly directed to getting from the spiders as much silk as possible; for it was evident that practical men would not credit the usefulness of spiders' silk until an appreciable quantity could be shown to them. The first trial of the machine with a live spider proved it an utter failure; for though quite ingenious and complicated, it had been devised with reference only to *dead* spiders. In regard to the arrangement (wherein lay its chief, if not sole, peculiarity) by which a thin slip of brass was sprung against a rubber band by the latter's elasticity, with a view to secure the spider's legs between them, it was found that, as the spider was alive, and, literally, kicking, and two of its legs were smaller than the rest, these were at once extricated,

and the others soon followed; while, if the spring was made forcible enough to hold the smaller legs, the larger were in danger of being crushed, and the spider, fearing this, often disjointed them, according to the convenient, though loose habit of most Arachnida, crabs, and other articulates. It was also proposed to secure several spiders in the above manner upon the periphery of a wheel, the revolution of which would give a twist to their conjoined threads, carried through a common eyelet upon the spindle; but this can be accomplished without the inconvenience of whirling the spiders out of sight, by modifications of the apparatus which has always been used for twisting ordinary silk. It will probably be inferred from the above, that, in securing the spider, two points are to be considered; first, to prevent its escape, and second, so to confine the legs that it cannot reach with their tips either the *silk* or the *spinners*. Now the machine accomplished this by putting all the legs together in a vice, as it were, entailing upon the captive much discomfort and perhaps the loss of some of its legs, which, though eight in number, are each appropriated to a special use by their possessor.

So, abandoning the machine, I fell back upon a simple reel, and a modification of my little contrivance of the previous year; which was, to grasp the spider by all the legs, holding them behind her back, and to let her body down into a deep notch or slot cut in a thin card, the edges of which reached the constriction between the two regions of the body, the *cephalothorax* and *abdomen*; so that, when a second piece of card was let down upon

it, the *cephalothorax*, with the *legs* of the spider, was upon one side of a partition, while on the other was the *abdomen*, bearing upon its posterior extremity the spinning organs. The head and horns of a cow to be milked are secured in a similar manner. By placing in a row, or one behind another, several spiders thus secured, a compound thread was simultaneously obtained from them, and wound upon a spindle of hard rubber.

By this means were produced several very handsome bands of bright yellow silk; but the time was so short, and the means of constructing and improving my apparatus so deficient, that I could procure no more than these few specimens, which were very beautiful, and shone in the sun like polished and almost translucent gold; but which, being wound upon a cylinder only an inch in diameter, and from several spiders at different times, could not be unwound, and so made of any further use.

I tried now to ascertain how much silk could be obtained from a single spider at once. It will be remembered that the first specimen, wound on Folly Island, was one hundred and fifty yards in length, and weighed one third of a grain. I now exhausted the supply of a spider for three days, using the same spindle, one inch in diameter, and turning this at the rate of one hundred and sixty times per minute. On the first day I reeled for twenty minutes, which gave two hundred and sixty-six and two thirds yards; on the third day, the second being Sunday, for twenty-five minutes, giving three hundred and thirty-three and one third yards; and on the fourth day, for eighteen minutes, giving two

hundred and thirty-three and one third yards,—amounting in all to eight hundred and thirty-three and one third yards in three or four days. This was all that could be got, and the spider herself seemed unable to evolve any more; but on killing her and opening her abdomen, plenty of the gum was found in the little silk bags into which it is secreted. As this has always been the case, I have concluded that the evolution of the silk is almost entirely a mechanical process, which is but little controlled by the spinners themselves, and that the gum requires some degree of preparation after it is secreted before it is fit for use as silk; for it must be remembered that with the spider, as with the silk-worm, the silk is formed and contained in little bags or glands in the abdomen, not as *threads*, but as a very viscid gum. This passes in little tubes or ducts to the spinners, through minute openings, in which it is drawn out into filaments, uniting and drying instantly in the air, and so forming the single fibre from each spinner.

The silk obtained the first day was of a deep yellow; to my great astonishment, the second reeling from the same spider gave silk of a brilliant silver-white color; while on the third occasion, as if by magic, the color had changed again, and I got only *yellow* silk. The hypothesis of individual peculiarity, adopted the previous year to explain why some spiders gave yellow, and others white silk, was now untenable; and, remembering that, beside these two positive colors there was also (and indeed more commonly) a *light yellow*, as if a combination of the other two, I saw that the real solution of the mystery must lie in the spinners

themselves. Examining carefully the thread as it came from the body, it was seen to be composed of two distinct portions, differing materially in their size, their color, their elasticity, and their relative position; for one of them was *white* and *inelastic*, crinkling and flying up when relaxed, and seemed to proceed from the *posterior* of the two principal pairs of spinners, while the other was *larger*, *yellow*, so *elastic* that when relaxed it kept its direction, and seemed to come from the *anterior* pair of spinners, and so, in the inverted position of the spider, was *above* the other. By putting a spider under the influence of chloroform, and then carrying the first thread under a pin stuck in a cork to one part of a spindle, and the second or yellow line over another pin to a different part of the spindle, I reeled off from the same spider, at the same time, two distinct bands of silk, of which one was a deep golden-yellow, the other a bright silver-white; while, if both threads ran together, there was formed a band of *light yellow* from the union of the two. Thinking such a difference must subserve some use in the economy of the insect, I made a more careful examination of its webs. At first sight these resembled those of most geometrical spiders, in being broad, rounded, nearly vertical nets; but they were unusually large, and in their native woods often stretched between trees and across the paths, so as to be two, three, and even more, feet in diameter, and in my room at Mt. Pleasant hung like curtains before the windows. They were of a bright yellow color and very viscid; but now I noticed that neither the color nor the viscidity pertained

to the entire net, for although the concentric circles constituting the principal part of the web were *yellow*, and very *elastic*, and studded with little beads of *gum*, (Fig 3,) yet the diverging lines or *radii* of the wheel-shaped structure, with all the guys and stays by which it was suspended and braced, were *dry* and *inelastic*, and of a *white* or lighter yellow color.

Fig. 3. Silk threads, viscid and dry.

Now, however, a new mystery presented itself. We will admit that the spider had the power, not only to vary the *size* of her lines according to the number of spinners, or of the minute holes in each spinner, which were applied to the surface whence the line

was to proceed, but also to make use of either golden or silver silk at will. But how was it that this yellow silk—which was quite dry and firm, though elastic, as reeled from the spider, or as spun by her in the formation of her cocoons—was nevertheless, when used for the concentric circles of the web, so viscid as to follow the point of a pin, stretching in so doing many times its length? A satisfactory explanation of this has never yet been offered, nor can be until the minute anatomy of the spinning organs is better understood, and the evolution of the silk more carefully observed at every stage, and under all conditions. I will merely state very briefly the few facts already established, with some of the possible explanations.

The spinning *mammulæ* are placed in pairs at the lower part of the abdomen, near its hinder end, and number four, six, or eight in different species. They are little conical or cylindrical papillæ, closely resembling the pro-legs of caterpillars, and are composed of two or three joints, the terminal one of which is pierced with a greater or less number of minute holes, the sides of these, in some, if not all, cases, being prolonged into tubes. Through these holes or tubes issue the fine filaments, which, uniting as they dry in the air, constitute the line from each spinner.

Fig. 4. Spinners.

Now the *Nephila plumipes* possesses at least three pairs of spinners. Of these, two are much larger than the third, which indeed does not appear till they are separated. From the *posterior* of the two largest pairs *seems* to proceed the *white*, and from the *anterior* the *yellow* silk, while from the small intermediate pair seem to proceed very fine filaments of a pale-blue color, the use of which is to envelop the prey after it has been seized and killed, being drawn out by the bristles near the tips of the spider's hinder legs. Beside these six papillæ there is, just in front of the anterior

pair, a single small papilla on the middle line, the nature and use of which I have not ascertained, though I feel quite sure that no silk comes from it. The large median papilla, just *behind* the posterior pair, surrounds the termination of the intestines, and through it the excrement is voided, the insect for this purpose turning back the abdomen as she hangs head downward, so that neither the web nor the spinners shall be contaminated. Now it has recently been ascertained that the minute globules with which the circles are studded, and the number of which on a web of average size is estimated at *one hundred thousand*, do not exist in that form when the viscid lines are first spun by the spider, but as a uniform coating of gum upon a thread; this gum, of itself and according to physical laws, soon exhibits little undulations, and then separates into the globules which have long been observed and supposed to be formed by the spider. The fact of spiders selecting the night for the construction of their webs, the difficulty of making any close observations upon them while so engaged without disturbing them, and the near approximation of the two larger pairs of spinners while the viscid line is slowly drawn out by the hind leg, have hitherto prevented my determining its exact source and manner of formation. If it comes from the anterior pair only, then one and the same organ has the power of evolving a central axis and covering it with viscid gum; and it seems less improbable that the axis is white and formed by the posterior pair, the yellow gum being spread upon it by the anterior pair, which also would then have the power

to evolve this same gum at other times as an equally dry, though more elastic thread. But in either case we have only *three* pairs of spinners and *four* kinds of silk, the *pale-blue fasciculi* the *dry white*, the *dry yellow*, and the *viscid* and very *elastic* silk which is employed only in the circles of the web, and which often does not become yellow till after exposure to the light. Apparently the surest method of investigation will be carefully to destroy one pair of spinners at a time without injuring the others, and then note the effect upon the spinning.

Let us go back now to the sixty spiders left at Mt. Pleasant. A few of these died on the way North, but the majority reached Boston in safety about the 20th of September, 1865; for some time I had observed that they all were becoming more or less emaciated, and relished their food less than at first. Occasionally one died from no apparent cause. The mortality increasing toward the end of the month, and all of them losing both flesh and vigor, I was persuaded to try them with water,—a thing I had thus far declined to do, never having heard of a spider's drinking water, and knowing that our common house species can hardly get it at all. The result was most gratifying: a drop of water upon the tip of a camel's-hair pencil, not only was not avoided, but greedily seized and slowly swallowed, being held between the jaws and the palpi. All of the spiders took it, and some even five or six drops in succession. You will exclaim, "Poor things! what tortures they must have suffered!" I admit that it could not have been pleasant for them to go so long without that which they

crave every day, but I cannot believe that creatures whose legs drop off on very slight provocation, and which never show any sign whatever of real pain, suffered very acute pangs even when subjected to what occasions such distress to ourselves.

The few survivors straightway improved in health and spirits; but being now convinced that a moist atmosphere was almost as needful as water to drink, I turned them loose in the north wing of the hot-house in Dr. Gray's Botanical Garden at Cambridge. They all mysteriously disappeared, excepting one, which made a nice web at one end just under the ridge-pole, and for several weeks lived and grew fat upon the flies; but a thorough fumigation of the house with tobacco so shocked her not yet civilized organization that she died.

Her untimely death, however, afforded opportunity for a closer examination of the web itself. The first one she had made was not *vertical*; and, following the prevalent ideas as to the precise construction of the spider's web, I had felt somewhat ashamed of my pet, but supposed the next she made would be an improvement. But no, the rebellious insect constantly made them all (for, it should have been said before, this spider seldom uses the same web more than forty-eight hours) after the same manner, and finally I laid it to a depraved idiocrasy, incident to captivity and poor health. But now another and most unexpected feature developed itself; for, on attempting to remove the last web by placing against it a large wire ring, and cutting the guy-lines, I found that this most degenerate spider had not only failed

to make her house *perpendicular*, but had so far departed from the traditions of our ancestors as to have the centre thereof decidedly eccentric, and four times as near the upper as the lower border of the web, so that its upper portion was only a confused array of irregular lines, which it was impossible to secure to the frame. For any accurate observation my web was of no value. But perhaps this was best; for had I then learned what I have since, that our spider utterly ignores every precedent, not only in the *position* and *shape* of her web, but also in its *minute arrangement*, I might have been so affected by her evident bad character and radical proclivities, as to have feared paying her any further attentions,—much more, presenting her to the world.

But in order to understand how these further discoveries were made, we must again go back to the original sixty spiders in my room at Mt. Pleasant, South Carolina.

At the time of their capture, I had observed upon a few of the webs little brown spiders, which I then imagined might be the half-grown young. Six of these were found among the sixty larger spiders, and a moment's examination of their palpi or feelers (Fig. 5) showed that they were males, though even then I could not believe they had reached their maturity; for their bodies were only about one fourth of an inch in length, and weighed only one thirty-second part of a grain, while the females were from an inch to an inch and a quarter in length, and weighed from three to four grains. It was as absurd as if a man weighing one hundred and fifty pounds were joined to a bigger half of *eighteen thousand*

pounds' weight, and I was not fully convinced that these small spiders were really the males of the *Nephila plumipes* till I had witnessed the impregnation of the eggs of the females by them.

Fig. 5. Palpi, or Feelers.

One morning, in the cell of a large female, I found a cocoon of beautiful yellow silk containing a rounded mass of eggs. Soon the same occurred with other females, and there were fifteen cocoons, which would give about *seven thousand spiders*. Early in October, just one month after they were laid, the eggs of the first cocoon were broken and disclosed little spiders with rounded yellow bodies and short legs, looking about as little like their parents as could be imagined. The eggs in the other cocoons followed in their order, and now each contained four or five hundred little spiders closely packed.

For some time they seemed to eat nothing at all; but within a few days all had shed their skins, and now the abdomen was smaller, while the *cephalothorax* and legs were larger and darker; but they showed no desire to leave their cocoons. Still they grew perceptibly; and coincident with this was a less pleasing fact: their numbers were decreasing in the same proportion, and occasionally one was seen eating another. It was some time before I could reconcile the good temper and quiet behavior of the parents with this instinctive and habitual fratricide on the part of their children. But look at it in this way: here were several hundred active little creatures in a space just large enough to contain them; presently they were hungry, and as no two could be of exactly the same size, the smaller and weaker naturally fell a prey to their larger brethren, or rather sisters, for either very few males are hatched, or else they are particularly good eating, and a very small proportion survive the perils of infancy. It is

evidently an established and well-understood thing among them: all seem to be aware of their destiny, to *eat* or *be eaten*. What else can they do? Human beings would do the same under the same circumstances; and I have never seen the least sign of personal spite or malignity in the spider. There is no pursuit, for there is no escape; and we can only conclude that, as the new-born fish's first nourishment is the contents of the yolk-sac, partly outside, though still a portion of its body, so the first food of the young spiders is, if not themselves, the next best thing,—each other. Thus it is provided that the smaller and less vigorous shall furnish food for the larger until the latter are strong enough to venture forth in search of other means of support.

In consequence of this mutual destruction, aided materially by the depredations of birds and of other insects, and by exposure to the weather, only about one per cent of those hatched reach maturity. If properly protected, however, a far larger proportion may be saved; and as their multiplication is so rapid, no fear need be entertained of a limit to the supply.

By keeping these little spiders in glass jars, inverted, and with a wet sponge at the bottom, they were easily watched and cared for. At first only about one twentieth of an inch long and nearly as wide, they increased in length as they grew, but for many weeks lived in common on an irregular web, feeding together on the crushed flies or bugs thrown to them. But when one fourth of an inch in length, they showed a disposition to separate, and to spin each for herself a regular web, out of which all intruders were

kept. And now it was found that all these webs were *inclined* at nearly the same angle, and were *never exactly vertical*; that, like the spider in the first web she made in the Botanical Garden, the insect took a position much nearer the upper than the lower border; and also that, instead of a web of *perfect circles* laid upon *regular radii*, as used to be described and is still figured in our books, or even one of a *spiral line*, as is now more correctly described of ordinary geometrical spiders (Fig. 6), these never made a circle, nor even a spiral, but a *series of concentric loops* or arcs of circles, the lines turning back upon themselves before reaching a point over the spider, and leaving the larger portion of the web below her; and more than this, that the lines, though quite regular, were by no means perfectly so, as may be seen in Fig. 7, copied from a photograph.

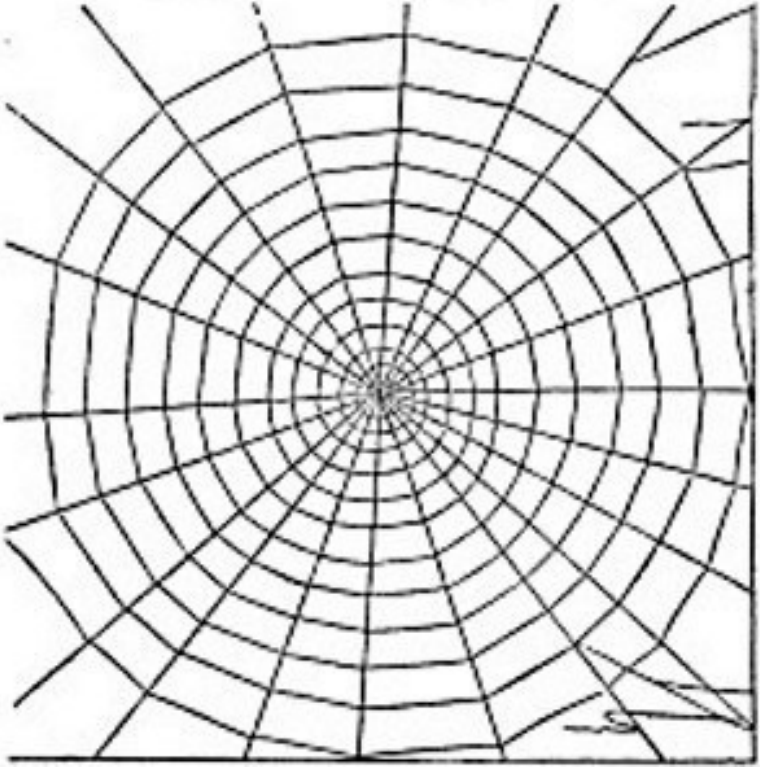

Fig. 6. Web of common Garden Spider.

Fig. 7. Web of Nephila plumipes.

As usual, the *radii*, or *spokes*, of the wheel-shaped structure are first made; then the spider begins a little way from the centre, and, passing from one radius to another, spins a series of loops at considerable distances from each other till she reaches the

circumference. These first loops, like the radii, are of *white, dry*, and *inelastic* silk, and may be recognized by the little notches at their junction with the radii. The notches are made by the spider's drawing her body a little inward toward the centre of the web at the time of attaching them to the radii, and so they always point in the direction in which the spider is moving at that time, and in opposite directions on any two successive lines (Fig. 8). Having reached what is to be the border of her web, and thus constructed a firm framework or scaffolding, she begins to retrace her steps, moving more slowly and spinning now in the *intervals* of the dry loops two or three similar loops, but much nearer together and made of the *elastic* and *viscid* silk, till she has again reached her starting-point near the middle of the web, where, on its under side, she takes a position, head downward, hanging by her claws, and thus keeping her body from direct contact with the web.

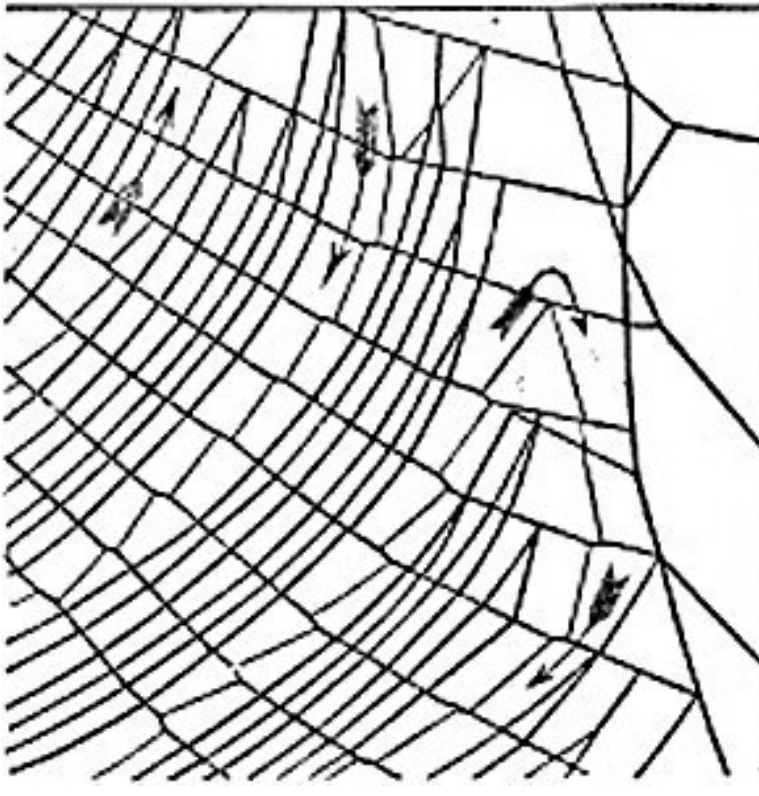

Fig. 8. Section of Web.

Here she will remain quiet for hours as if asleep; but no sooner does a fly or other insect strike the web, than she darts in the direction whence the vibrations proceed, and usually seizes her prey; but, strangely enough, if the insect have ceased its struggles

before she reaches it, she stops, and if she cannot renew them by shaking the web with her claws, will slowly and disconsolately return to the centre of the web, there to await fresh vibrations. These and many other facts, even more conclusive, have satisfied me that, although this spider has eight eyes (Fig. 9), it is as blind as a man with his eyelids shut, and can only distinguish light from darkness, nothing more. This seems to be the case with other geometrical species, but not at all with the field and hunting spiders, some of which will boldly turn upon you and look right in your eyes; they alone, of all insects, seeming to recognize the *face* of man as different from his body.

Fig. 9. Face and Jaws, magnified (eyes dimly seen).

The hearing and touch of this spider are very acute. The latter

is exercised by the palpi and the tips of the legs, especially the first pair, but no ear has yet been discovered; neither is anything known of the organs of taste and smell, or even whether the insect possesses these senses at all.

I ought before this to have anticipated and answered a question which nine out of ten, perhaps, of my readers have already asked themselves, "Do not spiders bite? and is not their bite poisonous, nay, at times, deadly even to man?" The answer is, in brief, Yes, spiders do bite, probably all of them, if provoked and so confined that they cannot escape; though only a few tropical species can be said to seek of their own accord an opportunity for attacking man, or any creature larger than the insects that form their natural prey. Even the *Nephila plumipes*, which, it has been intimated, is "Christian in its disposition, and well-behaved beyond most of its kind," will readily bite, if it is held in the fingers and anything is put to its jaws. But that is nothing. So would you, most gentle reader, if a great giant pinched you between his thumb and finger, and held your hands and feet and head; and if, too, like our spider, you could not see enough to distinguish friends from foes. Spiders, then, will bite. But to the second part of the inquiry our answer must be less positive. They have a very bad name; but much of this is due to their grim and forbidding aspect, and their bloody trade of trapping and eating poor little insects. It is to be remembered that there are very few, if any, medical reports of injuries from the bites of spiders, and that the accounts of such cases occurring in the newspapers consist in great measure of

inference, and either make no mention of the offender at all, or merely speak of a little black or gray spider being found in the vicinity. A number of experiments have been made in England to ascertain the effect of the bite of the larger geometrical spiders upon the experimenter himself, upon other spiders, and upon common insects; and the conclusion was, that it produces no greater effect than the prick of a pin, or any other injury of equal extent and severity; while the speedy death of its victim is ascribed to the spider's sucking its juices, rather than to any poison instilled into the wound. But these experiments, though somewhat reassuring, are not conclusive; for they were tried only on one person, and people vary much in their susceptibility to poison of all kinds; moreover, the spiders employed were of the *geometrical* kinds, which have never been so much feared as the larger *field* and *hunting* spiders. Indeed, it may be found that among spiders there is as great a difference in respect to venom as among serpents, and that those which depend upon their jaws for taking and holding their prey, such as the field and hunting spiders, are poisonous, while the web-builders which ensnare their victims are not so. In regard to our spiders, I have caused a large one to bite, so as to draw blood, a kitten three days old, and the kitten has not appeared to suffer in the least on that account.

They are very quiet insects, and never appear disturbed at what goes on about them; neither do they run away and hide in holes and corners, like our common spiders; but if their webs are injured, or they are startled by a noise, they will shake themselves

from side to side in their webs, so as to be wholly invisible. Their natural food is insects of all kinds; but they soon learn to eat soft flesh, such as the liver of chickens, for which, as well as for water, they will sometimes stretch themselves and turn in their webs so as to take it from the point of a pin or camel's-hair pencil. Besides water to drink, they require an atmosphere saturated with moisture, like that of their native island, the relative humidity being about *seventy* on the Hygrodeik scale. If stroked upon the back, they often raise their bodies as a cat does, and sometimes put back a leg to push away your finger. They may be allowed to run over one's person with perfect safety, but, if suddenly seized, will hold on with tooth as well as nail.

They are quite economical, and every few days, when the web has become too dry and dusty for use, will gather it up in a mass, which they stuff into their jaws and masticate for hours, swallowing the gum, but throwing out the rest, with the little particles of dust, in the form of a hard black pellet,—an instance rare, if not indeed unique, of an animal eating a substance already excreted from its body.

Here I must close, though much against my will. It would please me to describe, as it has almost fascinated me to observe, the doings of my spiders, as they grew older and made their webs in the Wardian cases to which they were removed when too many and too large for the jars; how the young are gregarious, and move from place to place in a close column, protected on all sides by skirmishers, which continually report to the main

body; how some of these young, whose parents were caught on Long Island, South Carolina, a year ago, and which were hatched from the egg in October last, have grown up during a Northern winter, have themselves become parents and laid eggs; how they periodically cast off their skins, even to that of the eyes, the jaws, and the breathing tubes, and how, from too great impatience, sad accidents sometimes befall them on these occasions; how, also, I have reeled silk from several of these spiders, and made a thread which has been woven in a power-loom as a woof or filling upon a warp of common black silk, so as to make a bit of ribbon two inches wide, thereby proving that it is real silk and can be treated as such.

Much, too, could be said of the only other attempts to utilize spiders' silk, a knowledge of which would have materially aided me. In France, one hundred and fifty years ago, M. Bon made gloves and stockings of silk got by carding spiders' cocoons, and seventy years later, as I have but recently ascertained, Termeyer, a Spaniard, not only used the cocoons, but also, by an observation similar to my own, was led to reel the silk from the living insect. He, however, had poorer spiders or too little perseverance, or friends and a government influenced by a most short-sighted economy and prudence, else the highly interesting and instructive account of his experiments would have been familiar to some one in this country, and would not have waited these many years to be found by accident last spring in an obscure corner of the Astor Library.

I will add, finally, that I believe some other geometrical spiders, especially of the genus *Nephila*, may be found as docile, and as productive of beautiful silk, as the species I have described. At any rate, you cannot find a more interesting inmate of your Wardian case than some large geometrical spider.

WHAT DID SHE SEE WITH?

I could not have been more than seven or eight years old, when it happened; but it might have been yesterday. Among all other childish memories, it stands alone. To this very day it brings with it the old, utter sinking of the heart, and the old, dull sense of mystery.

To read the story, you should have known my mother. To understand it, you should understand her. But that is quite impossible now, for there is a quiet spot over the hill, and past the church, and beside the little brook where the crimsoned mosses grow thick and wet and cool, from which I cannot call her. It is all I have left of her now. But after all, it is not of her that you will chiefly care to hear. The object of my story is simply to acquaint you with a few facts, which, though interwoven with the events of her life, are quite independent of it as objects of interest. It is, I know, only my own heart that makes these pages a memorial, —but, you see, I cannot help it.

Yet, I confess, no glamour of any earthly love has ever utterly dazzled me,—not even hers. Of imperfections, of mistakes, of sins, I knew she was guilty. I know it now,—even with the sanctity of those crimsoned mosses, and the hush of the rest beneath, so close to my heart, I cannot forget them. Yet somehow —I do not know how—the imperfections, the mistakes, the very sins, bring her nearer to me as the years slip by, and make her

dearer.

The key to her life is the key to my story. That given, as I can give it, I will try to compress. It lies in the fact that my mother was what we call an aristocrat, I do not like the term, as the term is used. I am sure she does not now; but I have no other word. She was a royal-looking woman, and she had the blood of princes in her veins. Generations back—how we children used to reckon the thing over!—she was cradled in a throne. A miserable race, to be sure, they were,—the Stuarts; and the most devout genealogist might deem it dubious honor to own them for great-grandfathers by innumerable degrees removed. So she used to tell us, over and over, as a damper on our childish vanity, looking such a very queen as she spoke, in every play of feature, and every motion of her hand, that it was the old story of preachers who did not practise. The very baby was proud of her. The beauty of a face, and the elegant repose of a manner, are by no means influences more unfelt at three years than at thirty.

As insanity will hide itself away, and lie sleeping, and die out,—while old men are gathered to their fathers scathless, and young men follow in their footsteps safe and free,—and start into life, and claim its own when children's children have forgotten it; as a single trait of a single scholar in a race of clods will bury itself in day-laborers and criminals, unto the third and fourth generation, and spring then, like a creation from a chaos, into statesmen and poets and sculptors;—so, I have sometimes fancied, the better and truer nature of voluptuaries and tyrants

was sifted down through the years, and purified in our little New England home, and the essential autocracy of monarchical blood refined and ennobled in my mother into royalty.

A broad and liberal culture had moulded her; she knew its worth, in every fibre of her heart; scholarly parents had blessed her with their legacies of scholarly mind and name. With the soul of an artist, she quivered under every grace and every defect; and the blessing of a beauty as rare as rich had been given to her. With every instinct of her nature recoiling from the very shadow of crimes the world winks at, as from a loathsome reptile, the family record had been stainless for a generation. God had indeed blessed her; but the very blessing was a temptation.

I knew, before she left me, what she might have been, but for the merciful and tender watch of Him who was despised and rejected of men. I know, for she told me, one still night when we were alone together, how she sometimes shuddered at herself, and what those daily and hourly struggles between her nature and her Christianity *meant*.

I think we were as near to one another as mother and daughter can be; but yet as utterly different. Since I have been talking in such lordly style of those miserable Jameses and Charleses, I will take the opportunity to confess that I have inherited my father's thorough-going democracy,—double measure, pressed down and running over. She not only pardoned it, but I think she loved it in me, for his sake.

It was about a year and a half, I think, after he died, that she

sent for Aunt Alice to come to Creston. "Your aunt loves me," she said, when she told us in her quiet way, "and I am so lonely now."

They had been the only children, and they loved each other,—how much, I afterwards knew. And how much they love each other *now*, I like to think,—quite freely and fully, and without shadow or doubt between them, I dare to hope.

A picture of Aunt Alice always hung in mother's room. It was taken down years ago. I never asked her where she put it. I remember it, though, quite well; for mother's sake I am glad I do. For it was a pleasant face to look upon, and a young, pure, happy face,—beautiful too, though with none of the regal beauty crowned by my mother's massive hair, and pencilled brows. It was a timid, girlish face, with reverent eyes, and ripe, tremulous lips,—weak lips, as I remember them. From babyhood, I felt a want in the face. I had, of course, no capacity to define it; it was represented to me only by the fact that it differed from my mother's.

She was teaching school out West when mother sent for her. I saw the letter. It was just like my mother:—"Alice, I need you. You and I ought to have but one home now. Will you come?"

I saw, too, a bit of a postscript to the answer,—"I'm not fit that you should love me so, Marie."

And how mother laughed at it!

When it was all settled, and the waiting weeks became at last a single day, I hardly knew my mother. She was in her early

married years; she was a girl; she was a child; she was every young thing, and merry thing, that she could have ever been. So full of fitful moods, and little fantastic jokes! such a flush on her cheeks too, as she ran to the window every five minutes, like a child! I remember how we went all over the house together, she and I, to see that everything looked neat, and bright, and welcome. And how we lingered in the guest-room, to put the little finishing touches to its stillness, and coolness, and coseyness. The best spread on the bed, and the white folds smoothed as only mother's fingers could smooth them; the curtain freshly washed, and looped with its crimson cord; the blinds drawn, cool and green; the late afternoon sunlight slanting through, in flecks upon the floor. Flowers, too, upon the table. I remember they were all white,—lilies of the valley, I think; and the vase of Parian marble, itself a solitary lily, unfolding stainless leaves. Over the mantle she had hung the finest picture in the house,—an "Ecce Homo," and an exquisite engraving. It used to hang in grandmother's room in the old house. We children wondered a little that she took it up stairs.

"I want your aunt to feel at home, and see home things," she said. "I wish I could think of something more to make it pleasant in here."

Just as we left the room she turned and looked into it. "Pleasant, isn't it? I am so glad, Sarah," her eyes dimming a little. "She's a very dear sister to me."

She stepped in again to raise a stem of the lilies that had fallen

from the vase, and lay like wax upon the table, then she shut the door and came away.

That door was shut just so for years; the lonely bars of sunlight flecked the solitude of the room, and the lilies faded on the table. We children passed it with hushed footfall, and shrank from it at twilight, as from a room that held the dead. But into it we never went.

Mother was tired out that afternoon; for she had been on her feet all day, busied in her loving cares to make our simple home as pleasant and as welcome as home could be. But yet she stopped to dress us in our Sunday clothes,—and no sinecure was it to dress three persistently undressable children; Winthrop was a host in himself. "Auntie must see us look our prettiest," she said.

She was a picture herself when she came down. She had taken off her widow's cap and coiled her heavy hair low in her neck, and she always looked like a queen in that lustreless black silk. I do not know why these little things should have made such an impression on me then. They are priceless to me now. I remember how she looked, framed there in the doorway, while we were watching for the coach,—the late light ebbing in golden tides over the grass at her feet, and touching her face now and then through the branches of trees, her head bent a little, with eager, parted lips, and the girlish color on her cheeks, her hand shading her eyes as they strained for a sight of the lumbering coach. She must have been a magnificent woman when she was young,—not unlike, I have heard it said, to that far-off ancestress

whose name she bore, and whose sorrowful story has made her sorrowful beauty immortal. Somewhere abroad there is a reclining statue of Queen Mary, to which, when my mother stood beside it, her resemblance was so strong that the by-standers clustered about her, whispering curiously. "Ah, mon Dieu!" said a little Frenchman, aloud, "c'est une résurrection."

We must have tried her that afternoon, Clara and Winthrop and I; for the spirit of her own excitement had made us completely wild. Winthrop's scream of delight when, stationed on the gate-post, he caught the first sight of the old yellow coach, might have been heard a quarter of a mile.

"Coming?" said mother, nervously, and stepped out to the gate, full in the sunlight that crowned her like royal gold.

The coach lumbered on, and rattled up, and passed.

"Why, she hasn't come!" All the eager color died out of her face. "I am so disappointed!" speaking like a troubled child, and turning slowly into the house.

Then, after a while, she drew me aside from the others,—I was the oldest, and she was used to make a sort of confidence between us, instinctively, as it seemed, and often quite forgetting how very few my years were. "Sarah, I don't understand. You think she might have lost the train? But Alice is so punctual, Alice never lost a train. And she said she would come." And then, a while after, "I *don't* understand."

It was not like my mother to worry. The next day the coach lumbered up and rattled past, and did not stop,—and the next,

and the next.

"We shall have a letter," mother said, her eyes saddening every afternoon. But we had no letter. And another day went by, and another.

"She is sick," we said; and mother wrote to her, and watched for the lumbering coach, and grew silent day by day. But to the letter there was no answer.

Ten days passed. Mother came to me one afternoon to ask for her pen, which I had borrowed. Something in her face troubled me vaguely.

"What are you going to do, mother?"

"Write to your aunt's boarding-place. I can't bear this any longer," sharply. She had already grown unlike herself.

She wrote, and asked for an answer by return of mail.

It was on a Wednesday, I remember, that we looked for it. I remember everything that happened that day. I came home early from school. Mother was sewing at the parlor window, her eyes wandering from her work, up the road. It was an ugly day. It had rained drearily from eight o'clock till two, and closed in suffocating mist, creeping and dense and chill. It gave me a childish fancy of long-closed tombs and lowland graveyards, as I walked home in it.

I tried to keep the younger children quiet when we went in, mother was so nervous. As the early, uncanny twilight fell, we grouped around her timidly. A dull sense of awe and mystery clung to the night, and clung to her watching face, and clung even

then to that closed room up stairs where the lilies were fading.

Mother sat leaning her head upon her hand, the outline of her face dim in the dusk against the falling curtain. She was sitting so when we heard the first rumble of the distant coach-wheels. At the sound, she folded her hands in her lap and stirred a little, rose slowly from her chair, and sat down again.

"Sarah."

I crept up to her. At the near sight of her face, I was so frightened I could have cried.

"Sarah, you may go out and get the letter. I—I can't."

I went slowly out at the door and down the walk. At the gate I looked back. The outline of her face was there against the window-pane, white in the gathering gloom.

It seems to me that my older and less sensitive years have never known such a night. The world was stifling in a deluge of gray, cold mists, unstirred by a breath of air. A robin with feathers all ruffled, and head hidden, sat on the gate-post, and chirped a little mournful chirp, like a creature dying in a vacuum. The very daisy that nodded and drooped in the grass at my feet seemed to be gasping for breath. The neighbor's house, not forty paces across the street, was invisible. I remember the sensation it gave me, as I struggled to find its outlines, of a world washed out, like the figures I washed out on my slate. As I trudged, half frightened, into the road, and the fog closed about me, it seemed to my childish superstition like a horde of long-imprisoned ghosts let loose and angry. The distant sound of the coach, which I could

not see, added to the fancy.

The coach turned the corner presently. On a clear day I could see the brass buttons on the driver's coat at that distance. There was nothing visible now of the whole dark structure but the two lamps in front, like the eyes of some evil thing, glaring and defiant, borne with swift motion down upon me by a power utterly unseen,—it had a curious effect. Even at this time, I confess I do not like to see a lighted carriage driven through a fog.

I summoned all my little courage, and piped out the driver's name, standing there in the road.

He reined up his horses with a shout,—he had nearly driven over me. After some searching, he discovered the small object cowering down in the mist, handed me a letter, with a muttered oath at being intercepted on such a night, and lumbered on and out of sight in three rods.

I went slowly into the house. Mother had lighted a lamp, and stood at the parlor door. She did not come into the hall to meet me.

She took the letter and went to the light, holding it with the seal unbroken. She might have stood so two minutes.

"Why don't you read, mamma?" spoke up Winthrop. I hushed him.

She opened it then, read it, laid it down upon the table, and went out of the room without a word. I had not seen her face. We heard her go up stairs and shut the door.

She had left the letter open there before us. After a little awed

silence, Clara broke out into sobs. I went up and read the few and simple lines.

Aunt Alice had left for Creston on the appointed day.

Mother spent that night in the closed room where the lilies had drooped and died. Clara and I heard her pacing the floor till we cried ourselves to sleep. When we woke in the morning, she was pacing it still.

Well, weeks wore into months, and the months became many years. More than that we never knew. Some inquiry revealed the fact, after a while, that a slight accident had occurred upon the Erie Railroad to the train which she should have taken. There was some disabling, but no deaths, the conductor had supposed. The car had fallen into the water. She might not have been missed when the half-drowned passengers were all drawn out.

So mother added a little crape to her widow's weeds, the key of the closed room lay henceforth in her drawer, and all things went on as before. To her children my mother was never gloomy,—it was not her way. No shadow of household affliction was placed like a skeleton confronting our uncomprehending joy. Of what those weeks and months and years were to her,—a widow, and quite uncomforted in their dark places by any human love,—she gave no sign. We thought her a shade paler, perhaps. We found her often alone with her little Bible. Sometimes, on the Sabbath, we missed her, and knew that she had gone into that closed room. But she was just as tender with us in our little faults and sorrows, as merry with us in our plays, as eager in our gayest plans, as she

had always been. As she had always been,—our mother.

And so the years slipped by, to her and to us. Winthrop went into business in Boston; he never took to his books, and mother was too wise to *push* him through college; but I think she was disappointed. He was her only boy, and she would have chosen for him the profession of his father and grandfather. Clara and I graduated in our white dresses and blue ribbons, like other girls, and came home to mother, crochet-work, and Tennyson. And then something happened, as the veriest little things—which, unnoticed and uncomprehended, hold the destinies of lives in their control—will happen.

I mean that our old and long-tried cook, Bathsheba, who had been an heirloom in the family, suddenly fell in love with the older sexton, who had rung the passing-bell for every soul who died in the village for forty years, and took it into her head to marry him, and desert our kitchen for his little brown house under the hill.

So it came about that we hunted the township for a handmaiden; and it also came about that our inquiring steps led us to the poor-house. A stout, not over-brilliant-looking girl, about twelve years of age, was to be had for her board and clothes, and such schooling as we could give her,—in country fashion, to be "bound out" till she should be eighteen. The economy of the arrangement decided in her favor; for, in spite of our grand descent and grander notions, we were poor enough, after father died, and the education of three children had made

no small gap in our little principal, and she came.

Her name was a singular one,—Selphar. It always savored too nearly of brimstone to please me. I used to call her Sel, "for short." She was a good, sensible, uninteresting-looking girl, with broad face, large features, and limp, tow-colored curls. I doubt if I ever see curls like them now without a little shudder. They used to hang straight down about her eyes, and were never otherwise than perfectly smooth. She proved to be of good temper, which is worth quite as much as brains in a servant, as honest as the daylight, dull enough at her books, but a good, plodding worker, if you marked out every step of the way for her beforehand. I do not think she would ever have discovered the laws of gravitation; but she might have jumped off a precipice to prove them, if she had been bidden.

Until she was seventeen, she was precisely like any other rather stupid girl; never given to novel-reading or fancies; never frightened by the dark or ghost-stories; proving herself warmly attached to us, after a while, and rousing in us, in return, the kindly interest naturally felt for a faithful servant; but she was not in any respect *un*common,—quite far from it,—except in the circumstance that she never told a falsehood.

At seventeen she had a violent attack of diphtheria, and her life hung by a thread. Mother's aristocracy had nothing of that false pride which is afraid of contamination from kindly association with its inferiors. She was too thoroughly a lady. She was as tender and unwearying in her care of Selphar as the girl's own

mother might have been. She was somehow touched by the child's orphaned life,—suffering always, in all places, appealed to her so strongly,—every sorrow found so warm a place in her heart.

From that time, I believe Sel was immovable in her faith in my mother's divinity. Under such nursing as she had, she slowly recovered, but her old, stolid strength never came back to her. Severe headaches became of frequent occurrence. Her stout, muscular arms grew weak. As weeks went on, it became evident in many ways that, though the diphtheria itself was quite out of her system, it had left her thoroughly diseased. Strange fits of silence came over her: her volubility had been the greatest objection we had to her hitherto. Her face began to wear a troubled look. She was often found in places where she had stolen away to be alone.

One morning she slept late in her little garret-chamber, and we did not call her. The girl had gone up stairs the night before crying with the pain in her temples, and mother, who was always thoughtful of her servants, said it was a pity to wake her, and, as there were only three of us, we might get our own breakfast for once. While we were at work together in the kitchen, Clara heard her kitten mewing out in the snow, and went to the door to let her in. The creature, possessed by some sudden frolic, darted away behind the well-curb. Clara was always a bit of a romp, and, with never a thought of her daintily-slippered feet, she flung her trailing dress over one arm and was off over the three-inch

snow. The cat led her a brisk chase, and she came in flushed, and panting, and pretty, her little feet drenched, and the tip of a Maltese tail just visible above a great bundle she had made of her apron.

"Why!" said mother, "you have lost your ear-ring."

Clara dropped the kitten with unceremonious haste on the floor, felt of her little pink ear, shook her apron, and the corners of her mouth went down into her dimpled chin.

"They're the ones Winthrop sent, of all things in the world!"

"You'd better put on your rubbers, and have a hunt out-doors," said mother.

We hunted out-doors,—on the steps, on the well-boards, in the wood-shed, in the snow; Clara looked down the well till her nose and fingers were blue, but the ear-ring was not to be found. We hunted in-doors, under the stove, and the chairs, and the table, in every possible and impossible nook, cranny, and crevice, but gave up the search in despair. It was a pretty trinket,—a leaf of delicately wrought gold, with a pearl dew-drop on it,—very becoming to Clara, and the first present Winthrop had sent her from his earnings. If she had been a little younger she would have cried. She came very near it as it was, I suspect, for when she went after the plates she stayed in the cupboard long enough to set two tables.

When we were half through breakfast, Selphar came down, blushing, and frightened half out of her wits, her apologies tumbling over each other with such skill as to render each

one unintelligible,—and evidently undecided in, her own mind whether she was to be hung or burnt at the stake.

"It's no matter at all," said mother, kindly; "I knew you felt sick last night. I should have called you if I had needed you."

Having set the girl at her ease, as only she could do, she went on with her breakfast, and we forgot all about her. She stayed, however, in the room to wait on the table. It was afterwards remembered that she had not been out of our sight since she came down the garret-stairs. Also, that her room looked out upon the opposite side of the house from that on which the well-curb stood.

"Why, look at Sel!" said Clara, suddenly, "she has her eyes shut."

The girl was just passing the toast. Mother spoke to her. "Selphar, what is the matter?"

"I don't know."

"Why don't you open your eyes?"

"I can't."

"Hand the salt to Miss Sarah."

She took it up and brought it around the table to me, with perfect precision.

"Sel, how you act!" said Clara, petulantly. "Of course you saw."

"Yes'm, I saw," said the girl in a puzzled way, "but my eyes are shut, Miss Clara."

"Tight?"

"Tight."

Whatever this freak meant, we thought best to take no notice of it. My mother told her, somewhat gravely, that she might sit down until she was wanted, and we returned to our conversation about the ear-ring.

"Why!" said Sel, with a little jump, "I see your ear-ring, Miss Clara,—the one with a white drop on the leaf. It's out by the well."

The girl was sitting with her back to the window, her eyes, to all appearance, tightly closed.

"It's on the right-hand side, under the snow, between the well and the wood-pile. Why, don't you see?"

Clara began to look frightened, mother displeased.

"Selphar," she said, "this is nonsense. It is impossible for you to see through the walls of two rooms and a wood-shed."

"May I go and get it?" said the girl, quietly.

"Sel," said Clara, "on your word and honor, are your eyes shut *perfectly* tight?"

"If they ain't, Miss Clara, then they never was."

Sel never told a lie. We looked at each other, and let her go. I followed her out, and kept my eyes on her closed lids. She did not once raise them; nor did they tremble, as lids will tremble, if only partially closed.

She walked without the slightest hesitation directly to the well-curb, to the spot which she had mentioned, stooped down, and brushed away the three-inch fall of snow. The ear-ring lay there,

where it had sunk in falling. She picked it up, carried it in, and gave it to Clara.

That Clara had the thing on when she started after her kitten, there could be no doubt. She and I both remembered it. That Sel, asleep on the opposite side of the house, could not have seen it drop, was also settled. That she, with her eyes closed and her back to the window, had seen through three walls, and through three inches of snow, at a distance of fifty feet, was an inference.

"I don't believe it!" said my mother, "it's some nonsensical mistake." Clara looked a little pale, and I laughed.

We watched her carefully through the day. Her eyes remained tightly closed. She understood all that was said to her, answered correctly, but did not seem inclined to talk. She went about her work as usual, and performed it without a mistake. It could not be seen that she groped at all with her hands to feel her way, as is the case with the blind. On the contrary, she touched everything with her usual decision. It was impossible to believe, without seeing them, that her eyes were closed.

We tied a handkerchief tightly over them; see through it or below it she could not, if she had tried. We then sent her into the parlor, with orders to bring from the book-case two Bibles which had been given as prizes to Clara and me at school, when we were children. The books were of precisely the same size, color, and texture. Our names in gilt letters were printed upon the binding. We followed her in, and watched her narrowly. She went directly to the book-case, laid her hands upon the books

at once, and brought them to my mother. Mother changed them from, hand to hand several times, and turned them with the gilt lettering downwards upon her lap.

"Now, Selphar, which is Miss Sarah's?"

The girl quietly took mine up. The experiment was repeated and varied again and again. In every case the result was the same. She made no mistake. It was no guess-work. All this was done with the bandage tightly drawn about her eyes. *She did not see those letters with them.*

That evening we were sitting quietly in the dining-room. Selphar sat a little apart with her sewing, her eyes still closed. We kept her with us, and kept her in sight. The parlor, which was a long room, was between us and the front of the house. The distance was so great that we had often thought, if prowlers were to come around at night, how impossible it would be to hear them. The curtains and shutters were closely drawn. Sel was sitting by the fire. Suddenly she turned pale, dropped her sewing, and sprang from her chair.

"Robbers, robbers!" she cried. "Don't you see? they're getting in the east parlor window! There's three of 'em, and a lantern. They've just opened the window,—hurry, hurry!"

"I believe the girl is insane," said mother, decidedly. Nevertheless, she put out the light, opened the parlor door noiselessly, and went in.

The east window was open. There was a quick vision of three men and a dark lantern. Then Clara screamed, and it

disappeared. We went to the window, and saw the men running down the street. The snow the next morning was found trodden down under the window, and their footprints were traced out to the road.

When we went back to the other room, Selphar was standing in the middle of it, a puzzled, frightened look on her face, her eyes wide open.

"Selphar," said my mother, a little suspiciously, "how did you know the robbers were there?"

"Robbers!" said the girl, aghast.

She knew nothing of the robbers. She knew nothing of the ear-ring. She remembered nothing that had happened since she went up the garret-stairs to bed, the night before. And, as I said, the girl was as honest as the sunlight. When we told her what had happened, she burst into terrified tears.

For some time after this there was no return of the "tantrums," as Selphar had called the condition, whatever it was. I began to get up vague theories of a trance state. But mother said, "Nonsense!" and Clara was too much frightened to reason at all about the matter.

One Sunday morning Sel complained of a headache. There was an evening service that night, and we all went to church. Mother let Sel take the empty seat in the carryall beside her.

It was very dark when we started to come home. But Creston was a safe old Orthodox town, the roads were filled with returning church-goers like ourselves, and mother drove like a

man. A darker night I think I have never seen. Literally, we could not see a hand before our eyes. We met a carriage on a narrow road, and the horses' heads touched, before either driver had seen the other.

Selphar had been quite silent during the drive. I leaned forward, looked closely into her face, and could dimly see through the darkness that her eyes were closed.

"Why!" she said at last, "see those gloves!"

"Where?"

"Down in the ditch; we passed them before I spoke. I see them on a blackberry-bush; they've got little brass buttons on the wrist."

Three rods past now, and we could not see our horse's head.

"Selphar," said my mother, quickly, "what *is* the matter with you?"

"If you please, ma'am, I don't know," replied the girl, hanging her head. "May I get out and bring 'em to you?"

Prince was reined up, and Sel got out. She went so far back, that, though we strained our eyes to do it, we could not see her. In about two minutes she came up, a pair of gentleman's gloves in her hand. They were rolled together, were of cloth so black that on a bright night it would never have been seen, and had small brass buttons at the wrist.

Mother took them without a word.

The story leaked out somehow, and spread all over town. It raised a great hue and cry. Four or five antediluvian ladies

declared at once that we were nothing more nor less than a family of "them spirituous mediums," and seriously proposed to expel mother from the prayer-meeting. Masculine Creston did worse. It smiled a pitying smile, and pronounced the whole thing the fancy of "scared women-folks." I could endure with calmness any slander upon earth but that. I sent by the next mail for Winthrop, and stated the case to him in a condition of suppressed fury. He very politely bit back an incredulous smile, and said he should be *very* happy to see her perform. The answer was somewhat dubious. I accepted it in silent suspicion.

He came on Saturday noon. That afternoon we attended *en masse* one of those refined inquisitions commonly known as picnics, and Winthrop lost his pocket-knife. Selphar, of course, kept house at home.

When we returned, Winthrop made some careless reference to his loss in her presence, and thought no more of it. About half an hour after, we observed that she was washing the dishes with her eyes shut. The condition had not been upon her five minutes before she dropped the spoon suddenly into the water, and asked permission to go out to walk. She "saw Mr. Winthrop's knife somewhere under a stone, and wanted to get it." It was fully two miles to the picnic grounds, and nearly dark. Winthrop followed the girl, unknown to her, and kept her in sight. She went rapidly, and without the slightest hesitation or search, to an out-of-the-way gully down by the pond, where Winthrop afterwards remembered having gone to cut some willow-twigs for the girls,

parted a thick cluster of bushes, lifted a large, loose stone under which the knife had rolled, and picked it up. She returned it to Winthrop, quietly, and hurried away about her work to avoid being thanked.

I observed that, after this incident, masculine Creston became more respectful.

Of several peculiarities in this development of the girl I made at the time careful memoranda, and the exactness of these can be relied upon.

1. She herself, so far from attempting to bring on these trance states, or taking any pride therein, was intensely troubled and mortified by them,—would run out of the room, if she felt them coming on in the presence of visitors.

2. They were apt to be preceded by severe headaches, but came often without any warning.

3. She never, in any instance, recalled anything that happened during the trance, after it was passed.

4. She was powerfully and unpleasantly affected by electricity from a battery, or acting in milder forms. She was also unable at any time to put her hands and arms into hot water; the effect was to paralyze them at once.

5. Space proved to be no impediment to her vision. She has been known to follow the acts, words, and expressions of countenance of members of the family hundreds of miles away, with accuracy; as was afterwards proved by comparing notes as to time.

6. The girl's eyes, after her trances became habitual, assumed, and always retained, the most singular expression I ever saw on any face. They were oblong and narrow, and set back in her head like the eyes of a snake. They were not—smile if you will, O practical and incredulous reader!—but they were not *human* eyes. The eyes of Elsie Venner are the only eyes I can think of as at all like them. The most horrible circumstance about them—a circumstance that always made me shudder, familiar as I was with it—was, that, though turned fully on you, *they never looked at you*. Something behind them or out of them did the seeing, not they.

7. She not only saw substance, but soul. She has repeatedly told me my thoughts when they were upon subjects to which she could not by any possibility have had the slightest clew.

8. We were never able to detect a shadow of deceit about her.

9. The clairvoyance never failed in any instance to be correct, so far as we were able to trace it.

As will be readily imagined, the girl became a useful member of the family. The lost valuables restored and the warnings against mischances given by her quite balanced her incapacity for peculiar kinds of work. This incapacity, however, rather increased than diminished, and, together with her fickle health, which also grew more unsettled, caused us a great deal of care. The Creston physician—who was a keen man in his way, for a country doctor—pronounced the case altogether undreamt of before in Horatio's philosophy, and kept constant notes of it.

Some of these have, I believe, found their way into the medical journals.

After a while there came, like a thief in the night, that which I suppose was poor Selphar's one unconscious, golden mission in this world. It came on a quiet summer night, that ended a long trance of a week's continuance. Mother had gone out into the kitchen to give an order for breakfast. I heard a few eager words in Selphar's voice, and then the door shut quickly, and it was an hour before it was opened.

Then my mother came to me without a particle of color in lips or cheek, and drew me away alone, and told the secret to me.

Selphar had seen Aunt Alice.

We sat down and looked at one another. There was a singular pinched look about my mother's mouth.

"Sarah."

"Yes."

"She says"—and then she told me what she said. She had seen Alice Stuart in a Western town, seven hundred miles away. Among the living, she desired to be counted of the dead. And that was all.

My mother paced the room three times back and forth, her hands locked.

"Sarah." There was a chill in her voice—it had been such a gentle voice!—that froze me. "Sarah, the girl is an impostor."

"Mother!"

She paced the room, once more, three times, back and forth.

"At any rate, she is a poor, self-deluded creature. How *can* she see, seven hundred miles away, a dead woman who has been an angel all these years? Think! an *angel*, Sarah! So much better than I, and I—I loved—"

Before or since, I never heard my mother speak like that. She broke off sharply, and froze back into her chilling voice.

"We will say nothing about this, if you please. I do not believe a word of it."

We said nothing about it, but Selphar did. The delusion, if delusion it were, clung to her, haunted her, pursued her, week after week. To rid her of it, or to silence her, was impossible. She added no new facts to her first statement, but insisted that the long-lost dead was yet alive, with a quiet pertinacity that it was simply impossible to ridicule, frighten, threaten, or cross-question out of her, Clara was so thoroughly alarmed that she would not have slept alone for any mortal—perhaps not for any immortal—considerations. Winthrop and I talked the matter over often and gravely when we were alone and in quiet places. Mother's lips were sealed. From the day when Sel made the first disclosure, she was never heard once to refer to the matter. A perceptible haughtiness crept into her manner towards the girl. She even talked of dismissing her; but repented it, and melted into momentary gentleness. I could have cried over her that night. I was beginning to understand what a pitiful struggle her life had become, and how utterly alone she must be in it. She *would* not believe—she knew not what. She could not doubt the girl. And

with the conflict even her children could not intermeddle.

To understand the crisis into which she was brought, the reader must bear in mind our long habit of belief, not only in Selphar's personal honesty, but in the infallibility of her mysterious power. Indeed, it had almost ceased to be mysterious to us, from daily familiarity. We had come to regard it as the curious working of physical disease, had taken its results as a matter of course, and had ceased, in common with converted Creston, to doubt the girl's capacity for seeing anything that she chose to, at any place.

Thus a year wore on. My mother grew sleepless and pallid. She laughed often, in a nervous, shallow way, as unlike her as a butterfly is unlike a sunset; and her face settled into an habitual sharpness and hardness unutterably painful to me.

Once only I ventured to break into the silence of the haunting thought that she knew, and we knew, was never escaped by either. "Mother, it would do no harm for Winthrop to go out West, and —"

She interrupted me sternly: "Sarah, I had not thought you capable of such childish superstition. I wish that girl and her nonsense had never come into this house!"—turning sharply away, and out of the room.

Just what that year was to my mother, I suppose only God and she have ever known, or will know.

But it ended. It ended at last, as I had prayed every night and morning of it that it should end. Mother came into my room

one night, locked the door behind her, and, walking over to the window, stood with her face turned from me.

"Sarah."

"Yes."

"Sarah."

But that was all for a little while. Then,—"Sick and in suffering, Sarah,—the girl—she may be right, God Almighty knows! *Sick and in suffering*, you see. I am going. I think, I—"

The voice broke and melted utterly. I stole away and left her alone.

Creston put on its spectacles and looked wise on learning, the next day, that Mrs. Dugald had taken the earliest morning train for the West, on sudden and important business. It was precisely what Creston expected, and just like the Dugalds for all the world,—gone to hunt up material for that genealogical book, or map, or tree, or something, that they thought nobody knew they were going to publish. O yes, Creston understood it perfectly.

Space forbids me to relate in detail the clews which Selphar had given as to the whereabouts of the wanderer. Her trances, just at this time, were somewhat scarce and fragmentary, and the information she had professed to give had come in snatches and very imperfectly,—the trance being apt to end suddenly at the moment when some important question was pending, and then, of course, all memory of what she had said, or was about to say, was gone. The names and appearance of persons and

places necessary to the search had, however, been given with sufficient distinctness to serve as a guide in my mother's rather chimerical undertaking. I suppose ninety-nine persons out of a hundred would have thought her a candidate for the State Lunatic Asylum. Exactly what she herself expected, hoped, or feared, I think it doubtful if she knew. I confess to a condition of simple bewilderment, when she was fairly gone, and Clara and I were left alone with Selphar's ghostly eyes forever on us. One night I had to lock the poor thing into her garret-room before I could sleep.

Just three weeks from the day mother started for the West, the coach rattled up to the door, and two women, arm in arm, came slowly up the walk. The one, erect, royal, with her great steadfast eyes alight; the other, bent and worn, gray-haired and sallow and dumb, crawling feebly through the golden afternoon sunshine, as the ghost of a glorious life might crawl back to its grave.

Mother threw open the door, and stood there like a queen. "Children, your aunt has come home. She is too tired to talk just now. By and by she will be glad to see you."

We took her gently up stairs, into the room where the lilies were mouldering to dust, and laid her down upon the bed. She closed her eyes wearily, turned her face over to the wall, and said no word.

What was the story of those tired eyes I never asked, and I never knew. Once, as I passed the room, a quick picture showed through the open door. The two women lying with their

arms about each other's neck, as they used to do when they were children together; and above them, still and watchful, the wounded Face that had waited there so many years for this.

One was speaking with weak sobs, and very low. It was Aunt Alice. I caught but two words,—"My husband."

But what that husband was remains unknown till the day when the grave shall give up its dead, and the secrets of hearts oppressed and sinned against and sorrowful shall be revealed.

She lingered weakly there, within the restful room, for seven days, and then one morning we found her with her eyes upon the thorn-crowned face, her own quite still and smiling.

A little funeral train wound away one night behind the church, and left her down among those red-cup mosses that opened in so few months again to cradle the sister who had loved her. Two words only, by mother's orders, marked the simple headstone,—

"Alice Browning."

I have given you facts. Explain them as you will. I do not attempt it, for the simple reason that I cannot.

A word must be said as to the fate of poor Sel, which was mournful enough. Her trances grew gradually more frequent and erratic, till she became so thoroughly diseased in mind and body as to be entirely unfitted for household work, and, in short, nothing but an encumbrance. We kept her, however, for the sake of charity, and should have done so, till her poor, tormented life wore itself out; but after the advent of a new servant, and my mother's death, she conceived the idea that she was a burden,

cried over it a few weeks, and at last one bitter winter's night she disappeared. We did not give up all search for her for years, but nothing was ever heard from her. He, I hope, who permitted life to be such a terrible mystery to her, has cared for her somehow, and kindly, and well.

THE MINER

Down 'mid the tangled roots of things
That coil about the central fire,
I seek for that which giveth wings,
To stoop, not soar, to my desire.

Sometimes I hear, as 't were a sigh,
The sea's deep yearning far above.
"Thou hast the secret not," I cry,
"In deeper deeps is hid my Love."

They think I burrow from the sun,
In darkness, all alone and weak;
Such loss were gain if He were won.
For 't is the sun's own Sun I seek.

The earth, they murmur, is the tomb
That vainly sought his life to prison;
Why grovel longer in its gloom?
He is not here; He hath arisen.

More life for me where He hath lain
Hidden, while ye believed him dead,
Than in cathedrals cold and vain,
Built on loose sands of "It is said."

My search is for the living gold,
Him I desire who dwells recluse,
And not his image, worn and old,
Day-servant of our sordid use.

If Him I find not, yet I find
The ancient joy of cell and church,
The glimpse, the surety undefined,
The unquenched ardor of the search.

Happier to chase a flying goal,
Than to sit counting laurelled gains,
To guess the Soul within the soul,
Than to be lord of what remains.

PHYSICAL HISTORY OF THE VALLEY OF THE AMAZONS

II

Major Coutinho and myself passed three days in the investigation of the Serra of Erreré. We found it to consist wholly of the sandstone deposits described in my previous article, and to have exactly the same geological constitution. In short, the Serra of Monte Alegre, and of course all those connected with it on the northern side of the river, lie in the prolongation of the lower beds forming the banks of the river, their greater height being due simply to the fact that they have not been worn to the same low level. The opposite range of Santarem, which has the same general outline and character, shares, no doubt, the same geological structure. In one word, all these hills were formerly part of a continuous formation, and owe their present outline and their isolated position to a colossal denudation. The surface of the once unbroken strata, which in their original condition must have formed an immense plain covered by water, has been cut into ravines or carried away over large tracts, to a greater or less depth, leaving only such portions standing as from their hardness could resist the floods which swept over it. The longitudinal trend

of these hills is to be ascribed to the direction of the current which caused the denudation, while their level summits are due to the regularity of the stratification. They are not all table-topped, however; among them are many of smaller size, in which the sides have been gradually worn down, producing a gently rounded surface. Of course, under the heavy tropical rains this denudation is still going on, though in a greatly modified form.

I cannot leave this Serra without alluding to the great beauty and extraordinary extent of the view to be obtained from it. Indeed, it was here that for the first time the geography of the country presented itself to my mind as a living reality, in all its completeness. Insignificant as is its actual height, the Serra of Erreré commands a wider prospect than is to be had from many a more imposing mountain; for the surrounding plain, covered with forests, and ploughed by countless rivers, stretches away for hundreds of leagues in every direction, without any object to obstruct the view. Standing on the brow of the Serra, with the numerous lakes intersecting the low lands at its base, you look across the Valley of the Amazons, as far as the eye can reach, and through its midst you follow for miles on either side the broad flood of the great river, carrying its yellow waters to the sea. As I stood there, panoramas from the Swiss mountains came up to my memory, and I fancied myself standing on the Alps, looking across the plain of Switzerland, instead of the bed of the Amazons, the distant line of the Santarem hills on the southern bank of the river, and lower than the northern chain,

representing the Jura range. As if to complete the comparison, I found Alpine lichens growing among cactus and palms, and a crust of Arctic cryptogamous growth covered rocks, between which sprang tropical flowers. On the northern flank of this Serra I found the only genuine erratic boulders I have seen in the whole length of the Amazonian Valley, from Pará to the frontier of Peru, though there are many detached masses of rock, as, for instance, at Pedreira, near the junction of the Rio Negro and Rio Branco, which might be mistaken for them, but are due to the decomposition of the rocks in place. The boulders of Erreré are entirely distinct from the rock of the Serra, and consist of masses of compact hornblende.

It would seem that these two ranges skirting a part of the northern and southern banks of the Lower Amazons are not the only remnants of this arenaceous formation in its primitive altitude. On the banks of the Japura, in the Serra of Cupati, Major Coutinho has found the same beds rising to the same height. It thus appears, by positive evidence, that over an extent of a thousand miles these deposits had a very considerable thickness in the present direction of the valley. How far they extended in width has not been ascertained by direct observation, for we have not seen how they sink away to the northward, and towards the south the denudation has been so complete that, except in the very low range of hills in the neighborhood of Santarem, they do not rise above the plain. But the fact that this formation once had a thickness of more than eight hundred feet within the

limits where we have had an opportunity of observing it, leaves no doubt that it must have extended to the edge of the basin, filling it to the same height throughout its whole extent. The thickness of the deposits gives a measure for the colossal scale of the denudations by which this immense accumulation was reduced to its present level. Here then is a system of high hills, having the prominence of mountains in the landscape, produced by causes to whose agency inequalities on the earth's surface of this magnitude have never yet been ascribed. We may fairly call them denudation mountains.

At this stage of the inquiry we have to account for two remarkable phenomena. First, the filling of the Amazonian bottom with coarse arenaceous materials and finely laminated clays, immediately followed by sandstones rising to a height of more than eight hundred feet above the sea; the basin meanwhile having no rocky barrier towards the ocean on its eastern side. Second, the wearing away and reduction of these formations to their present level, by a denudation, more extensive than any thus far recorded in the annals of geology, which has given rise to all the most prominent hills and mountain chains along the northern bank of the river. Before seeking an explanation of these facts, let us look at the third and uppermost deposit.

This deposit, essentially the same as the Rio drift, has been minutely described in my former article; but in the north, it presents itself under a somewhat different aspect. As in Rio, it is a clayey deposit, containing more or less sand, and reddish

in color, though varying from deep ochre to a brownish tint. It is not so absolutely destitute of stratification here as in its more southern range, though the traces of stratification are rare, and, when they do occur, are faint and indistinct. The materials are also more completely comminuted, and, as I have said above, contain hardly any large masses, though quartz pebbles are sometimes scattered throughout the deposit, and occasionally a thin seam of pebbles, exactly as in the Rio drift, is seen resting between it and the underlying sandstone. In some places this bed of pebbles even intersects the mass of the clay, giving it in such instances an unquestionably stratified character. There can be no question that this more recent formation rests unconformably upon the sandstone beds beneath it; for it fills all the inequalities of their denudated surfaces, whether they be more or less limited furrows, or wide, undulating depressions. It may be seen everywhere along the banks of the river, above the stratified sandstone, sometimes with the river mud accumulated against it; at the season of the *enchente*, or high water, it is the only formation left exposed above the water level. Its thickness is not great; it varies from twenty or thirty to fifty feet, and may occasionally rise nearly to a hundred feet in height, though this is rarely the case. It is evident that this formation also was once continuous, stretching over the whole basin at one level. Though it is now worn down in many places, and has wholly disappeared in others, its connection may be readily traced; since it is everywhere visible, not only on opposite banks of

the Amazons, but also on those of all its tributaries, as far as their shores have been examined. I have said that it rests always above the sandstone beds. This is true, with one exception. Wherever the sandstone deposits retain their original thickness, as in the hills of Monte Alegre and Almeyrim, the red clay is not found on their summits, but occurs only in their ravines and hollows, or resting against their sides. This shows that it is not only posterior to the sandstone, but was accumulated in a shallower basin, and consequently never reached so high a level. The boulders of Erreré do not rest on the stratified sandstone of the Serra, but are sunk in the unstratified mass of the clay. This should be remembered, as it will presently be seen that their position associates them with a later period than that of the mountain itself. The unconformability of the ochraceous clay and the underlying sandstones might lead to the idea that the two formations belong to distinct geological periods, and are not due to the same agency, acting at successive times. One feature, however, shows their close connection. The ochraceous clay exhibits a remarkable identity of configuration with the underlying sandstones. An extensive survey of the two, in their mutual relations, shows clearly that they were both deposited by the same water-system within the same basin, but at different levels. Here and there the clay formation has so pale and grayish a tint, that it may be confounded with the mud deposits of the river. These latter, however, never rise so high as the ochraceous clay, but are everywhere confined within the limits of high and low

water. The islands also in the main course of the Amazons consist invariably of river-mud, while those arising from the intersection and cutting off of portions of the land by diverging branches of the main stream always consist of the well-known sandstones, capped by the ochre-colored clay.

Конец ознакомительного фрагмента.