of the slit marked by a pair of spider-lines. I see that Professor Young has a different arrangement for accomplishing, with similar facility, the same purpose.

Respectfully submitted.

J. HOMER LANE.

Professor BENJAMIN PEIRCE,
Superintendent of the United States Eclipse Expedition.

WASHINGTON, *June* 30, 1873.

DEAR SIR: The following is my report on the observations of the total eclipse of the sun on December 21, 1870. In accordance with your directions I went to Catania to observe the eclipse. I was to have observed it with the same spectroscope and telescope with which I observed the eclipse of 1869, but fitted with Professor Winlock's attachment for recording the position of the spectral lines. Unfortunately, owing to a mistake with which I was in no way concerned, this instrument was dispatched to Spain, and the circumstance was not discovered in time to get the instrument or to go to it. Mr. Adams, of the English expedition, was good enough to lend me an eye-piece with a Savart polariscope. I fitted this to a telescope which I found among the instruments of our own party, in order to observe the nature of the polarization of the corona. I was stationed at the villa of the Marquis di San Giuliano, some three miles behind Catania, on the road to Etna. The weather was remarkably clear in the morning, but a storm blew up at the time of the eclipse, and it was raining during the total phase, at least at the beginning of it. Fortunately, a very small opening occurred in the clouds, so that the observations could be made, although under disadvantageous circumstances. I had previously tested the telescope for polarization, and found none perceptible. The plan was to set first upon the dark face of the moon and turn the polariscope so that the bands disappeared, and then observe the position angle (from the center of the moon) of that part of the corona on which the bands attained their maximum. I observed two parts of the corona, differing 180° in position angle, and found the plane of polarization to be about 6° from the radial position, being more nearly vertical. The parts observed upon were 65° and 145° from the vertex towards the east in position angle. The measures were made upon a part about six or seven minutes from the limb. The measures both of the position of the plane of polarization and of position angle were recorded by scratches upon the lacquer of the eye-piece, the edge of the polariscope affording the means of measuring the latter.

Yours, very respectfully,

C. S. PEIRCE.

Professor BENJAMIN PEIRCE,
Superintendent Coast Survey.

Report of Mrs. Charles S. Peirce.

DEAR SIR: My duty as a member of the United States Coast Survey Expedition to the Mediterranean for observing the eclipse of 1870, was to sketch the corona, and I will premise that my knowledge of drawing extends merely to outlinings and shading single objects. That is, I cannot group a landscape rapidly and effectively, but any one object in a landscape I believe I can copy with great accuracy.

After we arrived at Catania, Mr. Lockyer, of the English expedition, kindly lent me a copy of the twelve observations, more or less, which he had drawn up, as being important for the sketchers to make, and these I conned diligently. I also heard, through Professor Peirce, that Mr. Lockyer was advising his sketchers to practice from pictures of former coronas, pinned up on the wall, and to see how many outlines they could dash off in a given time.

I immediately acted upon this hint, but the only copy of a corona of which, as it happened, I could have the use, was one of a former eclipse by Padre Secchi, with what, I must think, exaggerated rays and streamers radiating out from it in all directions. This I pinned high up on my bed-hangings, and copied endless times, by first drawing circles on my paper, and quartering them,

and then, always beginning at the left-hand upper quarter, I went through the upper half of the pictured corona, and afterward, starting at the left-hand lower quarter, I carried the lower half round to meet the upper. I also practiced sketching as rapidly as possible the outline of any object that my eye fell upon casually, and I drew frequently the ever-changing steam-cloud that rolls continually out of Etna.

Secchi's picture, however, consisting, as it did, principally of very strongly marked rays, my attention became fixed on the idea of rays, or streamers, and these I was determined, if there were any, to see.

The post of observation of our party was at a villa of the Marquis di San Giuliano, about two miles from Catania. The road to it was that also to Etna, and therefore up-hill all the way. The villa overlooked the valley in which lay Catania and its harbor, and which, set in a wide, encircling frame of mountains on the eastern and western, and of open sea, stretching to the center, horizon, made the most enchanting landscape possible to behold. I was placed at a window in a room of the second story, commanding this view, and with the sun a little to my right hand.

Other reports will, no doubt, describe the sudden change in the weather, which, after the eclipse had begun, converted the most blue and brilliant of skies into one which was covered with clouds. As the eclipse progressed these clouds became denser, and when the sun was nearly covered, they fairly serried themselves into a black wall and hid the phenomenon completely from sight, rain and hail falling at the same time, and a chill blast blowing. Neither the lady with me, nor I, had any watch, and I was convinced, so long the minutes seemed, that the totality and the rain were simultaneous, when suddenly the cloud broke, and left a little lake of clear sky, in which the sun, now nearly extinguished by the black moon, was exhibited as in a frame.

Lest it should prove too dark for me to see to draw, I had been provided with a lantern, but, in my despair of the moments before, I had mechanically blown the candle out, as being no longer needed. Instantly I was nervously anxious to light it again, but the wind was blowing in so strongly from the open window that this was a difficult operation, and while I was struggling to accomplish it, with my eyes down on my table, in a flash, a crimson, almost bloody, light fell upon my paper, throwing black shadows, and I lifted my eyes to the sun just in time to see what I suppose to have been the "Baily's beads," and to catch in the upward sweep of my glance a most tantalizing glimpse of the color-transformation in the clouds, which lined the horizon over the sea and the mountains, and which, in the lurid light, looked as unearthly as dancing witches.

Up to this point, I had steadily watched the landscape, but had seen nothing in the changes of the light more remarkable than the usual appearances of a greenish-black thunder-storm. Indeed, I have seen effects of that kind much more striking than those of this occasion. The color-tints at the instant of the Baily's beads, or vanishing point, however—could one have had thought and eyes for only that—must have been altogether exceptional and peculiar to an eclipse. I, at least, never saw anything approaching the strange and weird effects which that upward glance impressed *en passant* upon my vision.

I had been told to take one look at the corona, as a whole, before beginning to draw, and I did so. But as I never should venture to draw from memory, I am only sure of a thing if I copy it directly from the object. I did not dare to linger over this glance. It was but a second, and most disappointing. The bright halo of the corona immediately surrounding the sun was much narrower than I had supposed, and, as I remember it, it was not pure white, but faintly yellowish, though I can hardly believe that this latter impression is from anything but an imperfect and agitated memory. It, the halo, lost itself suddenly in a confused brightish surrounding that seemed to me a golden mist, so that my belief was, and almost is, that I was looking at the whole thing through a cloud. Let all this, however, go for nothing, since it was too momentary to be correct.

I began to draw, and, even as I had practiced from my pictured corona, I began at the lower side of the left-hand upper quarter and passed round through the right-hand upper quarter. But I could see no bright rays such as I had been copying, only a radiation of dark lines over the bright halo, a few of which I put down as seen in my drawing, just to show the character of them, not as portraits of individual lines. Indeed, I said to myself that it was of no use to try to draw them, because there was, or I thought there was, a cloud over the corona comprising them. I soon turned

my eyes and my pencil, therefore, to the lower left-hand quarter. What was my astonishment to find here, not a long and broad bright ray, wide at the base and narrowing to a point, as in Secchi's corona, but a long, dark, or rather delicate gray or steel colored ray, narrowest at the sun and widening as it went out, which entirely crossed the bright halo, and ceased or lost itself only on the very outside edges of the hazy envelope beyond. I put it in its place exactly as it appears in the drawing, and going farther round the diameter, found a more delicate and shorter one about halfway between the two lower quarters, and, further on still, a still shorter one in the upper part of the right-hand lower quarter, and then the eclipse was over, and I had had no time to verify my observation on the lower half, or to scan once more the upper half, in order to see whether there were not some dark rays there which I might have overlooked.

So very delicate was the tint of these rays, so lost in the general halo, and so short was the time, that I doubt, had I not happened to have my attention fixed on the idea of rays alone, whether I should have discovered them at all. Not one of Mr. Lockyer's other twelve questions, by the way, crossed my mind for a moment; nor could they have been answered if they had. The time is too brief, the novelty too complete, and the agitation too great, I am convinced, for a person observing an eclipse for the first time, to see truly more than one point in it. I had not time to allow myself to look at any of the accompanying phonomena, the stars, the light on the landscape, the width of the corona as compared with the diameter of the dark moon, the sphericity of the latter, *anything*. As a whole, the phenomenon was completely lost upon me, and all I brought away with me, all that I can vouch for in what I did see, are my three dark rays. They reminded me somewhat of the way the dark beam across the air looks when the sun is, what the country people call "drawing water," behind a cloud. My first thought in regard to them was, that they were shadows from mountains on the back of the moon, and hence the reader will perceive that the dark rays had something the look of a shadow thrown across a luminous object. I remembered that all the photographs (not drawings) I had seen of eclipses had a decided notch in the outline of the corona, about the neighborhood of my first dark ray, which induced me to think that the appearance might be something permanent. Professor Peirce thought that the observations of the dark rays was new and might be important. I mentioned it to one or two of the scientific gentlemen then in Catania, but they listened as if they thought my imagination had as much to do with my impression as the facts, and it was not until we got to London and heard about the comparison of Professor Winlock's and Mr. Brothers's photographs in regard to the position of these very rifts, that I felt sure I had seen anything worth seeing.

Mr. Lockyer, in one of his published comments on the eclipse in *Nature*, said, I believe, that "none of the sketchers in Sicily had seen the rift." I was in the hotel with Mr. Lockyer, but he had not thought it worth while to ask me what I had observed, and I did not like to volunteer the information, especially as the English parties in Catania and upon Etna had been deprived by the rain of seeing the eclipse at all.

In future eclipses it would, perhaps, be well that every two sketchers should take one point between them. Thus they will have time to make a definite observation of value, and to correct each other by comparing notes. Had it not been for the photographs, my observation would hardly have been credited. Yet, Professor Winlock's photograph so nearly bears out my observation of the position of the dark rays on the lower half of the corona, that I can feel no doubt that I really saw what I have here attempted to picture and describe.

The drawing represents the eclipse as it appeared to the naked eye, and the vertical direction is up and down on the sketch.

Yours, very respectfully,

ZINA FAY PEIRCE.

Professor BENJAMIN PEIRCE,
Superintendent Coast Survey.