there offered the kind hospitality of Mr. Bartlett during our stay; and thirdly, we there found an almost uninterrupted panoramic view of the country for upwards of twenty miles, presenting thereby an opportunity of witnessing the grand sweep of the moon's shadow, and the various atmospheric effects which we anticipated would accompany the eclipse. Nor were we disappointed.

Our station was on a small table-land at the culminating point of the Spanish Pyrenees, and of one of the steepest and most elevated railways in Europe. It formed the watershed of streams which on the one hand flow into the Atlantic, and at the distance of a quarter of a mile on the other, find their way into the Ebro and the Mediterranean. Before leaving Bilbao we took the height of the barometer on the shore of the river Nervion, and again immediately on our arrival at Gujuli. These observations gave us on calculation 2,200 feet as our height above mean high water at Bilbao—a result in very satisfactory accordance with the railway levellings.

Our instruments had been conveyed from Bilbao to Gujuli in the railway ambulance, and ourselves in Mr. Bartlett's carriage. Comfortable lodgings were arranged for us at the little village of Izara in the house occupied by Mr. Rhodes, the very intelligent and amiable foreman of the works of the railway; nothing, in fact, was wanting to us, that the most liberal hospitality and thoughtful care could suggest.

On Thursday, the day after our arrival, the workmen of the railway erected for us a most convenient observing hut, about half a mile from the workshops, railing it off with a palisading, lest we should have "the misfortune to be oppressed with too much company." The Spanish authorities also offered us a guard of soldiers, for the protection of ourselves and our instruments by night and by day. This we respectfully declined.

So there was our party of four posted in a little hut on the culminating edge of the Spanish Pyrenees, amidst scenery of no ordinary wildness and grandeur; alone, and yet with no impression of solitude. Our days were spent in the hut and its little enclosure, endeavouring, as the weather permitted, to adjust our instruments; now and then strolling, as opportunity presented itself, into the neighbouring villages, and in the evening returning through a forest of ilex and pine, and by the side of beech-ponds, to our hospitable quarters. A few months before our arrival, but few Englishmen had ever traversed that wood, or perhaps could have traversed it alone and in safety; but now we wondered at, and we welcomed as the precursors of civilization, the scream of the steam-whistle and the screech of the saw-mill. To us, strangers as we were in a foreign land rarely visited, many were the strange scenes, and strange incidents, and strange ways of men. As to the maxims of political economy, they were of course set utterly at nought. You would be imprisoned if you bought a ham, or a cheese, or a joint of mutton, or a pigskin of wine, from the unlicensed person. More than once we tried to intercede with the Alcalde in behalf of a recalcitrant Irishwoman who would not or could not understand that, while she herself took care to sell her commodities in the dearest of markets, she was interdicted from purchasing in the cheapest. Imprisonment was also threatened to one of our young engineers, because on the Sunday after our arrival he permitted Divine Service after a Protestant model to be performed in his house. We were ourselves supposed to be in league with the Evil One, from whom, for a consideration, we had purchased our knowledge of the eclipse. But what struck us beyond other things was the little respect in which a man's self and the life of a man were held. The native workmen, by day, were as coarsely fed as the domestic animals among ourselves, and, by night, they were packed away very much like herrings in a box: if they died they were buried with apparently little more ceremony than the dogs. These were the first impressions made upon our minds by what we witnessed with our eyes and ears; but, on further and more quiet reflection, we came to the conclusion that we Englishmen, not being without our own peculiar sins and shortcomings, were not justified in casting stones at our neighbours; time also, patience, and civilization, would do that for them which they had done for ourselves.

Our instruments consisted of an excellent telescope, wth an aperture of 3¼ inches, mounted equatorially, and an altazimuth for the determination of our time and our latitude. The telescope was provided with the Herschelian contrivance of a plane glass diagonal reflector in the eye-piece, already referred to, and by means of which we could observe the sun's disc with the entire aperture of the telescope, without the risk of the splitting of the slightly-tinted eye-shade, through the concentration there of the solar heat. This plane glass reflector had a sliding motion in its frame, one half of it was covered with a polished silver film, and could be slipped into use when the solar light during the eclipse had become sufficiently feeble.* The meteorological instruments consisted of a barometer, several thermometers of various constructions, especially one with a blackened bulb *in vacuo*, intended for the estimation of the solar radiation; and an actinometer, all of th m being of standard excellence. We took with us no rain-guage, for we at least desired fine weather; had we taken one, it would have been in almost constant use.

With the exception of Sunday, the 15th, the state of the weather was such as to fill us with the greatest anxiety for the success of the expedition. It was with much difficulty we could adjust our equatorial telescope to the latitude of our position, and at last it was effected mainly by observations on a sun-spot fitfully visible through the clouds or the mist. Throughout Sunday night there was a violent storm of thunder and rain, the usual precursor of broken weather in those districts. On the Monday and Tuesday following nothing could be done beyond a constant register of the meteorological instruments, for the sky was persistently covered with clouds. We amused ourselves, however, with the barometrical measurement of the height of the precipice on the very brink of which our hut was built, and at the end of which the Altube fall rushed sheer down into the plain below in its course to swell the waters of the Ebro. Its height exceeded 600 feet. Anticipating the possible failure of our enterprise, some of our party arranged for the purchase of half a sheep, in order that if the eclipse failed them, they might, through holes bored in the side of our hut, at least study the manners and customs which our neighbours the eagles and vultures observed at their banquets.

On the evening of the 17th, the day before the eclipse, many of the engineers and *employés* assembled by appointment in our lodgings at Izara. We there detailed to them the principal phenomena to which it was desirable to direct their attention. Various selections from these were drawn up on small pieces of paper, each person selected that which pleased him best, and to that he promised in the main to devote his attention. The meteorological observations, which had been carefully conducted at short intervals since the time of our arrival at Gujuli, were still to be entrusted to the accurate and experienced eyes of Mr. Fasel. Mr. Wright undertook to expose for a definite time certain pieces of photographic paper which had been carefully marked and arranged in order in the pages of a book; the purport of this arrangement being to obtain a formal estimation of the diminishing amount of light as the eclipse advanced. This arrangement, however, which was purposely put into execution half-an-hour before the commencement of the eclipse, wholly failed through the imperfection of the photographic paper supplied to us by a London photographer. Of course we ought properly to have tested our materials before leaving England.

Our kind friend, Mr. Bartlett, with a companion, agreed to adjourn to the summit of the Undiagan Hill, a conical eminence, about half a mile from our station, rising about 500 feet above the level of our hut. From this elevated post he undertook to watch and record the position of such coloured prominences as might become visible to the unaided eye. For the accurate performance of this duty, the author of this paper contrived a sort of rough natural micrometer, which was found to be singularly effective for the observations in question. The observer was directed to erect a plumb-line,—in plain language, a string with a heavy stone attached to it; he was then to place his eye in such a position behind it, that the plumb-line should appear to divide the sun in front of it into two halves. The sun he was mentally to regard as the face of a clock. Where the plumb-line struck the upper limb of the sun he was mentally to regard as XII. o'clock; the point opposite to it on the lower limb he was to regard as VI. o'clock. Whatever phenomenon occurred on the edge of the sun, or in the corona, was to be recorded as having occurred at the corresponding hour and minute of the imaginary clock face. This mode of observation was found to be practically very convenient, and susceptible of considerable accuracy. For the want of some such easy contrivance determining the vertical point of the sun's upper limb, many even modern observations of solar spots have been deprived of very much of their practical value. In order to impress upon the observers the necessity of attending to this matter, each paper of directions was headed with the words, "MIND YOUR PLUMB-LINE," and this continued to be an adage among many of our party for months afterwards, and may no doubt be profitably remembered by some of our readers under circumstances by no means astronomical.

M. Schwartz and Senor Don A. Fuente were furnished with slips of paper taken from various parts of the *Times* newspaper, printed in the various types employed in that journal, the object being to ascertain in a practical form some measure of the amount of light still existing during the obscuration of the sun.

Mr. Russell Scott and a friend undertook to observe what stars and planets became visible during the eclipse, and for this purpose they were furnished with Mr. Hind's valuable star-chart already referred to. These gentlemen were also specially charged with a careful scrutiny of the neighbourhood of the eclipsed sun, in search of M. Lescarbault's suspected planet Vulcan, or any other intra-Mercurial planet.

Our intelligent friend, Mr. Rhodes, and an assistant, charged themselves with observing the form and dimensions of the corona, and in particular with noting the position of any luminous radiations which might occur, and with this view they were enjoined to be careful to "*mind their plumb-line*," and the imaginary clock face.

Mr. Bartlett's groom was to be in charge of a pair of spirited horses, and a dog or two, and undertook to watch the effects produced upon them and on other animals during the totality of the eclipse. The writer reserved the observations with the telescope for himself. Mr. Fasel undertook to watch the approach and recession of the moon's shadow. Thus, each person having selected that portion of the work which suited him best, we separated, looking forward to the morrow with more fear than hope.

The morning of Wednesday the 18th, and the day of the eclipse,

* See here page 19, and *passim*, The Bakerian Lecture, by Mr. de la Rue, fo. Phil. Transr 1862.