Another medium did about the same thing with his hands apparently tied. That his hands were loose enough for all that was done, was glaringly evident.

Thus far the commission as a whole. Their verdict is everywhere the same: "No new facts and many old frauds." Individually the members have seen much, in fact, more than the mediums intended. The experiences of Dr. Furness, the acting chairman, are especially interesting, and recorded with a humor that does much to relieve the monotony of this record of constant fraud and deceit. Dr. Furness was repeatedly assured by several Spiritualists that there was in him the making of a magnificent medium; and so he sacrificed himself for the cause, and 'sat for development.' Every day for six months Dr. Furness sat with a slate for half or three-quarters of an hour, and, in addition, constantly wore a bit of magnetized (!) blotting-paper on the top of his head, until he was allowed, by the dispensation of the medium under whose direction he was studying, to wear it around his neck. The paper had to be changed every twelve hours, and the medium received a dollar for each sheet. Although he was promised writing, or at least some zigzag lines, in three weeks at the utmost, at the end of six months 'not a zig nor a zag.' "Let spiritualistic reproaches of investigators, for lack of zeal and patience, be heaped up hereafter until 'ossa becomes a wart.' I care not: my withers are unwrung."

Dr. Furness next experimented with sealed letters. A question carefully sealed was sent to the medium, and the answer to the unopened letter returned. Many mediums were written to. They gave contradictory answers when asked the same question, and in every case the letter had been opened, and mucilage and skill been used to cover up the deception.

Dr. Furness's description of the materializing seances can only be appreciated when read in full. Everywhere he found fraud where he looked for honesty. The fraud is so gross, so easily made to leave its hiding-place and snatch the bait offered by an ingenious question, that it becomes ridiculous.

Professor Fullerton's account of the famous Zoellner investigations with Dr. Slade is a highly valuable contribution. He has personally examined Zoellner's confrères in the investigation, and finds that Zoellner was of unsound mind at the time; that Fechner was partially blind, and relied on Zoellner; that Scheibner was too myopic to see any thing, and was not quite satisfied with the seances; that Weber was old, and did not recognize the disabilities of his associates. On the evidence of these men, — deservedly honored in their own specialties, as they are, — without knowledge of the arts of a conjuror, has rested one of the most famous proofs of the truth of Spiritualism and its connection with the fourth dimension of space.

A device by which Dr. Knerr detected a fraud is too ingenious to be left unnoticed. He arranged a mirror about his person so that it reflected the hands of the medium at work on a slate under the table. He plainly saw the hand open the slate, read the question, and noiselessly write the answer, which the fair medium had the impudence to present to him the next minute as the work of departed spirits.

The mysteries and miracles that shape people's beliefs upon that which is most sacred to the human heart, thus resolve themselves, under the scrutiny of careful scientific observers, into a mass of vulgar frauds and low deceptions. The mystic theories and spiritual messages are 'disgusting cant;' the medium, a criminal.

The psychological process by which believers are convinced is the key to the secret of the success of Spiritualism: this is the problem that lies closest to the securing of that mental health with which such practices and beliefs are incompatible. If any one will recall the feelings of utter bewilderment on leaving for the first time a good performance of a professional trickster, and will imagine in addition that the things he holds dearest were at stake in the explanation of what he saw, he will easily understand the excited state of mind of a susceptible person on leaving a spiritualistic seance at which he has seen but not understood. If your friend is a believer, and urges your ignorance on to belief, you are apt to yield, and assume that credulous state of mind which accepts all and examines nothing. It is this state of mind that is to be prevented; it is this state of mind that is dangerous to mental sanity, that becomes morbidly hungry for something unusual, something mystic, something occult. There can be no better check to the spread of this mental temperament (except, of course, a sound training in scientific reasoning) than such a report as this, of sincere, able, scholarly men, anxious to learn, and meeting only with practices for which the law provides the jail.

That these men have not yet exhausted the art of detecting deception is shown by the fact that they are confessedly unable to discover the methods by which a prestidigitateur performed slate-writing tricks in their presence: this needed more training than they as yet possess. But the magician confided his methods to one of the commission, and showed that they were simply tricks. This suggests the final point to be here noticed: this is, that the Spiritualists will have a roundabout way of explaining these frauds. They will say, "That does not prove that real manifestations do not exist." This the commission admit, but it makes it improbable in more ways than one. They claim that their explanations of how the things are done are rational from their point of view. They need the dark because darkness is negative; if the spirit takes on the peculiarities of the medium, that is a habit of the spirits; if the writing does not occur when the slate is looked at, it is because the magnetism of the eye is unfavorable; and so on, and so on. This is perfectly true. There is no proposition so absurd, no fancy so insane, as not to be capable of some kind of support, on the basis of some kind of a theory. But the logic upon which civilization is built is a marvellous network of mutually corroborating laws and observations, multiplying the probabilities of the truth of its conceptions in a geometrical ratio, and similarly dwindling into insignificance the possibility of theories opposed to its fundamental tenets. Of such a character are the explanations offered by the Spiritualists. They are not impossible in an extremely exact, ultimate sense. From a practical point of view, they are utterly impossible. But, after all, it is not the logic that convinces. It is because this system goes deeper, and appeals to the feelings, that it blinds its adherents to sense and reasoning.

The commission has done its work well, has set an excellent example in recording what they saw *accurately* (for all turns here, as in jugglers' tricks, upon the apparently most insignificant detail), in subjecting mediums to ingenious tests, in treating them courteously and sympathetically, as well as in exposing them plainly and mercilessly. The present report, though only a preliminary one, should do much to hasten that day, which Dr. Furness thinks not far distant, "when the more elevated class of Spiritualists will cast loose from all these physical manifestations, which, even if they be proved genuine, are but little removed from materialism; and eventually materializing seances, held on recurrent days and at fixed hours, will become unknown. JOSEPH JASTROW.

NOTES AND NEWS.

THE New York Electrical Society has decided to give an electrical exhibition in this city during the coming fall in the large exhibition-building of the American Institute. The exhibition will open Sept. 28, and continue to Dec. 3, 1887, and is intended to include all that relates to the science and application of electricity in its broadest sense. No electrical exhibition has ever been held in New York, and it is confidently believed that the one now to be given will attract a large number of visitors, both residents and from other cities. The American Institute has provided ample means to carry out the designs of the society, which is also assured of the co-operation of the American Institute of Electrical Engineers.

— The *Political Science Quarterly* for June is a splendid number, the articles covering important topics in economics, history, and administrative science. Dr. Seligman's masterly article on the interstate commerce law, an abstract of which was read before the American Economic Association, is the leading article in the number. It is sufficient to say that the paper amply sustains Dr. Seligman's reputation as a master of the railway question in all its phases. Prof. Woodrow Wilson writes on the study of administration; and William M. Sims, chamberlain of New York City, discusses municipal government, making generous use of his knowledge of the details of the municipal machinery of the metropolis. Professor Burgess's paper on the Culturconflict in

Prussia — by the way, why is not the perfectly familiar *Culturkampf* used in the title, instead of a word which is partly foreign in form, and wholly so in sound? — is the first clear and adequate description in English of that very significant and important movement in Prussia's political history. The book-reviews are as numerous and as well done as usual. We observe that a very severe criticism is passed on the volume on New York in the 'American Commonwealth' series. Prof. Richmond Smith reviews Prof. H. C. Adams's 'Public Debts' in a very appreciative manner, describing the book as "careful, scholarly, and extremely suggestive." We observe this sentence, which Professor Smith uses in speaking of the industrial effects of public debts: "Professor Adams's discussion is acute and logical, and, in my opinion, a distinct advance upon the treatment of the same question by Leroy-Beaulieu, the distinguished French financier."

— Some remarkable facts as to the change in the population of Alsace-Lorraine are brought out by the recent publication of the results of the census taken in those provinces in December, 1885. The statistics are published in the *Landes Zeitung*, the official journal in the provinces. It appears that in December, 1885, the total population was only 1,564,355 as compared with 1,566,670 five years before, — a decrease of 2,315 in five years. Classified according to nationality, there were in December, 1885, 1,368,711 natives of Alsace-Lorraine, 151,755 Germans from other parts of the empire, and 43,829 foreigners; whereas in December, 1880, the natives of Alsace-Lorraine numbered 1,418,025, and the immigrants from Germany only 114,797. So in five years the native population has decreased by 49,254, while the immigrants have increased by 36,958. The increasing emigration of the native population explains their falling-off; and the *Landes Zeitung* estimates, that, if the present rate of diminution continues, the native population will have disappeared entirely in less than thirty years.

LETTERS TO THE EDITOR.

**** *The attention of scientific men is called to the advantages of the correspondence columns of* SCIENCE *for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The Total Solar Eclipse of 1886.

THE following brief account is penned in order that it may be published in time to be of service to the observers of the eclipse of 1887.

It was found that by using rapid gelatine plates an exposure of one or two seconds was sufficient to show the details of the inner corona satisfactorily with an ordinary telescope-lens. With a portrait-lens the ratio of whose aperture to its focus was as one to five, one or two seconds' exposure showed the outer corona satisfactorily, as far as a distinct falling-off place in the light. This was at a distance of from 15′ to 30′ from the limb of the moon. Beyond that the light was very decidedly fainter, and was shown best by exposures with lenses of the same ratio, of from eight to forty seconds. This light extended to from one to two degrees from the moon's limb, was very faint, and seemed analogous in character to the zodiacal light. It was clearly not a mere reflection of the corona in the camera-lenses, as it did not extend over the moon's image, where it would, in that case, have been brightest. Measurements of the actinic brightness of different portions of the corona were made, which will appear in a subsequent paper.

The corona showed the usual short rays of light proceeding from the sun's poles, and from the south-western quadrant a very conspicuous ray, appearing like a hollow cone projected to a distance of some twenty minutes of arc. On one of the long-exposure plates it was noticed that this was crowned by a curious fountain-like structure, — three fine jets, about a minute in diameter, shooting up 35′ to 40′ from the moon's limb, curving round, and falling back towards the sun. On closer inspection, seven other jets were counted, all more or less well marked, and all proceeding from the summits of bright rays of the corona. Some of these returned towards the sun, but the majority faded away at about 30′ distance from the limb. Unfortunately, only one of the plates was taken on a sufficiently large scale, and with sufficient exposure, to show this phenomenon, and the whole appearance may therefore be due to defects in the gelatine film of that plate. But, as the markings are certainly on the plate, I have ventured to describe them; the more readily, as a somewhat analogous appearance, though on a smaller scale, is represented in Mr. Ranyard's 'Observations made during Total Solar Eclipses' (Memoirs of the Royal Astronomical Society, xli., Plate x.)

Passing from the corona to the prominences, a number of them were seen near the equator, on both sides of the moon; but the most conspicuous one of all was situated in the north-western quadrant. It extended to a height of about one hundred thousand miles, and had apparently a somewhat spiral structure. The spectra of the various prominences were shown very clearly by the prismatic camera. In the equatorial ones the hydrogen and H and K lines were prominent, superposed on a background of continuous spectrum; but in the large prominence the hydrogen lines were all absent, confirming Professor Tacchini's observation of its invisibility both before and after totality.

The H and K lines, however, were strongly marked; and it seems quite probable that numbers of prominences may escape ordinary observation by the spectroscopic method, merely because they shine only by the actinic radiations, and are hence invisible to the eye. The remedy for this difficulty would be, either to use a fluorescent eyepiece, or, better, to photograph them, instead of trusting merely to eye-observations. The position of the maximum density in the continuous spectrum of the prominences was found to be quite different from that of the corona. In the prominences and in the sun it is found to be not far from the G line, while in the corona it lies between G and F. This may indicate, that, besides the gaseous constituent, the corona is composed also of incandescent solid or liquid matter, which, while cooler than the sun, still shines by its own light. In this case, the position of the maximum might give us a hint as to the temperature of the corona.

Photometric measurements of the general light during totality were made, which, roughly stated, indicate a brightness equal to one candle at about 29 inches or 73.5 centimetres distance. Previous observations by Mr. W. O. Ross in 1870 had given 18.5 inches; and by Dr. J. C. Smith in 1878, 51.25 inches. It had been intended to make some observations on the actinic power of the sky during the eclipse, but unfortunately the plates reserved for this purpose were found to have been spoiled by the excessive moisture of the Grenada climate; so that no result was obtained. In some of the longer exposures, however, where a large field was used, portions of the landscape appeared upon the plates, showing that considerable actinic radiation was given out even during the total phase.

A large number of persons observed the shadow-bands, which appeared before and after totality. The general result of their observations indicated that the bands were about five inches wide and eight inches apart, that they were colored like the spectrum, and that they moved with a velocity comparable with that of an express-train; at all events, much faster than a man could run. Before totality the bands lay N. 12° W. and S. 12° E., and travelled west: after totality they lay N. 60° E. and S. 60° W., and travelled north-west. The wind during totality blew from the point S. 35° E.: during the partial phases it was blowing from six to nine miles an hour, but fell during the three minutes of totality to between two and four miles. The thermometer ceased rising as totality approached, but afterwards rose more rapidly. The extent of the effect produced on it amounted to .4° C. This figure may seem small, but it must be remembered that the fluctuation between sunrise and noon in these tropical islands in the summer season seldom exceeds two or three degrees.

In general results, the expedition may be said to have proved successful, although one of the most important instruments, the forty-foot photo-heliograph, failed to work, through lack of sunlight previous to totality, which prevented the application of the necessary adjustments to the mirror. It is hoped, however, that this omission will be in part rectified at the present eclipse, as a similar instrument, even better equipped, has been sent in charge of Professor Todd to Japan; and, if the weather favors, some excellent pictures should be the result.

W. H. PICKERING.

Harvard Observatory, Cambridge, June 23.