

only 1.6 inches, the average for November in former years being 4.5 inches. Considerable snow was reported from northern districts, and a little from the southern states.

Among miscellaneous phenomena may be mentioned earthquake shocks, which occurred on the 7th in Wyoming, Colorado, Utah, and Kansas, and on the 14th in Missouri.

The most noteworthy feature of the whole month was the remarkable magnetic storm which occurred from the 16th to the 20th. It prevailed, not only throughout this country, but in Europe, and was characterized by extensive auroral displays. It was simultaneous with a large sun-spot, visible to the naked eye. The English journals have contained many articles upon this storm and its attendant features; but in this country extensive cloudiness prevented as complete auroral observations as would otherwise have been secured.

#### NEW TESTAMENT AUTOGRAPHS.

AN interesting and important application of the methods of the theory of probability to the criticism of the New Testament was made in a paper read by Mr. J. Rendel Harris, late a fellow of Clare College and a lecturer in the university of Cambridge, before the Philological society of Johns Hopkins university, at their meeting on the 5th of January: the results of which investigation will, if substantiated, form a new departure in textual criticism.

Attention was first drawn to the exact equality of the second and third epistles of St. John, each of which occupies 29 lines of type in the edition of Westcott and Hort; and it was remarked, that the text of these epistles probably represented an integral number of sheets of the original papyrus.

An examination was then made of the space occupied by the various books of the New Testament in the Vatican codex. This MS. is written in triple columns, each containing 42 lines to the column. Every book begins at the top of a column; but, strange to say, instead of ending according to a random distribution over the 42 lines of the columns, they show a preference for ending at the 27th or 28th lines.

Five epistles were shown to end on the 27th line, one on the 26th, and two on the 28th.

A calculation was made which showed that this was not the work of chance, but of law; and it was inferred that there was a commensurability of the books in question with one another, with the whole Vatican column, and the partial column of 28 lines.

From this was at once deduced, that the Vatican page is composed of nine smaller pages of papyrus arranged in a square, so that three go to a column, and three columns to the page. Each of these smaller pages was represented by the term V-page; so that a Vatican page is equivalent to the following notation:—

V	V	V
V	V	V
V	V	V

And, since any deviation from the form of papyrus found in the autographs would have resulted in the introduction of a random distribution of the endings, it was shown that the V-page for the books in question was approximately the page of the autograph.

A similar analysis for the Sinaitic codex, which has four columns to the page, and 48 lines to the column, revealed the existence of a smaller papyrus page employed by a number of other books. This page was represented by 12 lines of the Sinaitic column, and was denoted by S; so that the page of the MS. was equivalent to:—

S	S	S	S
S	S	S	S
S	S	S	S
S	S	S	S

By means of these two types the majority of the books of the New Testament were restored to the original sheets.

But even more remarkable was the application of the results of this inquiry to the purposes of textual criticism, and to the stichometry of the New Testament. For these we must refer to the forthcoming supplementary number of the American journal of philology, where it will be found demonstrated, that the celebrated passage of St. John in which is given the account of the woman taken in adultery is, in all probability, four lost pages of the original document of the Gospel; and that the account of the agony in the garden, which is also rejected by the critics, is a lost page of

the autograph of St. Luke. The details of the investigation will be found, with many other points of interest to New-Testament students, in the article above referred to.

#### INFLUENCE OF MAGNETISM ON CHEMICAL ACTION.<sup>1</sup>

MORE than a year ago I gave an account<sup>2</sup> of some experiments which I had performed with the object of determining whether magnetism exerts any influence on chemical action. I succeeded in getting what appears to me to be strong evidence in favor of the view that magnetism does, at least in one case, exert a marked influence on chemical action. The principal experiment upon which this conclusion is based may be briefly described here. A vessel made of thin iron (ferrotype-plates were used) was placed on the poles of a magnet, and a solution of sulphate of copper poured into it. Instead of getting a uniform deposit of copper on the bottom of the vessel, the metal was deposited in distinctly marked lines, the direction of which was at right angles to the lines of magnetic force. Further, directly over the poles, the deposit was uniform; and this uniform deposit was bounded by a band of no deposit, from one-sixteenth to one-eighth of an inch in width.

Since the first paper on this subject was published, I have spent a great deal of time in endeavoring to discover other cases of similar action, and to extend the observations in various directions, in the hope of reaching a satisfactory explanation of the phenomenon described. I shall soon give a full account of the work in the *American chemical journal*. In the mean time a condensed account is here given.

I should say at the outset, that the subject of this paper has frequently been discussed and experimented upon in past years. In 1847 Wartmann<sup>3</sup> summed up what had been done previous to that time, and also described some new experiments of his own. According to him, magnetism does not influence chemical action. His proof was furnished by two experiments. In the first, the electrolysis of water was carried on in a magnetic field, and the results compared with those obtained with the same apparatus without the magnet. The results were the same in both cases. In the second experiment, iron cylinders were placed

in a solution of copper sulphate. Some of the cylinders were magnetized, and others were not. No difference was observed between the deposits formed. The author calls attention to the fact that his conclusion, that magnetism does not influence chemical action, differs from that of a number of earlier writers, among whom may be mentioned Schweigger, Döbereiner, Fresnel, Ampère, and Robert Hunt; but that, on the other hand, it agrees with that of Otto-Linné Erdmann, Berzelius, and the Chevalier Nobili.

Among the experiments referred to by Wartmann, those of Robert Hunt<sup>1</sup> are perhaps the most striking; and to these I turned my attention. Hunt states, that, when a concentrated solution of silver nitrate or of mercurous nitrate is placed on glass over the poles of a magnet, the salts crystallize out in curious lines, of which an illustration is given. While these experiments have no direct bearing on the question whether magnetism influences chemical action or not, I nevertheless repeated them. To my surprise, the effects described by Hunt were not obtained. The conditions were repeatedly changed, — the strength of the solutions, the strength and form of the magnets, the thickness of the glass plates, being varied; but under no conditions were the expected effects obtained. Some of the other experiments of Hunt were also repeated, but only with negative results. So that even the most positive statements of Hunt will require verification before they can be accepted in favor of his conclusion that magnetism influences chemical action and crystallization.

Among the experiments which I have performed since the publication of the first paper already referred to, may be mentioned the following: 1. The action of copper on zinc. In this case the magnet evidently exerted some influence on the action; causing apparently an accumulation of copper on the lines bounding the space directly above the poles. No lines between the poles like those obtained when copper acts on iron were observed. I am unable to say positively whether the faint figure observed in the zinc was due to an increased deposit of copper or to a lack of deposit. 2. Action of silver on zinc. Indistinct lines were observed, which appeared to be at right angles to the lines of force. These were obtained only when the solution of silver nitrate was quite dilute. 3. Action of copper on tin. The action was evidently modified by the presence of the magnet. 4. Action of silver on lead. No action was

<sup>1</sup> Abstract of a paper read before the National academy of sciences, at its semi-annual meeting in New York, Nov. 14-17, 1882.

<sup>2</sup> *American chemical journal*, iii. 157.

<sup>3</sup> *Philosophical magazine*, 1847 [3], 30.

<sup>1</sup> *Philosophical magazine*, 1846 [3], 281.