nature of the union, whether chemical or mechanical, which takes place when solid substances are dissolved in water, alcohol and other liquids. He hoped, however, to be able to present these investigations in a definite form to the Society before long. And he considered the subject one full of interest and importance, by reason of its intimate connexion with the molecular forces and constitution of matter, and its relation to certain recently discovered electro-dynamical phenomena.

On motion of Dr. Patterson, the Proceedings of the Society for the present year were directed to be sent to the publisher of the Literary World, New York.

Pending nomination, No. 197, and new nominations, Nos. 198—201, were read.

Stated Meeting, September 17.

Present, twenty-three members.

Dr. Chapman, President, in the Chair.

Mr. Townsend, a member of a corresponding society, was introduced.

A letter was received and read:—

From the Royal Bavarian Academy of Sciences, dated Munich, 24th of April, 1847, acknowledging the receipt of Transactions and Proceedings of this Society, and of Dr. Dunglison's Public Discourse on Mr. Du Ponceau.

The following donations were announced:—

FOR THE LIBRARY.

Report of the Sixteenth Meeting of the British Association for the Advancement of Science; held at Southampton, in September, 1846. London, 1847. 8vo.—*From the British Association.*

Abhandlungen der Mathematisch-Physikalischen Classe der Kœniglich Bayerischen Akademie der Wissenschaften. Vierter Band die Abhandlungen von den Jahren 1844–46, enthaltend. München, 1846. 4to.—*From the Royal Academy of Munich.*

Bulletin der Kœnigl. Akademie der Wissenschaften. Nos. 6 to 77, inclusive. 4to.—*From the same.*

Gelehrte Anzeigen, herausgegeben von Mitgliedern der K. Bayer. Akademie der Wissenschaften. Vols. 16 to 23, inclusive, for the Years 1843 to 1846. 4to.—*From the same.*

Almanach der Kœniglich Bayerischen Akademie der Wissenschaften für das Jahr, 1847.—*From the same.*

Die Ueberbleibsel der Altägyptischen Menschenraçe. Eine Abhandlung gelesen in der öffentlichen Sitzung der K. Academie der Wissenschaften zu München am 24 August, 1846. Von Dr. Franz Pruner. München, 1846. 4to.—*From the same.*

Journal Asiatique, ou Recueil de Mémoires, d'Extraits, et de Notices relatifs à l'Histoire, à la Philosophie, aux Langues, etc. etc., des Peuples Orientaux. Quatrième Série. Tome IX. Nos. 42 et 43. Mars et Avril, 1847. 8vo.—*From the Asiatic Society of Paris.*

Annals of the Lyceum of Natural History of New York. Vol. IV. July, 1847. Nos. 10 and 11. 8vo.—*From the Lyceum.*

Journal of the Franklin Institute of the State of Pennsylvania. Vol. XLIV. Nos. 260, 261. Third Series. Vol. XIV. August and September, 1847. 8vo.—*From the Institute.*

The Annals and Magazine of Natural History, including Zoology, Botany, and Geology. Vol. XX. No. 131. August, 1847. 8vo. *From Sir Wm. Jardine, Bart.*

The African Repository and Colonial Journal. Vol. XXIII. September, 1847. No. 9. 8vo.—*From the American Colonization Society.*

The Medical News and Library. Vol. V. September, 1847. No. 57. 8vo.—*From Messrs. Lea & Blanchard.*

On Terrestrial Magnetism. By W. A. Norton. From the American Journal of Science and Arts, Vol. IV.—*From the Author.*

On Balances. By Franklin Peale. From the Journal of the Franklin Institute. 8vo.—*From the Author.*

ADDITIONS TO THE LIBRARY BY PURCHASE.

Annales de Chimie et de Physique. Troisième Série. Tome XX. Juin, 1847. 8vo.

Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences. Tome XXIV. Nos. 18 à 25. 4to.

The London, Edinburgh, and Dublin Philosophical Magazine, and Journal of Science. Vol. XXXI. No. 206. 8vo.

Astronomische Nachrichten. No. 604. Altona, July 15, 1847. 4to.

The Committee on Mr. R. A. Tilghman's paper, "On the Decomposing Power of Water at High Temperatures," reported, recommending its publication in the Transactions of the Society, which was ordered accordingly.

From the long known fact that solutions of salts, which require a high temperature for dehydration, frequently underwent partial decomposition before this end was effected, Mr. Tilghman was led to believe, that by exposing the salt, even in its anhydrous state, to a high heat, and passing over it a current of aqueous vapour at the same temperature, these salts might be completely decomposed, and perhaps the action observed even in those which had given no signs of partial decomposition under the treatment before alluded to. Upon trying the experiment, it was found that the anhydrous chlorides of calcium, strontium, and barium, could be rapidly decomposed by exposing them, at a high red heat, to a current of steam; hydrochloric acid being copiously evolved, and the oxides of the metals left, the lime remaining anhydrous from the intensity of the heat employed, while the baryta and strontia passed to the state of hydrates.

In these haloid salts, it is to be observed that the addition of the elements of water is absolutely essential to the decomposition; as neither the hydrogen of the acid, nor the oxygen of the base, existed in the anhydrous salt. The action is, therefore, the result of a double decomposition between the steam and the chloride, as well as of the affinity of the liberated acid and base for water. The experiments were then extended to the oxysalts, the sulphates of magnesia, lime, strontia and baryta, which contain, even when anhydrous, all the elements generally considered necessary for the separate existence of the acid and bases of which they are composed. The application of the strongest heat causes no liberation of their acid; but, as with the chlorides, this effect is immediately produced by the passage of a current of steam over them at a high temperature, the baryta and strontia being left in the state of hydrates, and the other bases anhydrous.

The intensity of the affinity between the acid and base of the respective salts, is curiously illustrated by the gradual increase of heat necessary for their decomposition by aqueous vapour. Thus sulphate of magnesia gives off its acid to steam at a low red heat, and consequently a large portion of the acid may be condensed in an undecomposed state.

The sulphate of lime requires a high red heat for its decomposition; and on this account the greater part of its acid is resolved into

sulphurous acid and oxygen gas. The decomposition of the sulphates of strontia and baryta requires progressively higher heats, which, in the case of the last salt, must be raised even to low whiteness.

The subphosphate of lime, as it contains an acid much less volatile than the sulphuric, combined with an excess of a powerful base, which adds to its stability, was selected as one of the most difficult tests of this decomposing power of aqueous vapour. By a full white heat, however, its phosphoric acid was slowly disengaged, and the acid, by its white precipitate with nitrate of silver, showed that the excess of aqueous vapour had not prevented the change which heat is known to produce upon this acid.

It was found, that with the sulphates and muriates of potassa and soda, although the decomposition began freely at a red heat, yet the proportion of alkali set free never exceeded a very small per centage of the residual salt, no matter how long the operation might be continued. This peculiarity being attributed to the volatility of the hydrates of these bases at high temperatures, substances capable of forming non-volatile combinations with the alkalies were mixed with the salts, before subjecting them to the action of the heated steam; the acids were then found to be completely disengaged with facility.

Lime, magnesia, and the subphosphates and subsilicates of lime, baryta, and strontia, produce this effect; and in all these cases the chemical combination is so feeble, that, when cold, the alkali is disengaged by the solvent powers of water alone.

Alumina, which possesses so much of the acid character with respect to the strong bases, is proportionally more efficient than any of the preceding substances in aiding the decomposition of the alkaline salts; it remains in combination with the alkali, when cold, as a soluble aluminate, but is easily precipitated by a current of carbonic acid gas. The fact, long since noticed by Berthier, that the mixture of alumina and sulphate of potassa, formed by the calcination of potash-alum, is converted by heat into aluminate of potassa, was shown to depend, probably, upon the presence of aqueous vapour. When the experiment was repeated, and the presence of this vapour carefully avoided, no decomposition of the sulphate of potassa took place; but by the contact of the vapour produced by the combustion of the fuel or otherwise, even in small quantity, and at much lower temperatures, the decomposition is produced rapidly.

The powerful action of aqueous vapour upon anhydrous alum, at a high temperature, suggested the possibility that a similar action might take place upon its mineral representative—feldspar. Steam

was therefore passed slowly, for some time, over small fragments of highly heated feldspar. Beyond parted fusion, no other visible change than a considerable degree of vesicularity in the parts most exposed was produced; but when the fragments were finely pulverized and boiled in water, the concentrated solution was strongly alkaline, and proved, by the usual tests, to consist of aluminate of potassa; and after water ceases to extract this salt from the powdered mineral, dilute sulphuric acid will produce from the residue a small proportion of alum. It is worthy of remark, that although the contact of the steam in this experiment is confined to the mere surface of the small fragments of feldspar, yet the chemical decomposition produced by it is not confined to that surface, but spreads by a "cementation action" through their entire mass; pulverization is therefore required to obtain evidence of the internal change which has been produced.

All the experiments so far made, would indicate that the following was the general rule applicable to all salts capable of sustaining heat alone without decomposition.

Whenever a salt, from its own elements alone, or by the addition of those of water, can produce a volatile acid and a fixed base, the evolution of this acid and the liberation of this base will be determined by passing a current of aqueous vapour over the salt, raised to a high temperature. When either the acid or the base to be liberated forms a combination with water, which can resist decomposition by the heat employed, the tendency to form such hydrates adds much to the decomposing power of the aqueous vapour. Although potash and soda are not, by themselves, fixed bases at high temperatures, yet, by the use of the substances before mentioned, they can form combinations which are fixed, and by this means these salts come under the above rule.

The actual number of salts which have been as yet subjected to this mode of decomposition is not very large; yet from their perfect analogy of composition with many others, there can be but little doubt of the general extension of the principle.

The applicability of this simple mode of decomposition to the explanation of a great variety of geological changes, is too evident to escape the attention of those conversant with that science. The author expresses the hope to be able, in a future paper, to give a more complete account of some interesting facts which have been observed in connexion with this subject, and to verify, by experiment, many points which must at present be left to inference and conjecture.

Mr. Ord announced the death of Dr. George M. Zecchinelli, of Padua, a member of this Society.

Mr. G. W. Smith stated that the singing mouse, which was discovered some weeks ago in the Northern Liberties, county of Philadelphia, was in the Librarian's room, and invited the members to listen to it after the adjournment of the Society. There does not appear to be any difference of external form between this and the common mouse.

Prof. Haldeman exhibited a specimen of a spider (lycosa scutulata), from which, when stuck with a pin, and in the act of dying, a parasitic worm of the genus Filaria, three times the length of the spider, proceeded.

Pending nominations, Nos. 197 to 201, inclusive, were read.

On motion of Prof. Frazer, permission was granted to the brother of Mr. Richard A. Tilghman to make a copy of the paper upon the decomposing power of water at a high temperature, for his own private use.

On motion of Mr. Ord, the Franklin Institute of Philadelphia was put upon the list of exchanges of this Society.

Stated Meeting, October 1.

Present, twenty-five members.

Dr. Patterson, Vice-President, in the Chair.

Letters were received and read:—

From the Literary and Philosophical Society of Manchester, England, dated Manchester, 3d August, 1847, acknowledging the receipt of the Transactions of this Society: and,—

From Baron Von Hammer Purgstall, dated Vienna, 19th March, 1847, acknowledging the receipt of the Proceedings of this Society, and announcing a donation.

The following donations were announced:—

FOR THE LIBRARY.

Journal Asiatique, ou Recueil de Mémoires, d'Extraits et de Notices relatifs à l'Histoire des Peuples Orientaux, etc. etc. Quatrième