precisely the same whether the neck was opened or closed. The only work the gas would do in expanding would be that which it did in inflating the balloon, or it would simply displace a volume of gas equal to the enlarged volume of the balloon. It is easy to see that this work would be almost inappreciable.

It may help to clearness if we consider two balloons suspended by an endless rope passing over a pulley situated at the extreme height to which the balloon rises. This rope has no weight, and there is no friction at the pulley. One of the balloons is at the earth's surface, and the other at the highest point. The system is in equilibrium, and it would require but the slightest weight at the topmost balloon or a diminution of weight in the balloon at sea-level to disturb the equilibrium and cause the balloons to change places. It is very evident that throughout this motion the air sustains both balloons, and the work of expansion in one balloon or the work done by the air in compressing the gas in the other balloon would be almost inappreciable.

Instead of using hydrogen in our balloons we may use heated air and the results of the analysis would be exactly the same. Lastly, we may dispense with our envelope, and simply consider the heated air as rising in the atmosphere. As we have just seen, this air would do very little work, and the consequent cooling would be very slight; the converse would also be true, that the work of diminishing the distance between the molecules of the gas would be very slight, and the heating almost inappreciable so far as the compression was concerned.

The application of these views, if they shall be sustained, to nearly all theories in meteorology is very obvious. It has been only after the most careful study and analysis of all the questions involved, and a taking up and explaining all the apparent contradictions between the older views and these, that I have felt justified in presenting them so much in detail. I bespeak for them a most searching examination and criticism, hoping that thereby the whole truth may be established. H. A. HAZEN.

March 2.

Pyrite Incrustations of the Cretaceous Formations of Middlesex County, N.J.

ONE would scarcely expect to find beautiful mineralogical specimens in so uninviting a place as a clay pit. The specimens of pyrite incrusting wood and bark, that may be found in most of the clay pits of Middlesex County, N.J., are very beautiful, whether viewed æsthetically or as cabinet specimens. The incrustations as found near Ford's Corners occur in the black and dark-colored clays which usually overlie the lighter and better clays. This dark stratum of clay contains many remains of leaves, twigs, and bark, which have been partially changed into brown coal. Occasionally whole trunks are found which yield wood which may be wrought into a variety of ornamental objects which are capable of taking a good polish. As waters containing sulphates of iron come in contact with this carbonaceous matter the carbon unites with the oxygen of the sulphates and sulphide of iron is left in its place. In some specimens the pyrite is found covering the carbon, while in others the carbon has been completely replaced by pyrite; at the same time the form of the wood is perfectly retained.

Specimens having the form of twigs not thicker than a lead pencil, and having a fine crystalline surface, are occasionally found. These make very pretty breast-pins when suitably mounted. Some specimens look as though the material of which they were formed had been poured out whilst hot, and had spread on cooling much as hot lead does when poured out on a flat plate. Many specimens occur in the shape of balls as large as hen's eggs. These are made up of concentric layers of scale-like crystals formed about a nucleus at the centre. As these are exposed to the weather they scale off gradually, sometimes remaining bright until the balls disappear completely, while at other times they turn dark immediately.

The pyrite weathers very quickly when left exposed to the action of the air, and the clay waters. If, however, the specimens are collected and washed as soon as they are removed from their native beds, they will remain bright indefinitely.

Specimens are occasionally found weighing four or five pounds. When the pyrite is exposed to the weather in contact with sand or gravel, as the iron is changed to the ferric oxide it cements sand and gravel together so that very often the resulting conglomerate retains the form of the original lump of wood. Your clay-pitter does not look with a favorable eye on the "sulphur balls," as he calls them, for clay containing much sulphide of iron is worthless for brick-making.

Of late years large amounts of clay containing iron have been used for making the so called mottled bricks.

D. T. MARSHALL.

Metuchen, N.J., March 2.

AMONG THE PUBLISHERS.

THE American girl is not slow to grasp a chance. Some time ago *The Ladies' Home Journal* organized a free education system for girls, and the magazine is now educating some forty odd girls at Vassar and Wellesley Colleges, and at the Boston Conservatory of Music, all the expenses of the girls being paid by the *Journal*.

— The March number of *Babyhood* contains an article on "Getting the Teeth — First and Second," by the medical editor, Dr. L. M. Yale, which corrects certain misapprehensions as to the teething process and the troubles which are popularly supposed to accompany it. Similarly helpful medical articles are "The Care of Delicate Children," by Dr. H. D. Chapin, and "Cuts and Scratches," by Dr. H. Power. An alleged "sure cure" for diphtheria is also discussed by a competent writer. Of most general interest, perhaps, is a curious article on "What Shall be Done with Him?" — an account of a completely unmanageable though not at all vicious boy, which is sure to give rise to considerable discussion.

— We have received a copy of the American edition of "Longmans's New School Atlas," the joint work of George G. Chisholm of the Royal Geographical Society and C. H. Leete of the American Geographical Society. It contains thirty-eight double-page maps; but in many cases what is numbered as a single map is really a collection of two or three maps. The introductory maps illustrate the various physical and astronomical phenomena of the globe, the climates and vegetation of different regions and the distribution of races and religions, while the remainder of the book is mainly devoted to political geography. There are, however, several special maps illustrating the climate, geology, and industry of the United States and Canada, and one showing the several acquisitions of territory by the United States. Most of the maps are so colored as to show the elevation of the different sections of land above the level of the sea; which seems to us to be making too much of a very small matter. The selection of maps is very judicious, and the United States does not appear with such overweening importance as it does in most American atlases; though it receives as much attention as the British Empire, and much more than any other part of the world. The number of towns indicated on most of the maps is small; and though a school atlas ought not to be overburdened with town names, the present work would have been better if it had contained more of them. The maps are well engraved on excellent paper, and as a general atlas of the world for school use, the book is meritorious. It is published by Longmans, Green, & Co. of New York, at one dollar and a half.

— Professor David Starr Jordan makes the inspiring influence of a great teacher of science strongly felt in the account of "Agassiz at Penikese," with which he is to open the April *Popular Science Monthly*. The article contains many of Agassiz's own words, which reveal the master's spirit better than pages of description. An authentic account of what treatment the Catholic Church actually gave to Galileo and his discoveries and writings will be given by Dr. Andrew D. White in one of his Warfare of Science papers. Attempts have been made to disprove or explain away much of this ecclesiastical persecution, but Dr. White's statements are fortified by copious citations from authors of unquestioned orthodoxy, The same article tells just how far into

the present century the Catholic Church held to the notion that the earth does not move, and shows that certain Protestant sects displayed much less wisdom by clinging to the antiquated delusion even longer. "Rapid Transit" is the subject of the sixth of Carroll D. Wright's Lessons from the Census. It contains much information concerning operating expenses, relative economy of motive powers, growth of mileage, etc. An interesting study of "Involuntary Movements," by Professor Joseph Jastrow, will appear. Experiments have been made in the psychological laboratory of the University of Wisconsin which show the reality and nature of the motions on which "muscle-reading" depends. Professor Jastrow's article is illustrated with tracings of such movements, and with a figure of the simple apparatus employed in taking them. "The Great Earthquake of Port Royal," which took place in 1692, will be described by Colonel A. B. Ellis. This account corrects certain erroneous notions of the occurrence that have long prevailed, and shows that the arrangement of the present town invites a repetition of the catastrophe. The article is illustrated. The last of the articles on musical instruments in the series on the Development of American Industries will be published in the April number. It is by Daniel Spillane, and traces the evolution of the manufacture of "Orchestral Musical Instruments" in America. The article is fully illustrated.

— Charles Scribner's Sons will publish at once Edward Whymper's long-expected book, "Travels Amongst the Great Andes of the Equator," which was announced last fall, but which they were unable to issue at that time. They have in press a new "Handbook of Great Archæology" (profusely illustrated), dealing with vases, bronzes, gems, painting, sculpture, and architecture, by A. S. Murray, keeper of Greek and Roman antiquities, British Museum. After a long delay Baedeker's "Upper Egypt" has at last been published in English, and is imported by Charles Scribner's Sons. It will be welcomed by all interested in that subject, whether travellers or students.

— Houghton, Mifflin, & Co. have published a book by the theosophist, Mr. A. P. Sinnett, on "The Rationale of Mesmerism." Mr. Sinnett is the author of "Esoteric Buddhism" and other works on theosophy, and in the present volume he professes to account for the phenomena of mesmerism, or hypnotism, on the principles of so-called occultism. He begins by rebuking the physicians and other scientific men for their refusal until very lately to study the phenomena in question or even to admit their existence; and it must be admitted that the rebuke is well deserved. The theories he advances to explain the phenomena are, however, of a very unscientific character. He asserts the existence of a magnetic fluid and also of a third principle in the nature of man, intermediate between the soul and the body, which he calls the "astral" principle; and it is by these imaginary agencies that he attempts to account for mesmerism, He tells us that there is an astral body, which "is quite visible when detached

CALENDAR OF SOCIETIES.

Biological Society, Washington.

March 5.—Fred V. Coville, Conditions affecting the Distribution of Plants in North America; Charles Hallock, The Physiology of a Poocoson; Vernon Bailey, The Homes of Our Mammals; Theo. Holm, The Flora of Nova Zembla.

Entomological Society, Washington.

March 3.—C. W. Stiles, The Histology of Ticks; T. N. Gill, The Larval Condition of Insects an Intercalated Stage.

Appalachian Mountain Club, Boston.

March 9.—Isaac Y. Chubbuck, Up North Tripyramid on Snow Shoes; Percival Lowell, An Ascent of Fuji.

Publications received at Editor's Office.

ARMSTRONG & NORTON. Laboratory Manual of Chemistry. New York, American Book Co. 8°. 144 p. 50 cents.

BLAIR, J. A. The Organic Analysis of Potable Drinking Waters. Philadelphia, P. Blakiston, Son & Co. 12°. 120 p.

BOWSER, EDWARD A. Academic Algebra. Boston, D. C. Heath & Co. 12°. 366 p. $1.25.

CHISHOLM AND LEETE. Longmans' New School Atlas. New York, Longmans, Green & Co. Imp. 8°. 38 Maps. $1.50.

CORNELL UNIVERSITY. Fourth Annual Report of Agricultural Experiment Station, 1891. Ithaca, The University. 8°. 499 p.

DORSEY, JAMES O. Omaha and Ponka Letters. Washington, Government. 8°. Paper. 127 p.

KARRER FELIX. Führer durch die Baumaterial-Sammlungdes k. k. naturhistorischar Hofmuseums in Wien. Wien, Eigenthum des Herausgebers. 12°. Paper. 355 p.

ORTON, EDWARD. Report on the Occurrence of Petroleum, Natural Gas and Asphalt Rock in Western Kentucky. Frankfort, Geological Survey. 8°. 233 p.

RUSSELL, STUART A. Electric Light Cables. London, Whittaker & Co. 12°. 332 p. Ill. $2.25.

SINNETT, A. P. The Rationale of Mesmerism. Boston, Houghton, Mifflin & Co. 16°. 232 p. $1.25.

TAYLOR, J. TRAILL. The Optics of Photography and Photographic Lenses. New York, Macmillan & Co. 16°. 254 p. $1.

THOMAS, CYRUS. Catalogue of Prehistoric Works East of the Rocky Mountains. Washington, Government. 8°. Paper. 246 p.

UNIVERSITY OF CALIFORNIA. Riverside Addresses, 1891. Berkely, The University. 16°. Paper. 74 p.

VERITY, JOHN B. Electricity up to Date. New York, Frederick Warne & Co. 18°. Paper. 178 p. 75 cents.

WINSLOW, ARTHUR. Report on the Coal Deposits of Missouri. Jefferson City, The Geological Survey. 8°. 226 p.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

For exchange.—A fine thirteen-keyed flute in leather covered case, for a photograph camera suitable for making lantern slides. Flute cost $27, and is nearly new. U. O. COX, Mankato, Minn.

To exchange; Experiment Station bulletins and reports for bulletins and reports not in my file. I will send list of what I have for exchange. P. H. ROLFS, Lake City, Florida.

Finished specimens of all colors of Vermont marble for fine fossils or crystals. Will be given only for valuable specimens because of the cost of polishing. GEO. W. PERRY, State Geologist, Rutland, Vt.

For exchange.—Three copies of "American State Papers Bearing on Sunday Legislation," 1891, $2.50, new and unused, for "The Sabbath," by Harmon Kingsbury, 1840; "The Sabbath," by A. A. Phelps, 1842; "History of the Institution of the Sabbath Day, Its Uses and Abuses," by W. L. Fisher, 1859; "Humorous Phases of the Law," by Irving Browne; or other works amounting to value of books exchanged, on the question of governmental legislation in reference to religion, personal liberty, etc. If preferred, I will sell "American State Papers," and buy other books on the subject. WILLIAM ADDISON BLAKELY, Chicago, Ill.

Wanted, in exchange for the following works, any standard works on Surgery and on Diseases of Children: Wilson's "American Ornithology," 3 vols.; Coues' "Birds of the Northwest" and "Birds of the Colorado Valley," 2 vols.; Minot's "Land and Game Birds of New England;" Samuels' "Our Northern and Eastern Birds;" all the Reports on the Birds of the Pacific R. R. Survey, bound in 2 vols., morocco; and a complete set of the Reports of the Arkansas Geological Survey. Please give editions and dates in corresponding. R. ELLSWORTH CALL, High School, Des Moines, Iowa.

For sale or exchange, LeConte, "Geology;" Quain, "Anatomy," 2 vols; Foster, "Physiology," Eng. edition; Shepard, Appleton, Elliott, and Stern, "Chemistry;" Jordan, "Manual of Vertebrates;" "International Scientists' Directory;" Vol. I. *Journal of Morphology;* Balfour, "Embryology," 2 vols.; Leidy, "Rhizopods;" *Science*, 18 vols., unbound. C. T. McCLINTOCK, Lexington, Ky.

To exchange Wright's "Ice Age in North America" and Le Conte's "Elements of Geology" (Copyright 1882) for "Darwinism," by A. R. Wallace, "Origin of Species," by Darwin, "Descent of Man," by Darwin, "Man's Place in Nature," Huxley, "Mental Evolution in Animals," by Romanes, "Pre-Adamites," by Winchell. No books wanted except latest editions, and books in good condition. C. S. Brown, Jr., Vanderbilt University, Nashville, Tenn.

For Sale or Exchange for books a complete private chemical laboratory outfit. Includes large Becker balance (200g to 1-10mg), platinum dishes and crucibles, agate motors, glass-blowing apparatus, etc. For sale in part or whole. Also complete file of *Silliman's Journal*, 1862-1885 (62-71 bound); Smithsonian Reports, 1854-1883; U. S. Coast Survey, 1854-1869. Full particulars to enquirers. F. GARDINER, JR., Pomfret, Conn.

from the physical body to those who are gifted in any high degree with clairvoyant vision," and that "the astral plane affords direct communion between the consciousness of the operator and the subject when the two are brought into true magnetic harmony." This explanation, as our readers will see, is no explanation at all; yet it is not a whit worse than the theory of "multiple personality" which is advocated by many French and German hypnotists. In our opinion the phenomena in question are far too intricate to be accounted for by any principles now known to us, and we believe that much more investigation and far deeper thinking are necessary before the true explanation can be given.

— The Cassell Publishing Company announce the "Record of Scientific Progress for the year 1891," exhibiting the most important discoveries and improvements in all the branches of engineering, architecture and building, mining and metallurgy, the mechanic arts, industrial technology, and the useful arts, photography, chemistry, medicine and surgery, printing, the generation, measurement, transmission, and application of electricity, the telegraph and telephone, meteorology and aeronauty, astronomy, etc. The editor is Professor Robert Grimshaw.

— M. Camille Flammarion, the author of "Uranie," is too well known to need more than the announcement of a new volume from his pen to attract readers. His new story, "Lumen," announced by the Cassell Publishing Company, is very much in the manner of "Uranie," a scientific romance. "It is a delightful thing in these prosaic days," says a well-known critic, "to get away from the novels of realism and strike out into something of an entirely different order that lifts one into the clouds — the pun is unintentional — and takes him away from the earth. It is just this that M. Flammarion does and it is a rest to the weary brain to read his graceful stories." Mrs. Serrano, who translated "Uranie," has translated this volume.