SCIENCE

NEW YORK, FEBRUARY 19, 1892.

NOTICE OF NEW GIGANTIC FOSSILS.

While on a collecting trip the past summer in the Bad Lands of north-western Nebraska and south-western South Dakota my attention was called by Mr. Charles E. Holmes

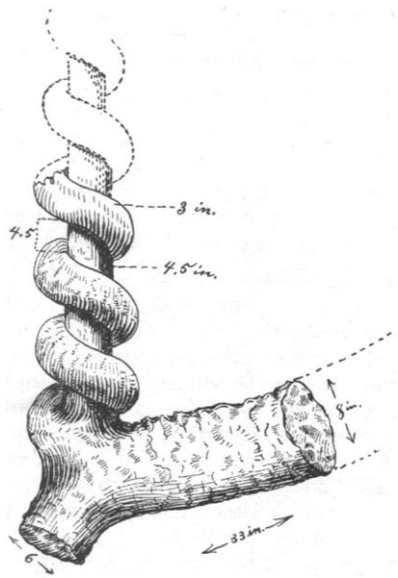

FIG. 1. — Devil's Corkscrew in the collection of C. E. Holmes. Drawn from nature.

(Yale, '84) to some gigantic fossils abounding in the extreme north-western corner of Nebraska. At that time I secured one large specimen, and noted and sketched several other forms, intending to return later and complete the work in that highly interesting field.

These fossils seem altogether so remarkable and of such imposing size and peculiarity of form, that I have felt great hesitancy in offering any suggestions as to what they are or in describing them at all; and what I now venture to publish is proposed tentatively, till I can return to this same spot and complete the work cut short last season. Not less than two genera and three species of the family were noted, and, because of their similarity to immense corkscrews, we dubbed them "Devil's Corkscrews," and I offer for them the provisional name *Daimonelix*. At least two gigantic and one small species were observed. They are almost mathematically exact and regular in form, and suggest a great three-inch vine coiled with strict uniformity of pitch about a four or five-inch pole. However, the vine and pole, as the cut will show, are just as much one as are the thread and screw which they so strikingly resemble. At the bottom of all is a transverse piece, indefinitely long, and about ten inches in diameter, rendering the appearance of the whole like that of the veritable corkscrew (See Fig. 1).

Just what this great "rizome" is, remains to be learned. In the mean time, suffice it to say, that, as far as observed, it consists invariably of a small obliquely descending portion, and a large obliquely ascending one. The latter, as shown by all that have been dug out, at least, seems to curve upward gradually, and ultimately reach the surface.

The great "underground" stem of my own specimen (Fig. 2) was followed from the wall of a small butte some ten feet straight into its interior, and then the work of further excavating in rock so very soft and crumbling, yet so peculiarly difficult to work, had to be abandoned. In the two remaining forms especially noted, one gigantic, the other small, the coil had the form and pitch of the common open corkscrew (see Fig. 3).

They covered an area of several square miles, where I saw large numbers of them, all standing in the incompletely lithified sandstone as erect as so many titanic hop poles with so many titanic vines coiled upon them. I estimated that many could not be less than thirty or more feet in height; at any rate, we frequently saw in the vertical walls of small cañons or draws fifteen feet of exposed corkscrews, while an unknown amount had been weathered from the top, and an indefinite amount was still buried in the rocks below. Then,

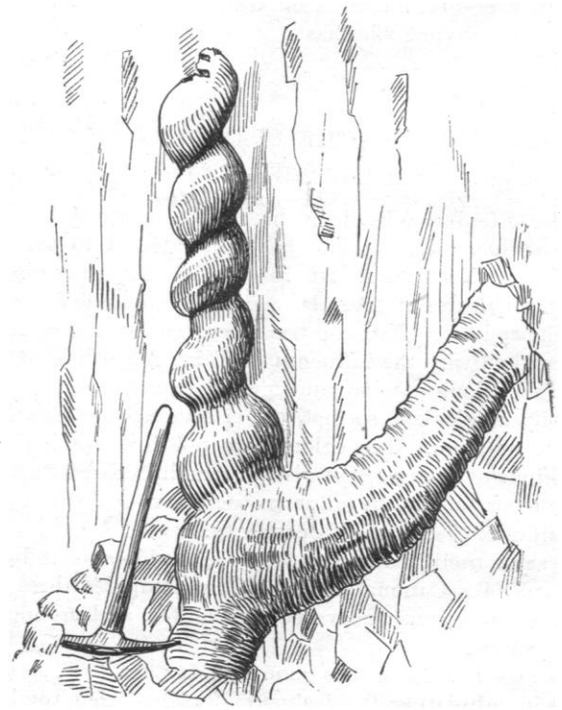

FIG 2. — A sketch of Devil's Corkscrew (in my own collection) as it appeared when nearly dug out of the vertical bank. Top eroded away. Height about five to six feet.

again, I dug out the basal portion of one specimen fully thirty feet below the surface, where the tip-ends of others were exposed. These strange forms seem to be casts, no structure being visible to the eye, or under the glass. The gray matrix readily weathers away from the specimen, which on fracture shows a spongy, friable, white wall, surrounding a core or matrix; though of chalky appearance, the wall is strictly silicious.

While reminding one forcibly of some monstrous fossil bryozoan, it seems improbable that it is such, neither is it a plant, nor a mollusk, as I believe. Possibly it is the case of some ancient worm. I have shown the specimen to eastern as well as western geologists and botanists, besides sending drawings and descriptions of it to others, who pronounce it entirely new to them. As far as my own experience goes, I have neither seen anything of the kind in any of our large eastern museums nor have seen anything published relating

FIG. 3. — Diagram of another form of Devil's Corkscrew, as sketched in the field.

to it, and I feel reasonable confidence in offering a notice of what I believe to be a new paleontological specimen, trusting that, if nothing more, it may elicit information on the matter from anyone who has it to offer.

IRWIN H. BARBOUR.

CONFIRMATION OF THE DISCOVERY OF THE INFLUENZA BACILLUS.

To Dr. Pfeiffer of Berlin is due the discovery of the influenza bacillus. Dr. Kitasato has cultivated it to the fifth generation. Koch has shown, in an article not yet published, how pure cultures of tubercle bacilli can be obtained directly from the sputum. Kitasato has succeeded in employing the same method with the influenza bacilli. According to him, the single colonies are so uncommonly small that they can be easily overlooked, so that former investigators may have failed to see them. The colonies do not flow together as in other kinds of bacteria, but always remain separated; this is so characteristic that the influenza bacilli can be distinguished from all other bacteria with certainty.

The same bacilli have been found in the blood of influenza patients by Dr. Canon. Dr. Koch has compared these with the micro-organisms discovered by Pfeiffer, and pronounces them identical.

And now Dr. Canon has gone still further,[1] and has succeeded in cultivating the influenza bacillus from the blood of patients attacked with the disease. The cultivation is especially difficult since the bacilli in the blood-drops are very few in number, and the colonies, on account of their fineness, are concealed through the coagulated blood. The blood therefore was not inoculated in tubes upon glycerin or sugar-agar, but in the Petrian "Schalen." A great quantity was employed. By this method there was not only a greater probability of preserving colonies, but also the possibility of eventually seeking out the colonies with the microscope.

The blood is taken in the following manner: a finger-tip is cleansed with sublimate, alcohol, and ether in the usual way; then with a red-hot needle the finger is pierced; an assistant presses the blood out of the opening in drops, being careful that they remain globular in form; from eight to twelve drops are placed upon the Petrian "Schale," and they are heated in a temperature of 37° C. The colonies show a slight development after twenty-four hours; in forty-eight hours they are distinctly seen. They are like those cultivated by Pfeiffer from sputum of influenza patients. In the cultures from the blood the colonies often lie close upon one another. The pure cultures from these colonies have the same appearance as those Kitasato has described.

Dr. Canon cultivated influenza bacilli from the blood of six patients, and in all the bacilli in the blood preparation were few in number and separated. And thus it appears that in those cases where the bacillus is wholly separated in the blood preparation, a sure diagnosis of influenza is given.

A. MACDONALD.

Georgetown Medical School, Washington, D.C.

[1] Deutsche Med. Wochenschrift, Jan. 21, 1892.

NOTES AND NEWS.

THE University of Edinburgh in June, 1891, conferred upon Professor Simon Newcomb the honorary degree of doctor of laws (*in absentia*). Professor Newcomb was also elected, in June, 1891, an honorary member of the Royal Institution of Great Britain.

— At a meeting of the trustees of Johns Hopkins University, Dec. 15, 1891, it was determined to proceed to construct an academic hall on the property belonging to the university, at the corner of Monument and Garden Streets, running back to Little Ross Street. The trustees are enabled to take this important step by the gift of the late John W. McCoy, who made the university his residuary legatee. Sufficient funds have been received from his estate for the erection of a building which will furnish rooms for the classes in languages, history, and philosophy, with space for the present requirements of the library, and an assembly-room which will hold over six hundred persons. The trustees voted that the building should be known, in honor of the munificent donor, as McCoy Hall. The piece of ground on which the new hall is to be constructed is 100×185 feet, and is now taken up with residences used for purposes of the university. Messrs. Baldwin and Pennington have been selected to draw up the plans for the building.

— On 12th of May, 1890, while making a professional call in the outskirts of the town, B. H. Hartwell, M.D., of Ayer, Mass., was summoned into the adjacent woods by a messenger, who stated that her mother was "burned alive." In a paper read before the Massachusetts Medico-Legal Society, and published in the *Boston Medical and Surgical Journal*, Dr. Hartwell says: "Hastily driving to the place indicated (about forty rods distant) a human body was found in the actual state of conflagration. The body was face downward; the face, arms, upper part of the chest, and left knee only touching the ground; the rest of the body was raised and held from the ground by the rigidity of the muscles of the parts. It was burning at the shoulder, both sides of the abdomen, and both legs. The flames reached from twelve to fifteen inches above the level of the body. The clothing was nearly all consumed. As I reached the spot the bones of the right leg broke with an audible snap, allowing the foot to hang by the tendons and muscles of one side, those of the other side having burned completely off. Sending my driver for water and assistance, I could only watch the curious and abhorrent spectacle, till a common spading fork was found with which the fire was put out by throwing earth upon it. The flesh was burned from the right shoulder, exposing the joint from the abdomen, allowing the intestines to protrude, and more or less from both legs. The leg bones were partially calcined. The clothing unburned consisted of parts of a calico dress, cotton vest, woollen skirt, and thick, red, woollen undergarment. The subject of the accident was a woman, forty-nine years of age, about five feet five inches in

height, and weighing not far from one hundred and forty pounds; of active habits and nervous temperament. A wife and mother, she was strictly a temperate person, accustomed through life to hard work, one who, in addition to her household duties, went washing and cleaning, besides doing a good share of the work in a large garden. On the fatal afternoon she had — as the place showed — been clearing a lot of stumps and roots, and had set fire to a pile of roots, from which it had communicated to her clothing, or it had spread into the woodland and had set fire to the clothing during her endeavors to stop it. The body lay about two rods from the burning pile. As proof that the flesh burned of itself, and nothing but the clothing set it afire, it may be stated that the accident occurred after a rain; that the fire merely skimmed over the surface of the ground, not burning through the leaves; that there was nothing but charred leaves under the body; that her straw hat which lay several feet distant was simply scorched; that the wooden handle of the spade was only blackened. The above case is interesting in several particulars. It is the first recorded case in which a human body has been found burning (that is, supporting combustion) by the medical attendant. It differs from nearly all of the recorded cases, in that it occurred in a person in middle life, not very fat, and not addicted to the use of alcohol. It is interesting in a medico-legal sense. It proves that under certain conditions — conditions that exist in the body itself — the human body will burn. We have abundant proof in the many recorded cases of so-called spontaneous combustion (seventy-three are chronicled in medical literature) that the body has been more or less completely destroyed by fire, under circumstances that show that it will support combustion, and this has given rise to the belief in the spontaneous origin of the fire."

— A gentleman in New York has recently tested the result of preserving a turkey in a refrigerator for ten years, says the *Boston Medical and Surgical Journal*. This time having elapsed, the fowl was removed from the refrigerator, and after being properly cooked was eaten by a party of gentlemen. While putrefactive changes seem to have been entirely absent it was found that the meat was practically tasteless.

— The annual general meeting of the Royal Meteorological Society was held on Jan. 27. Owing to the absence of the president, Mr. Baldwin Latham, through an attack of influenza, his address on "Evaporation and Condensation" was read by the secretary. The question of evaporation is of as great importance as the study of the precipitation of water on the face of the earth, as the available water supplies of the country entirely depend upon the differences between these two sets of observations. The earth receives moisture by means of rain, dew, hoar-frost, and by direct condensation. It loses its moisture very rapidly by evaporation. Although evaporation mainly depends upon the difference between the tensional force of vapor due to the temperature of the evaporating surface and the tensional force of the vapor already in the atmosphere, yet it is largely influenced by the movement of the air and by its dryness, or the difference between the dew-point and the actual air temperature. Evaporation goes on at night so long as the water surface is warmer than the dew-point. With sea-water the evaporation is about 4½ per cent less than with rain-water, while with water saturated with common salt the evaporation is 15 per cent less than with rain-water. In his experiments Mr. Latham used an evaporating gauge made of copper, one foot in diameter, and containing one foot in depth of water, which was floated by means of a hollow copper ring placed six inches distant from the body of the evaporator and attached to it by four radial arms. This form of evaporator was found extremely convenient in carrying on all evaporation experiments; it was floated in a tank four feet in diameter, containing thirty inches depth of water. During the period of thirteen years, from January, 1879, to December, 1891, this evaporator has never once been out of order or been interfered with in the slightest degree by frost. Experiments were made with some 5-inch evaporators as to the effect of color on the amount of evaporation, one being painted white, another black, and the results given by these gauges were compared with a copper gauge exposed under similar conditions. This comparison was the means of showing that the greatest errors in evaporating gauges arise from the capillarity of the water rising on the sides of the gauge and thus inordinately increasing the amount of evaporation. Consequently a small gauge having a larger amount, in proportion, of side area than a larger gauge, gives a very much greater amount of evaporation. The results from the floating evaporator, one foot in diameter, show that the average amount of water evaporated annually during 1879–91 was 19.948 inches. It was found, however, that, as a rule, during the period from October to March, there were certain occasions when condensation was measured. The amount of these condensations in thirteen years averaged .308 of an inch per annum The 5-inch evaporating gauge, freely exposed to atmospheric influences, gave during the same period (1879–91) an average annual depth of evaporation equal to 38.185 inches. The average annual evaporation during the three years 1879–81 from the 5-inch copper gauge standing in water was 27.90 inches, from one painted black, 22.97 inches, and from another painted white, 21.74 inches, whilst a gauge of the same dimensions, freely exposed in the atmosphere, gave in the same period 36.96 inches, and the 1-foot floating evaporator, 19.40 inches. The 5-inch copper gauge gave a larger amount of evaporation than the gauge painted black. Mr. Latham next described some percolation experiments which were carried out by Mr. C. Greaves at Old Ford, by Messrs. Dickinson and Evans at Hemel Hempstead, and by Sir J. B. Lawes and Dr. Gilbert at Rothamsted. He then detailed the results of his own experiments, and also the gaugings of the underground waters in the drainage areas of the rivers Wandle and Graveney. He further stated that in the course of his observations on the flow of underground water he had observed that at certain particular seasons of the year it was possible to indicate the direction and volume of the flow of underground streams, even when they were at a considerable depth, owing to the formation of peculiar lines of fog. Dr. C. Theodore Williams was elected president for the ensuing year.

— The *British Medical Journal*, in commenting on the death of a boy who died from drinking hot tea without milk, says that the tea had been left in the oven for some time, so that it had become a strong decoction of tannin. In being drunk without milk, the tannin was not brought into a relatively harmless albuminous tannate. It is on account of this method of making tea that it is so injurious to digestion. Neither the Chinese nor the Japanese, who know how to make tea, use milk with it; but with them the hot water is poured on and off the leaves at table, and it is drunk as soon as it becomes a pale straw color. No people in the world drink so much tea as the Japanese, yet in Japan it is never injurious to the digestion, as by their method of preparation the tannin is not extracted from the leaves.

— There will shortly be opened, probably early in March, in the Museum of Archæology of the University of Pennsylvania, a loan collection of objects used in religious ceremonies, including charms and inplements used in divination. The basis of the exhibition is the collection of oriental idols of the Board of Foreign Missions of the Presbyterian Church in the United States, comprising objects sent home by foreign missionaries through a period of sixty years. They include a series of Indian brass and marble idols, and a representative collection of Chinese deities and ancestral tablets. There are also a number of African idols from the well-known missionary station on the Gaboon River. This collection is supplemented by numerous loans from private collections and objects from different sections of the museum. A catalogue is in course of preparation which will contain sketches of the great religions of the world by Mrs. Cornelius Stevenson, Dr. Daniel G. Brinton, Dr. Morris Jastrow, and others. Ancient Egypt, India, Burma, China, Thibet, Japan, Aboriginal America, Polynesia, and Equatorial Africa will be represented by appropriate specimens, which are now being arranged and catalogued.

— At the opening session of the seventy-first meeting of the American Institute of Mining Engineers at the Johns Hopkins University, Baltimore, Md., on Tuesday evening, Feb. 16, Mr. George F. Kunz read a paper on the mining of gems and minerals in the Ural Mountains, illustrating his remarks with lantern slides made by himself on his trip last summer.

— The following experiment is reported in bulletin No. 15 of the Georgia experiment station: The object of this experiment was to determine the effect of applying varying quantities of each of the three elements — nitrogen, phosphoric acid, and potash. The section selected comprised one acre of very poor, gravelly soil, underlaid by a yellow pebbly clay, inclining to pipe clay. The original growth was scrubby post oak, red and yellow oak, and the soil is probably the poorest on the farm. It was in corn in 1890, fertilized at the rate per acre of 160 pounds of super-phosphate, 170 pounds of cotton seed meal, and 80 pounds of muriate of potash. The yield was 18 bushels of corn. The land was well broken, April 8, with a one-horse turn-plow, and harrowed smooth. April 14 it was laid off into fifty-two rows, running east and west, and four feet wide, using a long scooter, followed by a shovel. The section was then divided in the middle, across the rows, and grouped into plots of three rows each, extending half across the acre, from the west to the middle line, and from the middle line to the east side. The plots were numbered from 1 to 17, commencing on the north side of the west half and extending to the south side; then from 18 to 34, continuing from the south side of the east half to the north side. The normal or standard formula was: 156 pounds super-phosphate, 19.4 pounds of muriate of potash, and 32.4 pounds of nitrate of soda. This formula was applied to plots 1, 10, 18, and 27. On the next succeeding plots, 2, 11, 19, and 28, the potash was doubled, the other ingredients remaining the same. In the next series, plots 3, 12, 20 and 29, the nitrogen was doubled, the others remaining normal. In the fourth series, plots 4, 13, 21, and 30, both the potash and the nitrogen were doubled, phosphoric acid remaining normal. In the fifth series the phosphoric acid and potash were doubled, nitrogen remaining normal; and so on through to the eighth series. Plots 9 and 26, abutting each other, contained four rows each, and were not fertilized. By this arrangement of the plots inequalities in the character and productiveness of the different portions of the acre were approximately adjusted or corrected. In the table following the results are given, the yield in the case of the unfertilized plots being the average of two plots, and in every other case being that of four plots.

Series.	Fertilizers Per Acre.			Cost Per Acre.	Yield Per Acre.
	Super-phosphate.	Muriate of Potash.	Nitrate of Soda.		
1	156	19 4	32.4	$2.36	7 62
2	156	38 8	32 4	2.77	7.94
3	156	19.4	64.8	3.06	8 34
4	156	38.8	64.8	3 48	8.84
5	312	19.4	32 4	3.58	8.12
6	312	38.8	32.4	4.00	7.93
7	312	19.4	64 8	4.29	8.95
8	312	38.8	64.8	4 71	8 46
9	—	—	None.	—	5.00

— Dust, like the poor, we have always with us, nor has Hygeia with her newest brooms yet succeeded in banishing it. Yet there is abundant evidence to show that a dusty street contains more lurking potentialities of mischief than a jungle peopled with the hungriest wild beasts. To the researches of Miquel and others can now be added, says the *British Medical Journal*, the results of an elaborate investigation by Dr. Luigi Manfredi of the composition of the dust of the streets of Naples. The number of microbes of all kinds found in it amounted on the average to 761,521,000 per gramme. Remarkable differences in the proportion of micro-organisms were, however, observed in the dust from different quarters of the city. Thus, in the streets least exposed to contamination, that is to say, where there was the least traffic and where the hygienic conditions were most satisfactory, the average number of microbes in the dust was only 10,000,000 per gramme. On the other hand, in the busiest thoroughfares, the average rose to 1,000,000,000, and in some of the dirtiest streets to the enormous figure of 5,000,000,000 per gramme. In this "endless ocean" of infinitesimal life, there was a large number of pathogenic organisms, and the unhealthiness of the street or quarter was directly proportional to the number of microbes in the dust. Dr. Manfredi carefully tested the infective power of the dust, and obtained positive results in 73 per cent of his experiments. Of forty two cases in which he communicuted disease to guinea-pigs by inoculating them with Neapolitan dust, he found the microbe of pus in eight, the bacillus of malignant œdema in four, the bacillus of tetanus in two, the bacillus of tuberculosis in three, not to mention several other microscopic *ferœ naturœ* possessing the power of inducing fatal septicæmia in the unfortunate guinea-pigs on which they were tried. The moral pointed by these discouraging facts is that our Ædiles should take the Dutch housewife for their example, and wage relentless war against dust and dirt of every kind.

— Prosessor William Guy Peck of Columbia College died suddenly in Greenwich, Conn., on Feb. 7, aged 72 years. He published, in 1859, "The Elements of Mechanics," in 1860, an edition of Ganot's "Physics," and was joint editor with Charles Davies of the "Mathematical Dictionary and Cyclopedia of the Mathematical Sciences." He wrote several other text-books in mathematics.

— The Institute of Jamaica has begun the issue of special publications. The first, the "Rainfall Atlas of Jamaica," contains thirteen colored maps showing the average rainfall in each month and during the year, with explanatory text. The maps are based upon observations made at 153 stations from about the year 1870 to the end of the year 1889. The available stations are irregularly distributed, being for the most part sugar estates and cattle-pens, and in consequence of this irregularity the island has been divided into four rainfall divisions. The north-eastern division has the largest rainfall, then comes the west central, next the northern, and lastly the southern. The annual distribution of the rainfall varies from 30 to 35 inches in a few places to over 100 inches in the north-eastern division. The greatest fall is in October, and the least in February. The driest stations are on the north-eastern and south-eastern shores. The maps show the distribution and average amount of rainfall very clearly by different tints, and cannot fail to be of both scientific and practical utility. The work has been prepared, according to *Nature*, by Maxwell Hall, the government meteorologist.

— The Equatorial current of the Pacific Ocean, striking against the Philippines and the islands lying to the south of that group, divides into two branches (*The Scottish Geographical Magazine*, February, 1892), one of which turns southwards to the coast of Australia, while the other, under the name of Kuro Shiwo, or Black Stream, flows past the Liu-Kiu Islands and the coast of Japan. Coming from the warmer equatorial regions, its waters have a higher temperature than that of the sea through which it passes, and hence its limits may be determined by observations of temperature. Its breadth and velocity are greatly modified both by the monsoons of the Chinese Sea and by the storms of the Pacific. In fair weather the Kuro Shiwo flows in an almost straight line from the Van Diemen Straits to Rock Island, touching Oshima on its way. In winter it often lies considerably to the south of this limit, but the line from Oshima to Rock Island may be taken as its northern boundary. Its course is marked by sea-weed and drift-wood, and also by the dark color to which it owes its name. From Rock Island it runs past Nosima Saki into the Northern Pacific. On the northern edge of this stream no current is found as a rule, though occasionally a current in the opposite direction has been noticed. Between the zone where no marine currents are found and the coast of Japan tidal currents occur. The breadth of the zone between the Kuro Shiwo and the coast increases during violent northerly winds, and diminishes when southerly and easterly winds prevail. When the latter blow steadily and with great strength, the current sets more or less directly onto the coast, causing high tides, and it is then necessary for ships to keep a sharp lookout, lest they should be driven ashore. The zone of tidal currents extends for a distance of five to six nautical miles from the coast, and their velocity varies in

general inversely as the breadth of this zone. At Oshima the tidal current is sometimes imperceptible, either because it is overpowered by the Kuro Shiwo, or because at that time it flows through the strait between Oshima and the main island.

— The New York Industrial Building, erected during the past year, is nearly ready for use. The furniture dealers will be the first to occupy the building, and other trades have bespoken it so that there will be a continuous exhibition or fairs of varying kinds. The building is in a most fortunate situation, occupying the block bounded on the east by Lexington Avenue, on the west by Depew Place, on the north by Forty-fourth Street, and on the south by Forty-third Street, within a short block of the freight depot of the Grand Central Railroad, and within reach of all the street cars connecting with the ferries by which New York is approached from New Jersey, etc.

— The influence of steam on magnets is the subject of an interesting note in the *Schweizerische Bauzeitung*, in which reference is made to the researches of Strouhal and Barus. These have shown that, with long continued heating in steam, magnets lose from 28 to 67 per cent of their power. If, after this, the magnets are remagnetized, and again exposed to the action of steam, only a very slight loss of magnetic power is found to take place. The experiments which have been made would seem to warrant the conclusion, also, that after such treatment a magnet is less liable to deterioration from mechanical vibration as well as heat. In one of the experiments a short magnet was boiled in water for four hours. It was then magnetized and held in an atmosphere of steam for two hours more, after which its magnetic moment was measured. It was then subjected to fifty blows from a piece of wood, both transversely and longitudinally. Again measuring, its magnetic moment showed a loss of $\frac{1}{900}$, and, on repeating the hammering with the wooden bar, the loss was $\frac{1}{400}$ of the original moment. In view of this, repeated steaming and magnetizing is recommended as a good means of securing permanent magnetism in pieces of hard steel.

— The Orang-Ulu are a people living in the southern part of Sumatra, who were visited by M. J. Claine during the summer of 1890 (*Asiatic Quarterly Review*, October, 1891). In May he arrived at Palembang, formerly the capital of the sultans of Palembang and now the seat of a Dutch resident. This town, containing a population of 60,000, composed of Malays, Arabs, Chinese, and a few Europeans, is situated on the Kuraa Sunsang, a branch of the Musi. Leaving Palembang in August, M. Claine ascended the Musi and its affluent, the Lemattang (Lamatang), to Muri-Enim (Muara Inim), about 186 miles from Palembang. Two days later the land journey was commenced, and, after a few hours' march, the country of the Orang-Ulu was entered by a bridge guarded by a group of natives. At Lahat the curious peak of Bukih Segello (Cerillo?) was photographed, and at Bandar, the last fortified post of the Dutch Government, a halt of two days was made. The country is mountainous and wooded, with here and there fine plains. The head-waters of the Lemattang run through profound gorges, and aborescent ferns afford a welcome shade from the burning rays of the sun. Soon after leaving Bandar M. Claine came in sight of the rich plateau of Passumah and the superb outlines of the Dempo, strongly marked against the sky, and came to a halt at Pager Alam. The Ulu are very similar to the Malays in outward appearance and costume, but, never having adopted Mohammedanism, they differ in their habits. Each village is governed by a *Creo*, or chief, who wears, as a sign of authority, a pair of gold-woven pantaloons, provided by the Dutch Government. His power is very limited, all his acts being controlled by the elders. The chief occupations of the men are smoking and cock fighting, while the women do all the hard work. They grow rice and cocoa-nut trees. The houses, like those in other parts of Sumatra and Java, are built on piles, and entered by means of a notched beam. The husband, on his marriage, is bound to enter the service of the wife's family. Marriage is celebrated with the following curious ceremony: An immense balance, adorned with leaves, is placed before the house of the bride, in one of its wooden scales the parents deposit fruit, rice, fuel, cocoa-nuts, and a small kid, and in the other the bridegroom is bound to lay before sunset the gifts he makes to his intended. As soon as the scale dips in his favor, the girl leaves the house and approaches him, and the ceremony is concluded by a feast and dance. On the 11th of September M. Claine set out with a Dutch officer to ascend the Dempo. Passing by the village of Gunong Agun, through a region abounding in tigers, they reached the summit on the second day, and then, crossing a long and narrow plateau, ascended the Merapi volcano, visited seven years before by Mr. H. O. Forbes. The barometer marked 9,000 feet at the summit. From Pager Alam M. Claine made a tedious journey across the Passumah plateau to Padang-Bornay and Talang-Padang, crossing the Upper Musi several times by bamboo bridges. At Tebbing-Teggi (Tingi) he took passage on a coffee *prauw*, and descended to Palembang. The current is so rapid that it takes forty-five days to ascend the river, whereas three-fourths of the descent is accomplished in three days, and the remainder in four days and four nights.

— It has been proposed through the pages of the *British Journal of Photography* that upon the advent of the twenty-first birthday, in 1892, of the gelatino-bromide dry plate process, in photography, a substantial and fitting testimonial should be offered to Dr. R. L. Maddox, the inventor, now a veteran invalid, who has derived no pecuniary advantage from his valuable discovery, which has so largely advanced the progress of photography in all its branches, and in every country. For this purpose a committee has been formed in London, in order to carry out the scheme in the United Kingdom of Great Britain, consisting of the following gentlemen: Mr. James Glaisher, F.R.S., president of the Photographic Society of Great Britain, chairman; Captain W. de W. Abney, C.B., F.R.S., R.E., Messrs. A. H. Harman, F. York, and Sir H. Trueman Wood, assisted by others, as the executive, with the aid of Dr. A. Clifford Mercer, F.R.M.S., Syracuse, N.Y. For the furtherance of this project internationally, a foreign committee has been formed in Southampton, of the following gentlemen: James Lemon, Esq., Mayor of Southampton; Col. Sir Charles W. Wilson, K.C.B., F.R.S.. R.E., director of the Ordnance Survey, Southampton; Major-General I. Innis-Gibbs, Captain Robert Evans, R.N. Subscriptions can be forwarded to the Southampton Branch of the National and Provincial Bank of England, by check or bank draft, crossed "Maddox Fund," or by post-office order; but, if preferred, they can be addressed direct to the secretary, Charles J. Sharp, solicitor, 71 French Street, Southampton, and will be acknowledged by him.

— The outlook for the recently discovered coal mines in the Argentine Republic is so favorable, according to *Engineering*, that the railway companies of that country have declined to renew their contracts with the British mines for fuel. Hitherto all the coal burned on the Argentine railroads has been imported, but it is believed that the newly-discovered mines will furnish a supply entirely sufficient for domestic consumption.

— Mail advices from the Argentine Republic bring information of the discovery of a vast bed of silver in the bottom of the bay of San Blas, Argentine Republic. The silver appears in the black metallic sand which covers the bottom of the bay. This sand is full of silver pellets, and divers have brought up a sufficient quantity to justify the belief, as stated by the Buenos Ayres *Standard*, that "the silver deposit in the bottom of the bay is greater than in the famous Bonanza mines of California."

— About four years ago there was inaugurated in Berlin a series of popular lectures on astronomy, illustrated with stereopticon views. This series has proved so successful that it has continued till the present time, and within ten days a similar course has been opened in New York. The lectures are given at the Carnegie Music Hall three times a week, and are entitled "A Trip to the Moon." The views shown are excellent and must certainly impress on those seeing them many an important fact in astronomy. The matter given by the lecturer varies somewhat as occasion may require.

— William Draper Lewis, Ph.D., is the author of a pamphlet recently published by the American Academy of Political and Social Science. The title of the essay is "The Political Organization of a Modern Municipality."

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ARSENICAL POISONING FROM DOMESTIC FABRICS.

PHYSICIANS long ago associated a certain class of symptoms with the presence of arsenic in the wall papers of the rooms inhabited by their patients. Of course, so long as the question was in this condition there was abundant room for mistake, and all that had been observed might be explained by some chance coincidence. It now appears that whenever the class of symptoms referred to are well marked there is arsenic present in the urine. It further has been shown in a number of cases that when the suspected wall paper was removed the arsenic disappeared from the urine of the patient, and the symptoms disappeared as well. The number of cases is large in which these points have been made: a certain class of symptoms, arsenic in the wall paper, arsenic in the urine of patients, wall paper removed, arsenic disappears from the urine, symptoms disappear in proportion.

Of course this is not absolute proof that the arsenic came from the wall paper, but, after a large number of cases of the same sort, the evidence amounts to moral proof, and it is rare in medicine to obtain evidence that is more conclusive.

How the arsenic gets from the wall paper to the patient is another question; but, although it would be satisfactory to establish this point, the proof of the *modus operandi* is not essential so far as the legal aspects of the case are concerned. Without this last proof it is easy to throw dust in the eyes of those not versed in such inquiries, but protective legislation has been taken again and again in cases where the risk is far less than here.

"The question how the injurious effects are produced by arsenical colors in our domestic fabrics is a moot point, some thinking it arises from arsenical dust, others holding to the gaseous theory."[1]

[1] Lecture on our Domestic Poisons, by Henry Carr, London, Health Exhibition Literature of 1884, Vol. IX., p. 189.

A New York chemist testified in a hearing on the subject in Boston, "I found that a botanist named Selmi, in experimenting on mould, found it produced a little hydrogen, and he invented the suggestion that the mould on the back of wall paper might produce a little hydrogen, which might unite with the arsenic on the front of the paper, and produce arseniuretted hydrogen, which might account for the popular idea that arsenical wall paper was dangerous."

This "botanist named Selmi," who may have the advantage of a knowledge of that science also, is an Italian chemist of first-class reputation, who has been publishing his work for at least eighteen years since 1874, and has devoted himself lately more especially to physiological chemistry. He is mentioned in Henry Watts's "Dictionary of Chemistry," Third Supplement, p. 122 (1879), by this reference, "On the detection of Arsenic in Toxicological Investigations, see Selmi (Gazz. Chim. Ital., II. 544)." An interesting paper has lately been issued by the Italian Ministry of the Interior from the scientific laboratories of the Bureau of Health, under the direction of Professors A. Monari and A. Di Vestea, prepared by one of Selmi's countrymen, Dr. B. Gosio, assistant in these laboratories, the following translation of which I am sure will interest your readers and assist in the solution of this problem. GEORGE S. HALE.

Action of Microphytes on Solid Compounds of Arsenic: A Recapitulation, by Dr. B. Gosio.[1]

It is well known that, under certain conditions, poisonous products may be developed from wall papers and tapestries colored with arsenical colors (Scheele's green, Schweinfurth's green), and experience has repeatedly demonstrated the serious evils that may arise from their use.

But as to the internal mechanism by which the said coloring-matters become hurtful, many doubts remained, and on certain points perfect obscurity. The idea advanced by Selmi met with favor, viz., that poisonous gases may in such cases be produced by the vital processes of microphytes; but in view of the small range of his experiments (some of which gave results adverse to his theory although tried on a large scale) the preference is given, on the whole, to the theory of William Forster. He says that wall-hangings and tapestries containing arsenical colors are poisonous by reason of the solid particles that are mechanically set free from them and penetrate the organism when inhaled in the form of fine dust. The same conclusion was reached by Giglioli of Naples after eight months of experiment on mould-cultures in earths (both solid and broken up in water), mixed with arsenious anhydride; and he explained his ill success by saying that probably arsenic is not compatible with the life of those germs that would be capable of developing hydrogen, and, therefore, the reducing mechanism was wanting.

On the other hand, the partisans of the parasite theory, while they draw from their observations only general criteria, have not been able, thus far, to point out what microorganisms are peculiarly suited to bring about the modifications of substance to which they refer; nor have they determined whether all the compounds of arsenic, or, if not all, which of them are most susceptible of these modifications. Thus, Bischoff relates that it was noticed that from a mixture of flour and common white arsenic (which had been used to poison a horse for purposes of revenge) a gas was developed which had the smell of garlic and the characteristics of arseniuretted hydrogen. But he neither states how it was found

[1] This study was communicated in advance to the last Congress of Hygiene, held in London, where the preparations were also exhibited.

possible to verify this phenomenon, nor could this fact serve to establish our proposition; for in his case the substance in question was arsenious acid, while the colors used in dyeing are salts of this acid, generally with a cupric base (Scheele's and Schweinfurth's greens), or sulphids of arsenic (realgar, orpiment). And it is obvious that this circumstance is not irrelevant; for arsenic or arsenious acid may be compatible with the life of certain germs while arsenite of copper may be incompatible, and, indeed, would at first sight appear to be so, if we consider the well-known antiseptic action of the salts of this metal.

Hence, in order to prove that tapestries which contain arsenical colors can become poisonous by reason of the transformation of the coloring-matter itself into volatile poisons as a result of the biological activity of the micro-organisms that vegetate in contact with it, it is necessary to prove that these micro organisms can exist with and do transform precisely those colors which are used in tapestries.

My experiments bring a contribution to this interesting question of hygiene and toxicology. The results obtained allow us to determine not merely whether from solid compounds of arsenic and from which of them (arsenious acid, arsenic acid, arsenites, arseniates) it is possible, through the action of microphytes, to develop arseniuretted hydrogen gas or volatile arseno-organic products, but also to determine what species are pre-eminently suited to produce this transformation. In the first place I prepared some potato pulps containing from 0.05 to 0.1 of arsenious anhydride to 1,000 of pulp. These, distributed in several broad Petri capsules, were kept for some days uncovered in a cellar. Soon the growth of moulds and of the common bacteria of the air was very abundant, and at the end of one week a strong smell of garlic began to be perceived, showing that gaseous arsenical emanations were taking place. The cultures were then placed in a large damp chamber, from which, by means of an automatic pump, a continuous current of air was drawn, and this was made to bubble up during about two weeks through a solution of nitrate of silver. A strong reduction of this salt, together with the formation, in Marsh's apparatus, of arsenical rings and spots obtained from the liquid after the elimination of the silver, were the indisputable proofs that the cultures had developed a reducing arsenical gas.

While this was a positive indication of great value in reaching a conclusion, other arsenical pulps in which also germs of many species had been developed gave no evidence of having undergone a similar decomposition. This disparity of results, if on the one hand it justifies the discordant conclusions reached by the various investigators, must, on the other hand, necessarily be accounted for by the generic diversity of the germs developed in the two cultures, since all the other conditions of temperature, humidity, atmosphere, nutrition, etc., had remained unchanged. And here began the work of separating the germs and the series of experiments on pure cultures, of which I will treat in detail in my larger work. Of the germs thus isolated some belong to the moulds, others to the schizomycetes; among the former I note penicillium glaucum, aspergillum glaucum, and, above all, as greatly preponderating in the mother culture, mucor mucedo. I would also have endeavored to ascertain exactly the species of other moulds and of the other saprophytes, if I had found them capable of bringing about the important transformations to which I refer, which was not the case.

Nevertheless, each of the germs obtained in pure culture and others also which are most commonly kept in the laboraties (B. radiciforme, B. prodigiosum, B. subtile, yellow sarcina, etc.) were cultivated separately in sterilized potato pulp rendered arsenical by 0.05 grams per 1,000 of arsenic acid. The cultures were kept at the temperature of the surrounding air (20°–27° C.), and in diffused light. After one month of observation I was able to ascertain that the production of arsenical gas (indicated by the characteristic garlic smell) had taken place only in the cultures of mucor mucedo and (in a far less degree) in that of aspergillum glaucum. It was not perceived in any of the other cultures.

In view of these facts, special importance attaches to mucor mucedo, a mould very widely diffused in our atmosphere and capable of reducing remarkable quantities of arsenic acid, as I have been able to make sure by strict chemical researches on the abundant cultures carried on in presence of arsenic anhydride and of alkaline arseniates.

In another series of experiments, intending to follow out the practical direction that I had adopted, I inquired whether this activity of the mucor could he extended to those preparations of arsenic which the art of dyeing utilizes in the coloring of papers and hangings in general. To this end the cultures were carried on in the presence of Scheele's green, Schweinfurth's green, realgar and orpiment.

Without here dilating on the course of each separate experiment and on the method of chemical investigation pursued (a thing which I will do in my forthcoming publication) I will sum up my matter in the following corollaries: —

1. Mucor mucedo tolerates remarkable quantities of arsenic not only without injury, but with advantage to its nutrition, for it grows more vigorously.

2. Many solid compounds of arsenic are, through the biological activity of the fungus that vegetates in contact with them, transformed into gaseous combinations, of which arseniuretted hydrogen is certainly one.

3. This transformation is brought about more or less rapidly, but is constant and lasting in the case of all the oxygen compounds of arsenic, including arsenite of copper, which is the basis of the green arsenical colors used in dyeing. It does not appear to take place in the case of the sulphids of arsenic (realgar, orpiment) although the presence of these in the cultures is not at all detrimental.

4. In given conditions of humidity, temperature and light, arsenical gases may be given off from hangings colored with Scheele's and Schweinfurth's greens, through the vegetation of the mucor (I cannot say yet whether of all the mucorini): hence the danger to those who live in such an atmosphere.

This statement of mine does not, of course, exclude the possibility that poisoning may be caused through inhaling the fine dust, as William Forster thinks. But it is evident that this could only happen as an exception, inasmuch as one essential condition of the production of the fine dust is a certain degree of dryness of the walls to which the papers adhere, whereas we have seen that the poisonous character of arsenical hangings is generally favored by a certain degree of humidity and can be suspected from a more or less intense smell of garlic in atmospheres which answer to the above-mentioned conditions.

I cannot yet say whether the product of the action of mucor mucedo on the oxygen compounds of arsenic is entirely arseniuretted hydrogen. I have reason to think that it is not. By the action of alkalies I have, in fact, constantly succeeded in setting free a volative substance smelling strongly of garlic from the silver solutions employed to oxi-

dize the assumed AsH_3 developed by the cultures. The gas so obtained, when burned by oxide of copper, furnishes an abundance of CO_2; but it is not possible, thus far, to reach any positive conclusions on this point, nor even to exclude the suspicion that the formation of the CO_2 may depend on the admixture of some other hydrocarbon gas. This point will be made clearer by the special studies that I have undertaken together with Dr. Gorini, for which I am making use of a large culture material.

September, 1891.

A PROBLEM IN PHYSICS.

IN *Science* for Nov. 28, 1890, there was a short note on the experiment conducted by Joule, in which air compressed in one cylinder was allowed to expand into an exhausted cylinder. It was shown that the only work done by the compressed air was that of imparting a velocity to its own particles, i.e., it did not expand against a resistance, and hence the chilling produced was slight. This experiment has not received the attention it deserves, and, moreover, it seems to have been entirely misinterpreted. It has been suggested that, while at the first instant on opening communication between the two vessels, there is an expansion into a vacuum and no work done, yet at the very next instant there is air in the previously exhausted cylinder, and there is work done in compressing that. This is a serious fallacy, and lies at the bottom of the misinterpretation. It is very certain that no work against a resistance is done at any moment during the expansion This experiment is so far-reaching in its application, and is so extremely important, that I desire to discuss it a little farther, and I sincerely trust that some one in a suitably-equipped laboratory may be induced to try a few simple experiments in this line.

Tyndall has shown that mere rarefaction is not a source of cold, though this is somewhat of a popular fallacy. Let us take a cylinder with a piston fitted air-tight and moving without friction. Let us consider that there is no loss of heat from the interior nor accession from the outside. Suppose the piston is raised suddenly from bottom to top. A perfect vacuum will be formed; but, as no work has been done below the piston, there will be no cooling effect; all the work and consequent heating would be at the engine, which may communicate with the cylinder, though a hundred feet away. Now, suppose a very thin film of air .001 of an inch thick were at the bottom of the cylinder. When the vacuum was formed this thin film would impart a velocity to its particles in order that they might follow the piston, but this air certainly would not expand against a resistance, and hence the chilling would be exceedingly slight. Suppose the piston should be at a point half-way from top to bottom; when it was raised the air beneath would impart a certain velocity to its particles in following the piston, but here again there would be no expansion against a resistance, and hence the chilling would be slight.

Let us change the conditions slightly. Instead of having the air at atmospheric pressure beneath the piston, as in the last case, let it be at double that pressure. On lifting the piston as before we have taken off the pressure and the air beneath imparts a certain velocity to its particles in following the piston. At the first instant that the piston starts there may be a very slight expansion against a resistance, but that would be momentary. The bulk of the cooling would, as before, be due to the fact that a velocity is imparted to the particles beneath the piston, and, in this case, this velocity would be given to a greater number of particles than before. The cooling would be slightly greater, also, but it would not be due to the loss of heat consequent upon the work of expanding against a resistance.

In order to compute the cooling in such cases as these, a formula has been used which will be found in the *American Meteorological Journal* for November, 1890, p. 339, as follows:

$$\frac{T}{T'} = \left(\frac{p}{p'}\right)^{.291}$$

In this T and T' are the absolute temperatures corresponding to p and p'. It seems to me, however, that this formula is not applicable in this case; for it gives a greater cooling, the less the work that is done. Suppose $\frac{p}{p'} = \frac{3}{4}$, the cooling by the formula would be 38°; if $\frac{p}{p'} = \frac{1}{3}$ the cooling would be 134°; and if $\frac{p}{p'} = 0$, or the expansion was in a vacuum, the cooling would be 490°. Now, by the principles already enunciated, if the expansion took place in a vacuum there would be no expansion against a resistance, and hence there would be no work done except in imparting a certain velocity to the particles. If the formula fails in the last case, it must also fail in all the others. It seems to me that the formula is only intended to be used in cases where there is an expansion against a resistance, and not in the cases here given.

A question has come up recently which may be partly answered by this discussion. It is this: What will be the cooling due to the expansion of gas in a balloon if it should ascend very suddenly to several thousand feet above the earth? Suppose the balloon were instantly put into a perfect vacuum, and the envelope had no resistance; there would be no expansion whatever against a resistance, as we have just seen, and the only work performed would be that of imparting a certain velocity to the particles of gas. As a result the gas would be slightly chilled, but vastly less than if it had expanded against a resistance. Now, if the balloon had been suddenly placed at a point where the pressure was ten inches, or one-third that at the earth, the same principles would apply; the only work done would be in imparting a certain velocity to the particles of gas, and in consequence there would be only a slight chilling.

I should be very glad if some physicist would kindly solve the following problems.

1. Given an exhausted cylinder of certain dimensions, how much would the air be heated if allowed to enter without noise, and until the pressure was the same as that outside?

2. What would be the cooling of a perfect gas in a balloon one-third full, if the pressure on the outside were suddenly reduced from thirty inches to ten inches, the temperature of the outside air remaining constant, the envelope of the balloon being without weight and infinitely flexible?

H. A. HAZEN.

THOMAS WHITTAKER announces a volume by Frederick Saunders (of the Astor Library), entitled "The Story of the Discovery of the New World by Columbus," the same being an abridgment from the latest authorities. It will be an illustrated quarto.

PROFESSOR GEIKIE ON THE GLACIAL PERIOD.

ON Nov. 12 the Edinburgh Geological Society held its anniversary meeting, at which Professor Geikie delivered his presidential address, the subject being, "Supposed Causes of the Glacial Period." The lecturer began by remarking that, although the subject of his address had frequently been canvassed, the last word had not yet been said. The question of the cause or causes of the Ice Age was indeed a hard one, and he was not going to advance any novel speculation or hypothesis on the subject. His object was rather to examine certain views, which, after having been abandoned as untenable, had again been put forward to account for the phenomena of the glacial period. Before attempting to criticise these views it was obviously necessary to ascertain, in the first place, what conclusions had been arrived at with regard to the climatic conditions of glacial or Pleistocene and post-glacial times. We must first have an adequate conception of those conditions before we could estimate the value of any theory of their origin. The climatic conditions of the Pleistocene were then considered. It was shown that at the climax of the so-called glacial period the line of perennial snow in Europe was depressed for not less than 3,500 feet on an average. To bring about such a depression the mean annual temperature must have been lowered 10° or thereabout.

Full consideration of all the glacial phenomena led to the following conclusions: (1) That the cold of the glacial period was a general phenomenon due to some widely-acting cause — a cause sufficient to influence contemporaneously the climate of Europe and North America. (2) That glaciation in our continent increased in intensity from east to west, and from south to north. (3) That where now we have the greatest rainfall, in glacial times the greatest snowfall took place. (4) That in the extreme south of Europe, and in North Africa and South-western Asia, increased rain-precipitation accompanied lowering of temperature — from which it might be inferred that precipitation in glacial times was greater, generally, than it is now.

The remarkable climatic changes of the glacial or Pleistocene period were next considered. It had been proved that the period was interrupted certainly once — perhaps, as many geologists maintained, at least twice — by what were known as inter-glacial conditions. The evidence of this was treated in considerable detail, and the character of the inter-glacial climate was described as being markedly temperate and genial. There could be no doubt whatever that the Pleistocene period was characterized by great oscillations of climate — extremely cold and very genial conditions alternating. The evidence of the post glacial beds showed likewise that these had been accumulated under similar, but much less marked, alternations of cold and temperate climates. Lastly, attention was directed to the fact that both in Pleistocene and post-glacial times changes in the relative level of land and sea had taken place.

Any suggested explanation which did not fully account for these various climatic and geographical conditions could not be satisfactory. The view which had met with considerable acceptance, especially by American geologists, was that which attributed the phenomena of glacial times to great movements of the earth's crust. Professor Geikie then proceeded to examine that "earth-movement hypothesis" in detail. He pointed out that in the first place there was not the least evidence of great continental elevations in the northern hemisphere, such as the hypothesis postulated. Next, he showed that even if the desiderated earth-movements were admitted, they would not account for the phenomena. Each of the several applications of this earth-movement hypothesis was criticised in succession, with the result that they were all found inadequate. Neither great elevation of the northern lands alone, nor such elevation accompanied by submergence of the Isthmus of Panama and the deflection of the Gulf Stream, would account for the peculiar conditions of the Ice Age. These changes, no doubt, would profoundly affect the maritime regions of North America and Europe, but they would not reproduce the conditions that obtained at the climax of the Ice Age. Another objection to the earth-movement hypothesis was this, that it did not account for inter-glacial conditions. The advocates of that hypothesis imagined that those conditions would supervene when the highly-elevated northern regions were depressed to their present level, and when the Isthmus of Panama reappeared. But these were precisely the conditions that obtained at the present time, and yet in spite of them the climate was neither so equable nor so genial as that which obtained in inter-glacial times and during the mild stage of the succeeding post-glacial period. The earth-movement hypothesis must be rejected, not only because it was highly improbable that such wonderfully rhythmic elevations and depressions of high northern lands and of the Isthmus of Panama could have taken place, but chiefly because it did not explain the conditions of the glacial period, while it practically ignored those of inter-glacial times.

Professor Geikie next considered the proofs of former submergence which are so abundantly met with in temperate and northern latitudes, and discussed the various views which have been advanced to account for the facts. He concluded his address by considering an objection which had been urged against the physical theory of the glacial period as advocated by the late James Croll. This objection was based on certain estimates of the rate of erosion of river-valleys, the accumulation of alluvial deposits, and so forth, from which it was sought to show that only some 7,000 or 10,000 years had elapsed since the close of the glacial period. The consideration that, if this contention were true, it would bring the close of the Ice Age down to the dawn of civilization in Egypt was rather startling, to say the least. The fact was, however, that all such estimates, however carefully made, were unreliable. Dr. Croll's theory might some day be supplanted by one more satisfactory, but it would not be overturned by niggling and inconclusive measurements of that kind. That theory holds the field in giving the simplest and most consistent interpretation of the climatic vicissitudes of the Pleistocene and post-glacial periods, while it is the only one that throws any light on the very remarkable conditions that obtained during inter-glacial times.

LETTERS TO THE EDITOR.

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

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

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

The Loup Rivers in Nebraska.

PERMIT me to submit through your columns to Professor Hicks the following questions and comments on his acceptable account of the Loup and Platte Rivers in *Science* for Jan. 29 last.

The topographic maps of the region in question are too incomplete for one to learn much from them concerning the present condition of the river valleys; but from general descriptions of that part of the country and from the brief mention by Professor Hicks of the "channels excavated from fifty to two hundred feet

in soft tertiary marls" it may be inferred that the streams are little advanced in their present cycle of development. Professor Hicks postulates that at the beginning of the current cycle of river history, the several branches of the Loup River all pursued independent courses to the Platte. The origin of those early courses is not stated; whether they were consequent on the slanting surface of the tertiary marls, or whether they represented the finally adopted positions of old rivers of a previous cycle of growth.

Old rivers, revived by the uplift of the plains into a new cycle of growth are common enough in the western country, and perhaps the Platte and Loup may be of that kind; but, if so, it does not seem possible to explain the present course of the main Loup River as resulting from a recent capture of its several north-west branches. River captures occur during the early maturity of a river system. If the Platte and the Loup are revived from the old stage of a previous cycle, the captures should have taken place in the earlier part of that cycle; and when the river courses had thus become well adjusted, they would be maintained even after uplift and entrance into another cycle, unless distinctly new conditions were thereby introduced. The possibility of this will be considered in a later paragraph.

If the rivers are not now in a second cycle of development, but are in their first cycle, having first taken their course when their region rose from the waters in which its strata were deposited, and having since then done nothing more than cut their shallow trenches in the general unbroken surface of the country, then we must ask whether their initial courses must have been in the arrangement postulated by Professor Hicks, or whether they may not from the beginning have had courses essentially on their present lines of flow. This latter alternative appears to be indicated at the end of Professor Hicks's article, if I read it aright. Assuming that the last great tertiary lake not only submerged the area of the Loup River, but spread its lacustrine sediments over the surface so as to obliterate any channels of earlier date, then on the disappearance of the lake, the rivers would be newly developed on the faint slopes of its deposits. The Platte, bringing down silt in large amount, may have been at that time a constructive river, busied in building up a broad delta-like flood-plain, further and further out on the lacustrine deposits as they were revealed. If so, it would turn its lateral tributaries down-stream, and the existing arrangement would be produced without the aid of headwater erosion and capture. Hence, until the process of flood-plain deflection is excluded, it does not seem necessary to include the process of headwater erosion and capture.

But even if it be supposed that the courses of the rivers at the beginning of the present cycle were arranged as postulated by Professor Hicks, and that all of them from the Beaver to the South Loup entered directly into the Platte, it seems impossible to explain their present arrangement by the headwater erosion and piracy of the Loup. The conditions for so systematic a process do not occur in the region under consideration, as will appear from the following analysis.

In the first place, it is important to remember that it is not the river but the little trickling headwater streams on the slopes of the divides that do the capturing in cases of the kind here discussed. The capture of one river by another, or lateral abstraction, as described by Gilbert in his most original examination of this problem in his report on the Henry Mountains is a comparatively rare occurrence, and is not applicable here.

In the second place, capture by little headwaters is most common in regions of tilted rocks of varied hardness, and on the headwaters of "subsequent" streams; that is, streams whose headwater-growth is dependent on the opportunity given by the weathering of some especially weak stratum, along whose strike the stream extends. No such special opportunity has been offered to the Loup River in this region of horizontal beds.

In the third place, as one headwater stream grows, all other adjacent headwaters of the same kind grow at about the same pace. Hence, if the Loup River has so greatly extended itself by headwater erosion, all the other headwater streams should have grown also, and the country thereabouts would be much more dissected by channels than it now is.

Finally, the location of Prairie Creek seems to contradict the supposition that the branches of Loup River ever joined the Platte directly; for, if they had, then Prairie Creek must be, like the supposed extension of the Loup, an example of headwater erosion; and this is not to be thought of in a stream so systematically located between two parallel and larger rivers in a district of horizontal beds.

Taken all together, it does not seem necessary to give any especial emphasis to headwater erosion and capture in this river system. The natural result of excessive deposition along the Platte, as described by Professor Hicks, is alone sufficient to account for the present arrangement of the streams. The growth of the Platte flood-plain may have dammed back some of its tributaries, as certain branches of the Red River in Louisiana are dammed back and converted into shallow lakes; and the present main Loup River would then be developed by lateral overflow along the margin of the flood-plain; but this is quite another process from headwater erosion and capture.

These suggestions are only tentative; for not having seen the region and having no full account of its geological history or of its topography, I can only submit them for criticism.

W. M. DAVIS.

Harvard College, Feb. 10.

Origin of the Frigid Period in the Northern Hemisphere.

IN my letter, published in your issue of Oct. 16, I stated that the independent circulation of the southern ocean waters was the main cause of ice-sheets forming on the lands situated in the high latitudes of the southern hemisphere; and that such currents were caused by the strong westerly winds, which blew the surface waters of the southern ocean constantly around the globe, and thus prevented the tropical surface currents from largely entering its waters. Consequently, through this cause and the constant gathering of ice in the antarctic regions the temperature of the southern latitudes was slowly lowering; and that the growing coldness would continue until the southern ice-sheets filled the Cape Horn channel and prevented the further independent movement of the southern ocean waters. This being accomplished, the westerly winds would blow the surface waters of the sea away from the eastern side of the ice-formed isthmus and the southern lands of South America, and so cause a low sea-level, that would attract the surface waters of the tropical seas far into the southern latitudes, and thus in time furnish heat sufficient to melt the ice from the southern lands I also stated that an ice period could not be perfected in the northern hemisphere without the assistance of cold derived from a frigid period in the southern hemisphere. The independent circulation of the arctic waters is not complete, owing to land obstructions; but it is able to largely prevent the tropical Gulf Stream waters from entering the higher northern latitudes. The prevailing westerly winds blow the surface waters of the Atlantic away from the eastern shore of North America from Georgia to Labrador; consequently the low sea-level thus caused attracts the high-level tropical waters of the Gulf of Mexico through the Florida channel well into the northern latitudes; and during the same time the westerly winds which blow the surface waters of the Atlantic away from the American coast are also causing a high sea-level on the seas abreast north-western Europe, which creates a return current through the Arctic Ocean, passing through the several straits leading into Baffins Bay, and also down the eastern coast of Greenland. Thus the ocean waters of the high northern latitudes maintain a partly independent circulation, which serves to crowd the Gulf Stream away from the higher latitudes, and thus lower the temperature of the arctic regions. Through this exclusion of tropical waters, glaciers have formed on Greenland and other arctic shores; and these glaciers are probably slowly increasing, as every iceberg launched from the frigid lands and floated to the Gulf Stream lowers somewhat the temperature of the north Atlantic, and so causes conditions more favorable for larger accumulations of ice. Still it is probable that a northern ice period could not be perfected by this process alone should the tropical and southern oceans maintain their present temperature. But with the assistance of a frigid period in the

southern hemisphere to cool the ocean waters and still further lower the temperature of the Gulf Stream, and also the tropical currents of the oceans, including the great Japanese current, the ice period of both hemispheres would be brought about during the same era. For it is well known to those who have studied the subject that the Gulf Stream derives a large portion of its heat from the south Atlantic; which would not be the case should the waters of the southern hemisphere be chilled by ice. For it appears that all of the south Atlantic islands during frigid times were burdened with glaciers. Even the island of St. Helena, situated in the tropical zone, has the appearance of having been heavily iced during some remote period. Its steep ravines, which deepen as they approach the sea, recall to the southern voyager the ice-worn islands of the higher latitudes. Thus when the temperate regions of both hemispheres were heavily iced the temperature of the tropical seas must have been comparatively low, especially on the eastern sides of the oceans which are swept by the polar currents. Moreover, the sea was much salter than now, on account of a large portion of its waters being absorbed by glaciers. Furthermore, whenever the arctic channels are filled with glaciers the independent circulation of the arctic waters must cease; consequently the Gulf Stream, meeting with less opposing polar currents on its sweep northward, would thus be able to gain a much higher latitude than now. Although its waters at first would be colder than they are to-day; still their superior saltness would add to their ability for dissolving ice wherever they were able to flow. But it appears that the Gulf Stream and other tropical currents of the northern oceans would not be able to subdue the cold accumulated in northern ice-sheets without the assistance of a comparatively warm ocean in the southern hemisphere. The southern seas being so much superior and so widely connected with the northern, the tropical currents of the latter seas would require the assistance of the southern oceans to subdue the cold of a northern ice period, in the same degree that it required their co-operation to bring about the frigid period. The arctic straits, which now facilitate the independent circulation of cold Arctic waters, would, when filled with glaciers, be slow to thaw out, even with the increasing warmth of the arctic regions, on account of being situated to the windward of the warm gulf currents. Therefore, the glaciers that filled their deep channels would be the last great body of ice to melt in the northern regions; and for this reason it is probable that there are fragments of the old ice of the last frigid period still unmelted and now form a portion of the lower shores of the arctic straits. This conclusion is in harmony with reports from Point Barrow which inform us that a stratum of pure ice is found beneath the scanty soil. The low temperature of the waters of the tropical oceans during the perfection of a frigid period must have been very destructive to oceanic life; while such as survived probably found refuge in nearly landlocked equatorial seas, where the waters were largely excluded from the colder ocean, and also freshened by such rivers as emptied into them. Meanwhile, the low temperature of the ocean must have chilled the atmosphere over the land to such a degree as to have caused the destruction of many species of animals.

C. A. M. TABER.

Lake Como, Florida, Feb. 5.

Electricity in Agriculture.

THE abstract under the above title in *Science* for Jan. 15, 1892, which I have only just found time to read, proves very interesting to me, and I do not wish in any way to have it inferred that I disbelieve in the influence of electricity, at least indirectly, upon the growth of plants; but it does not seem out of place to call attention to the fact that the comparative rarity of mildew on plants grown above electricity-bearing copper wires in moist soil may be due to the action of the copper salts formed in killing the mildew rather than to electrical action.

The roots of the lettuce in the experiment mentioned at "Garden A" (*Science*, p. 36) are stated to have "grown about the wires, as if there they found the greatest amount of nourishment," etc. This would also be the result from the roots seeking the environment best suited for growth, if the mildew could not thrive about the wires on account of the trace of copper salts which the soil contained.

The use of sprays containing copper salts, in the form of Bordeaux mixture or similar compounds, as a preventive of mildew of grape-vines and other plants is well known, and the control plot, "Garden B," should have been provided with copper wires, exactly as was "Garden A," to make the results of the experiment conclusive. As I have not seen the original article in the Bulletin of the Hatch Experiment Station, from which the abstract in *Science* was taken, it may be the fact that this action of the copper salts upon mildew has been discussed there.

GEORGE DIMMOCK.

Canobie Lake, N.H., Feb. 15.

AMONG THE PUBLISHERS.

E. & F. N. SPON & CO. announce "Roll Turning for Sections in Steel and Iron," by Adam Spencer. The subject of roll-turning is treated from a purely practical point, and for practical men. The drawings are the result of experience, and their value consists in the fact that they are working drawings, that is, drawings of rolls which have passed through the ordeal of actual work. The arrangement of the work is as follows: First, drawing of modern blooming for steel slabs, followed by a pair of billet rolls, then various sections showing the related grooves in cogging, roughing, and finishing rolls, with the position and character of collars required. "A Text-Book of the Science of Brewing," by Edward Ralph Moritz and George Harris Morris. The following extract from the introduction will show its character: "The object of this work is to provide in a convenient and accessible form such knowledge of the processes of brewing and of the materials employed in that industry as is at our disposal; and — so far as we are able — to connect such knowledge with the practice of brewing. We therefore intend it as a text-book in which may be found the results of scientific research together with the practical conclusions which we consider justly deducible from them. We do not pretend that a perusal of our work will enable a novice to brew beer; neither will a study of it convert a purely practical man into a chemist. It is meant, however, to lead the brewer to a better understanding of what we may term the physiology and pathology of brewing, and, by so doing, put at his disposal a means for more efficient control over his operations." "Manual of Instruction in Hard Soldering," by Harvey Rowell. "The Mechanical and Other Properties of Iron and Steel in Connection with Their Chemical Composition," by A. Vosmaer, engineer. The author has gathered together the widely scattered information on this important subject, and gives in brief outline the actual knowledge of the intimate connection that exists between the properties of steel and iron and their chemical composition. The elements — carbon, manganese, silicon, phosphorus, sulphur, copper, chromium, titanium, tungsten, aluminium, nickel, cobalt, arsenic, antimony, zinc, lead, tin, silver, molybdenum, vanadium, potassium, sodium, barium, strontium, calcium, and magnesium — have been considered separately and in the following manner: First, as to the metallurgical behavior of the elements in question; next, to deal with their influence on pig iron, cast iron, wrought iron, and steel; lastly, the special uses made of them, and their occurrence in manufactured objects. The gases, intermolecular, reaction, and mixed, have been carefully considered, and analyses given of foundry, bessemer, basic, and forge pig-irons, spiegel-irons, ferromanganese, ferrosilicons, ferrochromes, ferrotungsten, ferroaluminium, cast-irons, weld irons. Steel — railway material, structural steel, ordnance material, miscellaneous. With a diagram of silicon in cast iron, and of disappearance of carbon. Also a new edition of "A Practical Treatise upon Warming Buildings by Hot Water."

— Morris Phillips of the *Home Journal* goes abroad every summer for recreation and business. He has kept up that habit for nearly twenty years, besides travelling widely over this country, and as a result of his experiences he has just compiled a note-book of practical hints for tourists entitled "Abroad and at Home," in which he gives incidents of his travels, as well as a

complete statistical and detailed account of the cost of trips in Europe and America. It promises to be a valuable guide-book for Americans.

— Henry Holt & Co. will add immediately to Sneath's series of modern Philosophers, volumes extracted from Reid by Dr. Sneath of Yale University; from Spinoza, by Professor Fullerton of the University of Pennsylvania; from Kant by Professor Watson of Queen's College, Canada; and from Descartes, by Professor Torrey of the University of Vermont. They contemplate adding, in the near future, volumes from Berkeley, Hume, and Hegel.

— "The Basis of the Demand for the Public Regulation of Industries" is the title of a monograph by the Hon. W. D. Dabney, which has recently been published by the American Academy of Political and Social Science. There have been numbers of plans suggested to remedy these evils, the most notable of which is, probably, socialism. Mr. Dabney thinks that this plan will not be adopted, but that government regulation of private business will be tried as remedy for the existing evils of private monopolies.

— The Department of Astronomy of the Brooklyn Institute of Arts and Sciences has just issued a "Hand-book of Astronomy for 1892." The publication is in a new field, and is one that will command general interest and constant use by a very large number of people who have considerable general knowledge of astronomy, and who desire to couple with information gained by reading a practical knowledge from experience and observation. The new publication is designed to aid in the observation of the planets and the constellations every hour when they are visible during the year 1892. The hand book will not only prove interesting to the "amateur" astronomer, but also to those who are working with instruments in observatories. It contains calendars of the eclipses of the sun and moon, of the periods of the inferior planets as morning and evening stars, and of the periods of the greatest brilliancy and elongation of the planets, a selection of the most important occultations of stars, calendars of the positions of the sun, moon, and planets for each day of each month, brief accounts of the opposition of Mars, of the evidence of Venus' rotation, tables showing the motions and positions of Jupiter's satellites, the names and positions of colored stars and double stars, tables of the variable stars of long periods and of short periods, accounts of the zodiacal light and the principal meteoric showers of the year, together with a great deal of valuable information concerning the satellites, the distances of planets and stars, the lengths of the years of the planets and the weights and dimensions of the members of the solar system. A calendar for the seasons and the church calendar are convenient additions. Copies of the hand-book may be purchased by members of the institute, or by others interested in astronomy, at twenty cents per copy, including postage.

CALENDAR OF SOCIETIES.

Philosophical Society, Washington.

Feb. 13.—Gardiner G. Hubbard, The History of the Education of the Deaf; A. W. Greely, Some Peculiarities in the Rainfall of Texas.

Society of Natural History, Boston.

Feb. 17.—George L. Goodale, Illustrations of Vegetation in Ceylon.

Publications received at Editor's Office.

BOWSER, EDWARD A. Elements of Plane and Solid Geometry. 2d ed. Boston, D. C. Heath & Co. 12° 393 p. $1.35.

BROCKWAY, FRED J. Essentials of Medical Physics. Phila., W. B. Saunders. 12°. 330 p. $1 net.

HARVARD COLLEGE. Annual Reports of the President and Treasurer, 1890-91. Cambridge, The University. 8°, paper. 294 p.

HEMPEL, WALTHER. Methods of Gas Analysis. Trans. from the German by L. M. Dennis. New York, Macmillan & Co. 12°. 401 p. $1.90.

LEFAVEL, CARRICA. Delsartean Physical Culture. New York, Fowler & Wells Co. 12°, paper. 108 p.

MCKILLOP, DUGALD. Shorthand and Typewriting. New York, Fowler & Wells Co. 12°, paper. 123 p.

MUNRO, J. Heroes of the Telegraph. London, Religious Tract Society. 12°, 288 p. $1.40.

MUSEUM OF FINE ARTS. Catalogue of the Print Department. Boston, The Museum. 12°, paper. 98 p.

SCOTT, W. The Lady of the Lake. Ed. by William J. Rolfe. Boston, Houghton, Mifflin & Co. 16°, paper. 273 p. 30 cents.

SCRIBNER'S MAGAZINE. Index to Vols. I-X. New York, Charles Scribner's Sons. 8°. 89 p.

THURSTON, ROBERT H. A Manual of the Steam Engine. Part II. Design, Construction and Operation. New York, John Wiley & Sons. 8°. 957 p.

WHITE, CHARLES E. Number Lessons. Boston, D. C. Heath & Co. 12°. 201 p. 45 cents.

Business Department.

Intending investors and others interested in real estate matters in the rapidly developing State of Washington are invited to give a careful reading of the advertisement of the Washington Fire Clay Company on first page of this number. Mr. C. Cooper Clark, Vice-President, will show photographs and blue prints of the property advertised. The writer is personally acquainted with all the officers and many of the stockholders of this company and can vouch for the entire reliability and truthfulness of any statements they may make.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, may have the 'Want' inserted under this head FREE OF COST, *if he satisfies the publisher of the suitable character of his application. Any person seeking information on any scientific question, the address of any scientific man, or who can in any way use this column for a purpose consonant with the nature of the paper, is cordially invited to do so.*

A PROFESSORSHIP in Chemistry is wanted by one who has had five years' experience in that capacity. Would prefer to give instruction by lectures and experiments rather than by text-book methods. Would like a position in a college or university where there is a good student's laboratory. Special points of strength claimed are: (1) Thorough control of a class and good order during lectures and recitations. (2) Accuracy in experimenting with chemicals and skill in the manipulation of chemical apparatus. The permission of several distinguished educators has been given to refer to them if required. Would not care to accept a position paying less than $1,500. Address B. E., care of *Science*, 874 Broadway, New York.

ADDRESS WANTED.—Will some one please send the address of the Secretary of the American Philological Society. Also that of Herbert Spencer. "ADDISON," Room 84, 164 Madison St., Chicago, Ill.

ADDRESSES of Old Book Dealers wanted.—Wishing to obtain a number of old books out of print, I very much desire the addresses or catalogues of rare second-hand book dealers. If there is a directory or list of such dealers I should like to obtain possession of one. W. A. BLAKELY, Chicago, Ill.

WANTED.—Books on the Magic Lantern. Will exchange, "How the Farm Pays," by Cozier and Henderson; "Culture of Farm Crops." by Stewart; "American Agriculturist," 1890 and 1891. I. SLEE ATKINSON, 43 Wallace St., Orange, N. J.

WANTED.—(1) A white man versed in wood and iron working, able to work from specifications and plans, suited for an instructor of boys; his business to have charge of shops of school, outline and direct the work for foremen and students; salary to be $1,000 per annum (nine months). (2) A man (black preferred) to teach the colored, iron working and forging, subordinate to the preceding; salary, $720. (3) A man (white) competent to take classes in engineering (assistant's position), but with the ability to perform any of the work required in any of the ordinary engineering courses of our universities; salary from $1,000 to $1,500. A. H. BEALS, Milledgeville, Ga.

BOOKS: How to Exchange them for others. Send a postal to the SCIENCE exchange column (insertion free), stating briefly what you want to exchange. SCIENCE, 874 Broadway, New York.

Exchanges.

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

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.

Wanted to buy or exchange a copy of Holbrook's North American Herpetology, by John Edwards. 5 vols. Philadelphia, 1842. G. BAUR, Clark University, Worcester, Mass.

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.

— The *Chautauquan* for March presents the following among other articles: Growth and Distribution of Population in the United States, by General Francis A. Walker; Physical Culture, II., by J. M. Buckley; National Agencies for Scientific Research, V., by Major J. W. Powell; Ocean Perils, by Felix L. Oswald, M.D.; The Ownership of Literary Property, by George Haven Putnam; Lyceum Attractions of To-day, by W. H. Stenger; The National Library and its Librarian, by Fannie C. W. Barbour; Words to the Deaf, by Katherine Armstrong; What Women Owe to Inventions, by Margaret N. Wishard.

— John Wiley & Sons have in preparation a work on timber and metallic structures entitled "Theory and Practice in the Designing of Modern Framed Structures." This book is written jointly by Professor J. B. Johnson, author of "Theory and Practice of Surveying," and professor of civil engineering in Washington University, St. Louis, by Mr. C. W. Bryan, designing engineer of the Edge Moor Bridge Works, Wilmington, Del., and by F. E. Turneaure, instructor in civil engineering in Washington University. It will describe in great detail the most modern and approved styles of structures and methods of analysis, giving only a historical review of obsolete forms of trusses and abandoned analytical methods. It will treat not only of bridges and roofs but also of trestles, viaducts, stand-pipes, elevated tanks, and steel skeletons for high buildings. It will be adapted to serve both as a text-book in the higher engineering schools and as a hand-book for the designing engineer.

— Houghton, Mifflin, & Co. have just ready "Mark Hopkins," illustrious as president of Williams College for thirty-six years, and as president of the American Board of Commissioners for Foreign Missions for thirty years, by Professor Franklin Carter, present president of Williams College; also a new work, by Dr. Josiah Royce, entitled "The Spirit of Modern Philosophy."