argument for a high geological position of the conglomerates (based on an assumed regular dip towards the south-west in this region) by the supposition that conglomerates must express nearness to shore, and that, running along a line from shore into deep water, it is safe to assume that for any given length of time the thickness of the deposit will diminish with the distance from the shore; and hence, if the general relation of shore to deep water continued through the upper Devonian, the dip of the strata will diminish as we ascend in the series, and the tendency of one who depended upon a general rate of dip would be to reckon the more southern deposits too high. Professor Williams has good evidence that this has been done for the sands of Wyoming and Alleghany counties.

Professor Williams's observations lead him to the opinion (which may be modified by further facts), that the sandstones lying at the top of the series at Portage Falls, barren of fossils so far as reported, are, when taken as a mass, stratigraphically identical with the lower Chemung sandstones farther south and west, and that geographical conditions had more to do with the presence or absence of the Chemung fauna than had the geological time of the deposit, after once the Chemung fauna appeared in the sea.

The present stage of Professor Williams's investigations leads him to the following opinion as to the distribution of faunas at this mid-upper Devonian for the eastern area: —

1. A Hamilton fauna coming in from the east and north, and extending around the southern border of the old paleozoic continent into the interior sea, through Canada West, Michigan, etc., to Iowa, etc.

2. A black slate fauna, at first reaching quite to the eastern New York areas, but, with the advance of time, oscillating back and forth, each stage withdrawing farther and farther to the west and south.

3. A sparse Portage fauna, mainly small lamellibranchs and pteropods and cephalopods, rather pelagic in character, common over the New York area, but whose centre or origin he is unable to trace.

4. A Chemung fauna from the south and east, pushing northward with the withdrawal of the Hamilton fauna, mingling with it at first in eastern New York areas, but in western New York not appearing at all until the complete withdrawal of the Hamilton fauna.

There are also traces of a fifth fauna over this region; for, as the Chemung fauna is followed towards the western part of the state, species characteristic of the subcarboniferous of the interior begin to appear, both in the nature of the varietal modifications of the species and in the rare new forms mixed with the Chemung species, leading to the suspicion that the subcarboniferous faunas of the western interior may have been contemporaneous with the Chemung faunas of New York and Pennsylvania. He says, however, that the solution of this problem must be left until a more thorough study of the western interior deposits and their faunas is made, and that the problems involved are too complex to make hasty generalizations safe.

These investigations have been partly in the line of some remarks made by Professor James Hall in the 'Paleontology of New York' (vol. iv. part i., March, 1867, p. 257), where he speaks of the diminution of Devonian types and the augmentation of carboniferous types in the same beds in western New York, and also expresses the opinion that the mingling of Devonian and carboniferous aspects is due to geographical and physical conditions, and not to difference in age or chronological sequence of the beds which contain the fossils. Professor Williams is elaborating this idea, and is dissecting the faunas and tracing them to their centres of distribution.

NOTES AND NEWS.

PROFESSOR SYLVESTER, who has resigned the chair of mathematics at the Johns Hopkins university, and has been appointed to the Savilian professorship of geometry at the University of Oxford, sailed for Europe on Saturday last, Dec. 22. The night before his departure from Baltimore, a farewell assembly was held at the university in his honor. Mr. Matthew Arnold, who was present, made a brief speech. Resolutions were read on behalf of the board of trustees and of the teachers in the university, expressing their profound regret at the departure of Professor Sylvester, and the highest appreciation of his work and of the great stimulus his presence has given to mathematical research in this country. Professor Sylvester responded in a speech of characteristic warmth and *naïveté*, in which, along with most enthusiastic admiration and approval of the university he has helped to inaugurate, he took the opportunity of making some pointed suggestions. One of these was addressed to millionnaires, to whom he indicated several ways in which, while aiding the Johns Hopkins university, they might secure for themselves imperishable fame. Another pointed at the advisability of introducing a system of pensions or some equivalent provision for superannuated and disabled professors; and still another was a protest against the dismemberment of a university library by the establishment of specialized branches. Professor Sylvester's departure removes from the university not only the most distinguished scientific man, but the most interesting personality connected with it; and his absence will make a gap in the general life of the university no less than in his own department. It is hardly to our credit that no American college has conferred an honorary degree upon him during his residence in this country.

— In his recent address to the Royal society, President Huxley states that thirty-eight of the reports of the Challenger expedition have been published, forming eight quarto volumes, with 4,195 pages of letter-press, 488 lithographic plates, and other illustrations. Thirty-four of these memoirs are on zoölogical, four on physical, subjects. Nine reports are now nearly all in type, and some of them partly printed. These will be published within three months, and will form three zoölogical volumes with 230 plates and many

woodcuts, and one physical volume with many diagrams and maps: this latter volume will contain the report on the composition of ocean water, the specific gravity and temperature observations. A considerable part of the general narrative of the cruise is now in type, and nearly all the illustrations are prepared. The narrative will extend to two volumes; and it is expected they will be ready for issue in May or June, 1884. The work connected with the remaining forty-two special reports is in most instances progressing satisfactorily. Portions of the manuscript for three of the larger memoirs have been received and put in type, and the manuscript of many others is in a forward state. For these memoirs, 386 lithographic plates have been printed off and delivered to the binders, 404 others are now on stone, and the drawings for many more are being prepared. It is estimated that the whole work connected with the report will be completed in the summer of 1887.

— Professor Huxley also expresses a regret that the admirable energy of the government in taking measures to make the recent advances of medical science available during the late outbreak of cholera in Egypt was not extended beyond the purely practical side of the matter, or perhaps not so far as the practical side in the proper sense; for, until we know something about the causes of that terrible disease, our measures for prevention and for cure will be alike leaps in the dark.

Those, he says, who have looked into the literature of cholera may perhaps be disposed to think that a new search after its cause will add but another to the innumerable wild hypotheses which have been set afloat on that topic; and yet devastating epidemics, like the pebrine of the silkworm, so similar in their fatality and their apparently capricious spread that careful investigators have not hesitated to institute a detailed comparison of the phenomena of this disease with those of cholera, have been proved by Pasteur to be the work of microscopic organisms; and hardly less fatal epidemics, such as splenic fever, have been traced to similar agencies. In both these cases, knowledge of the causes, and of the conditions which limit the operation of the causes, has led to the invention of effectual methods of cure. And it is assuredly, in the present state of science, something more than a permissible hypothesis, that the cause of cholera may be an organic living materies morbi, and that the discovery of the proper curative and prophylactic measures will follow upon the determination of the nature and conditions of existence of these organisms.

If this reasoning is just, it is certainly to be regretted that the opportunity of the outbreak of cholera in Egypt was not utilized for the purposes of scientific investigation into the cause of the epidemic. There are able, zealous, and courageous young pathologists in England who would have been willing enough to undertake the labor and the risk; and it seems a pity that England should leave to Germany and to France an enterprise which requires no less daring than arctic or African exploration, but which, if successful, would be of a thousand times more value to mankind than the most complete knowledge of the barren ice-wastes of the pole or of the sweltering barbarism of the equator. It may be said that inquiries into the causation of cholera have been for some years conducted in India by the government without yielding any very definite result; but this is perhaps rather an argument in favor of, than against, setting fresh minds to work upon the problem.

— Professor George Davidson read papers at the meeting of the California academy of sciences, Nov. 5, on the solar eclipse of Oct. 30, 1883, and the appearance of Saturn as seen at the Dearborn observatory under very favorable conditions. He said of the latter, "The evening was clear and pleasant, and nearly calm. . . . The atmosphere was charged with aqueous vapor, and the dew ran down the observatory almost like rain. . . . But one of the best revealed features . . . was the undoubted difference in brightness of the gauzy ring at the two ansae. The preceding part was decidedly brighter than the following ansa. . . . I should mention, that, in my limited experience in examining Saturn, I have never seen the atmospheric conditions so nearly perfect as they were that night. . . . I saw more than is given in the beautiful Cambridge drawing."

Professor Davidson also spoke of a brilliant meteor as follows: "On the evening of Oct. 29, at eleven o'clock, a remarkably brilliant meteor passed vertically downwards very near to Eridani (3 mag.). It illuminated the street, and its light cast a strong shadow. The train, about five degrees long, was persistent for three or four seconds, with an intense, vivid brightness, then faded away to a white, vaporous-looking streak, which assumed a wavy motion for three or four seconds, and then vanished. The color was an intense white, tinged with a purplish hue; and the brightest part of the train which was left was not at the point of disappearance, but about the middle of its length."

At a later meeting of the academy, Professor Davidson spoke of Trouvelot's red star, seen during the solar eclipse of May 6, and took the ground that δ Arietes was the star seen by Trouvelot.

Full accounts of all these papers were given in the *Mining and scientific press*, San Francisco.

— We take the following account of the awards of medals recently made by the council of the Royal society from Professor Huxley's presidential address: —

The number, the variety, and the importance of Sir William Thomson's contributions to mathematical and experimental physics are matters of common knowledge; and the fellows of the society will be more gratified than surprised to hear that the council have this year awarded him the Copley medal, — the highest honor which it is in their power to bestow. Sir William Thomson has taken a foremost place among those to whom the remarkable development of the theory of thermodynamics and of electricity in the last forty years is due. His share in the experimental treatment of these subjects has been no less considerable; while his constructive ability in applying science to practice is manifested by the number of instruments bearing his name which are at present in use in the physical laboratory and in the tele-

graph-office. Moreover, in propounding his views on the universal dissipation energy and on vortex motion and molecular vortices, Sir William Thomson has propounded conceptions which belong to the prima philosophia of physical science, and will assuredly lead the physicist of the future to attempt once more to grapple with those problems concerning the ultimate construction of the material world which Descartes and Leibnitz attempted to solve, but which have been sedulously ignored by most of their successors.

One Royal medal has been awarded to Dr. T. Archer Hirst, F.R.S., for his investigations in pure geometry, and more particularly for his researches into the correlation of two planes and into the complexes generated by them.

The other Royal medal has been awarded to Dr. J. S. Burdon Sanderson, F.R.S., for the eminent services which he has rendered to physiology and pathology, and especially for his researches on the electrical phenomena exhibited by plants, and for his investigations into the relation of minute organisms to disease. In making this award, the council desire not merely to recognize the merit of Dr. Burdon Sanderson's researches, especially those on the analogy between the electrical changes which take place in the contractile tissues of plants and those which occur in the like tissues of animals, but to mark their sense of the important influence which Dr. Sanderson has exerted upon the study of physiology and pathology in this country.

The Davy medal has this year been again awarded in duplicate; the recipients being M. Marcellin Berthelot, member of the Institute of France, and foreign member of the Royal society, and Professor Julius Thomsen of Copenhagen. The thermochemical researches of Berthelot and Thomsen have extended over many years, and have involved an immense amount of work, partly in the application of established methods to new cases, partly in devising new methods and applying them to cases in which the older methods were not applicable. Chemists had identified a vast variety of substances, and had determined the exact composition of nearly all of them; but of the forces which held together the elements of each compound they knew but little. It was known that certain elements combine with one another with great evolution of heat-forming products in which they are firmly united; while other elements combine but feebly, and with little evolution of heat. But the materials for forming any general theory of the forces of chemical combination were but scanty and imperfect. The labors of Messrs. Berthelot and Thomsen have done much towards supplying that want, and they will be of the utmost value for the advancement of chemical science.

— Dr. Charles W. Dabney, director of the North Carolina agricultural experiment-station, has issued a circular urging the necessity of a strictly scientific agricultural journal in this country, either a quarterly or monthly. Those interested should address Dr. Dabney at Raleigh, N.C. The station at Raleigh is reported to be in a prosperous condition.

— The next number of the *Journal of the Cincinnati society of natural history* will contain a biographical sketch and a steel-plate portrait of the late V. T. Chambers, the entomologist. Mr. Chambers was at one time president of the society, and at all times one of its most active members.

— The Ohio mechanics' institute of Cincinnati has inaugurated á series of popular scientific lectures on a plan pursued in former years. The lecturers and the topics for this series are as follows: Prof. T. C. Mendenhall, 'The electric light;' Prof. C. L. Mees, 'Molecular motion and crystallization;' Prof. F. W. Putnam, 'Ancient arts of North-American nations;' Dr. A. Springer, 'The cell and its functions;' Prof. E. S. Morse, 'Japan;' Prof. Thomas French, jun., 'Sound;' Prof. W. L. Dudley, 'Water;' Prof. T. H. Norton, 'Recent advances in chemical technology;' Prof. J. B. Porter, 'Mining and metallurgy.' The first two of these have already been given. The others will follow at intervals of about two weeks.

— The course of free popular scientific lectures just concluded by the Cincinnati society of natural history was a great success. Eight lectures were delivered on topics connected with zoölogy by members of the society. They were given every Friday evening from Oct. 19 to Dec. 7, and were attended by as large audiences as the lecture-room would accommodate. The lecture committee is arranging for another course, to begin on Jan. 4; and these lectures will treat of topics connected with geology and mineralogy. 'Gems,' 'Marbles and corals,' 'Physical geography of the United States,' and 'Fossil botany,' are some of the subjects. The officers of the society deserve credit for their efforts to make the institution of practical educational value.

— It is proposed to hold during the year 1884, says *Nature*, an international exhibition, which shall also illustrate certain branches of health and education, and which will occupy the buildings at South Kensington erected for the fisheries exhibition. The object of the exhibition will be to illustrate, as vividly and in as practical a manner as possible, food, dress, the dwelling, the school, and the workshop, as affecting the conditions of healthful life, and also to bring into public notice many of the most recent appliances for elementary school-teaching and instruction in applied science, art, and handicrafts. The influence of modern sanitary knowledge and intellectual progress upon the welfare of the people of all classes and all nations will thus be practically demonstrated, and an attempt will be made to display the most valuable and recent advances which have been attained in these important subjects. The exhibition will be divided into two main sections, — I. Health; II. Education,— and will be further subdivided into six principal groups. In the first group it is intended specially to illustrate the food-resources of the world, and the best and most economical methods of utilizing them. For the sake of comparison, not only will specimens of food from all countries be exhibited, but the various methods of preparing, cooking, and serving food will be practically shown. The numerous processes of manufacture connected with the preparation of

articles of food and drink will thus be exemplified; and, so far as the perishable nature of the articles will admit, full illustrations will be given of the various descriptions of foods themselves. In the second group, dress, chiefly in its relation to health, will be displayed. Illustrations of the clothing of the principal peoples of the world may be expected; and a part of this exhibition, which, it is anticipated, will be held in the galleries of the Royal Albert Hall, will be devoted to the history of costume. In the third, fourth, and fifth groups will be comprised all that pertains to the healthful construction and fitting of the dwelling, the school, and the workshop, not only as respects the needful arrangements for sanitation, but also the fittings and furniture generally in their effect on the health of the inmates. The most improved methods of school construction will be shown; and the modes of combating and preventing the evils of unhealthy trades, occupations, and processes of manufacture, will form portions of the exhibition. The sixth group will comprise all that relates to primary, technical, and art education, and will include designs and models for school-buildings, apparatus and appliances for teaching, diagrams, text-books, etc. Special attention will be directed to technical and art education, to the results of industrial teaching, and to the introduction of manual and handicraft work into schools.

— The members of the polar meteorological station which Denmark maintained at Godthaab in Greenland have just returned to Copenhagen. According to *Nature*, the chief of the expedition, Lieut. A. Paulsen, reports, that, having left Copenhagen on May 18, 1882, in the sailing-ship Ceres, they arrived at Godthaab on June 14. On the voyage out, observations of the temperature of the sea and air were made every hour. On the arrival out, the expedition had to select the most suitable spot for the erection of the four wooden buildings brought with them, in which the magnetic and astronomical observations were to be made. A small mountain ridge near the church in the colony was chosen for this, as the preliminary researches in its neighborhood showed that the influence of iron strata on the magnetic current was here very small. The buildings were then erected, and the pillars raised on which the transit instrument, the great astronomical clock, and the eight different magnetical instruments, were mounted, and simultaneously the instruments for the meteorological observations were also placed; so that the weathercock and the anemometers, as well as the thermometer hut, were situated as free as possible. On Aug. 1 the meteorological observations could be commenced, but the magnetic ones were through an accident delayed until the 7th. From that date complete observations were made in exact accordance with the international programme, without interruption, every hour until Aug. 31 this year; and the expedition has thereby fully accomplished its object, viz., of obtaining a full year's magnetical and meteorological observations in this locality. A number of other scientific researches have also been pursued, of which those on the aurora borealis should particularly be mentioned. This phenomenon was frequently observed and studied during the winter, while some exceedingly valuable statistics were obtained as to the altitude of the aurora borealis above the earth's surface by measurements effected simultaneously in various places by light-signals. The measurements of atmospheric electricity have also led to valuable results. It is stated to have been the best equipped polar expedition ever despatched from Denmark.

— M. Langier, at a meeting of the Académie des sciences held on Oct. 22, described a method of disinfecting plants for exportation, practised by himself and Dr. Koenig at Nice. Some branches of vine infected with phylloxera were treated with a solution of sulphocarbonate of ethyl, the eggs and phylloxera being completely destroyed. The plants submitted to the trial do not seem in general to have suffered from it. For the first trials in disinfecting leaves and twigs, gaseous hydrocyanic acid was used, as proposed by Dr. Koenig; and for the roots and surrounding earth, sulphocarbonate of potassium in weak solution. Their experiments, they believe, will be of great service to the flower-cultivators of the Riviera.

— The distinguished French geodesist, M. Antoine d'Abbadie, writes to the editor of *Nature*, regarding units of angular measure, as follows: —

> "We probably owe our degrees either to the earlier supposed year of 360 days, or to the fact that this number has many divisors, although such divisors afford no practical advantage. When trigonometrical functions were subsequently discovered, it was found that the natural unit is not the circle, but the quadrant or right angle. Our system of numeration being decimal, it was then most convenient to divide the quadrant decimally; and the circle is thus considered as composed of four, forty, four hundred, etc., parts, according to the degree of exactness required. This was proposed by Briggs when preparing his logarithms, which are based on decimals; but unfortunately it was then set aside. Revived a long time after by Lagrange, it was acted upon by Laplace in his Mécanique celeste. Nowadays decimal divisions of the quadrant are the only ones used by French geodesists. . . . In Italy two geodesists were instructed to observe and calculate, in both the centesimal and the sexagesimal systems, the same large lot of angles. It was then found that the use of decimals gave a saving of two-sevenths of time, either in observation or in calculation. This result was unknown to Sir George Airy; but he judged rightly that the conversion of all sexagesimal angles into decimal ones would materially lighten his labors, and he actually did so when calculating all the lunar observations previously made at Greenwich."

— Prof. H. G. Van de Sande Bakhuyzen, the director of the observatory at Leiden, announces the completion of a new catalogue of star-places (began by Hoek, and continued by Dr. Kam, and contained in the first sixty-six volumes of the *Astronomische nachrichten*). The catalogue will contain nearly five thousand stars, reduced to the epoch 1855.0, with the data pertaining to the observations, and the usual elements for carrying forward the star positions.

— The last expedition of Lessar toward the Oxus was attended with severe hardships. He lost nearly all his animals; and to save his famished escort, almost destitute of water and provisions in the desert, he was obliged to seek assistance from the Khivans. Worn with three years painful and continual exploration, the explorer thinks of returning to Europe.