substance of the composition CH_2N_2O is produced, which explodes below the temperature of boiling water. An account of the work is contributed to the current *Berichte*.

A NEW mode of preparing methylamine and ethylamine, based upon the reduction of the remarkable ammoniacal compounds of formaldehyde and acetaldehyde, is described by MM. Trillat and Fayollat in the current issue of the *Bulletin de la Société Chimique*. When aqueous solutions of formaldehyde and ammonia are mixed, a vigorous reaction occurs with considerable rise of temperature, and the evaporated liquid deposits hexagonal needles of the ammoniacal compound, the composition of which has been given by several chemists as $N_4(CH_2)_6$. It is now shown that the reaction can be much more simply explained in the light of the behaviour of the compound upon reduction, by accepting the simpler formula $N_2(CH_2)_3$. By the direct union of equal molecules of formaldehyde and ammonia, the substance $CH_2 : NH$, methylene imide, is supposed to be produced, two molecules of which then combine with another molecule of formaldehyde to produce the compound in question $CH_2\begin{cases}N : CH_2\\N : CH_2\end{cases}$ with elimination of a molecule of water. This substance is rapidly broken up upon treatment with zinc dust and hydrochloric acid, and subsequent addition of caustic alkali, with liberation of methylamine. It is probable that four atoms of hydrogen are taken up during the reduction, thus fully saturating the molecule and forming the compound $CH_2\begin{cases}NH \cdot CH_3\\NH \cdot CH_3\end{cases}$; this latter substance then becomes converted into formaldehyde and methylamine by assimilation of water during the saponification with alkali. In order to prepare methylamine it is unnecessary to isolate the ammoniacal compound; formaldehyde and ammonia are simply mixed and immediately treated with zinc dust and dilute hydrochloric acid. The liquid is then saturated with caustic alkali, and the methylamine, together with excess of ammonia, expelled by a current of steam and received in dilute hydrochloric acid. Upon evaporation of the acid solution, a mixture of sal-ammoniac and methylamine hydrochloride is left, and the latter may readily be extracted by absolute alcohol. A second distillation of the methylamine hydrochloride with caustic alkali yields pure methylamine. Ethylamine may be similarly prepared by reduction and saponification of the well-known compound of acetaldehyde and ammonia.

THE additions to the Zoological Society's Gardens during the past week include a Himalayan Monkey (*Macacus assamensis*, ♀) from Sikhim, presented by Capt. Edmund A. Grubbe; a Bonnet Monkey (*Macacus sinicus*, ♀) from India, presented by the Rev. Thomas Rickards; two Japanese Pheasants (*Phasianus versicolor*, ♂ ♀) from Japan, presented by Mr. W. Rudge Rootes; two Spanish Terrapins (*Clemmys leprosa*) from Melilla, North Africa, presented by Mr. Bennet Burleigh; a Dwarf Chameleon (*Chamæleon pumilus*) from South Africa, presented by Mr. E. Wingate; five Gigantic Salamanders (*Megalabatrachus maximus*) from Japan, deposited; a Cuvier's Podargus (*Podargus cuvieri*) from Australia, purchased.

OUR ASTRONOMICAL COLUMN.

REPORT OF THE WOLSINGHAM OBSERVATORY.—The Rev. T. E. Espin is to be congratulated upon the large amount of good work he is carrying on at the Wolsingham Observatory. The system he adopts of sending out circulars announcing any new or strange phenomenon observed by him, is one that could be followed with advantage in many other observatories, for astronomers thus have their attention drawn to interesting objects that they might otherwise have overlooked. We have noted the contents of these circulars from time to time, and the report that has just been issued sums up the work done in 1893. Sweeps for stars with remarkable spectra were made on fifty-three nights during the year. The total number of stars detected was 578, of which 489 were found to be new to Argelander's Chart. A thorough examination was made of the Red Region in Cygnus, and several new objects detected. Many nebulous objects were also met with, fifteen of which are not contained in the New General Catalogue. The Compton 8-inch photographic telescope was used during the year for photographing stars suspected of variation. The variability of four stars was confirmed, and three new variables were detected. Mr. Espin points out that it is much to be desired that the Compton instrument should be mounted separately, so that the large telescope could be devoted exclusively to spectroscopic work. During the latter part of the year photographic work was almost entirely discontinued, on account of the necessity of using the large telescope for spectroscopic observations. Early in last year the Observatory sustained a severe loss in the sudden death of Miss Brook, who equipped the Observatory with meteorological instruments, and generously defrayed all the incidental expenses. We hope a new benefactor will soon spring up and supply the much-needed mounting for the photographic telescope.

ANOMALOUS APPEARANCE OF JUPITER'S FIRST SATELLITE.—It will be remembered that in September 1890, Profs. Burnham and Barnard saw the first satellite of Jupiter, with the 12-inch telescope of the Lick Observatory, crossing the disc of the planet as a small dark double spot like a close double star (*Astr. Nach.* No. 2995). Various suggestions were made to account for this anamalous appearance, and it was even supposed for a time that the satellite was actually duplex. The explanation that found greatest favour in the eyes of astronomers, however, was that there was a permanent bright belt around the satellite, approximately parallel to Jupiter's belts, while the poles of this "Galilean star" are of a dusky hue. A repetition of the phenomenon was observed by Prof. Barnard, on September 25 of last year, with the 36-inch Lick telescope (*Astr. Nach.* No. 3206). The observations show that beyond doubt the second explanation is the true one. The satellite apparently rotates on an axis nearly perpendicular to the plane of its orbit. When it is over a portion of the Jovian disc as dark as its own polar regions, it appears more or less elongated, and parallel to the belts of Jupiter. But when it is projected on a brighter region it appears double, with the components in a line nearly vertical to Jupiter's equator, the dusky polar regions alone being visible. The smaller size of the southern component is very probably a perspective effect produced by a tilt towards Jupiter of the satellite's south pole.

ASTRONOMY AND ASTRO-PHYSICS.—The January number of *Astronomy and Astro-Physics* maintains the high reputation of that journal. Prof. W. H. Pickering describes a number of different telescope mountings in use in England and France, and compares them with some of those employed on the other side of the Atlantic. The history and work of the National Argentine Observatory forms the subject of a paper by Mr. J. M. Thorne, the director. The immense number of observations made in that Observatory testifies to the zeal of the astronomers as well as to the generally cloudless sky of Cordoba. Prof. S. W. Burnham gives a descriptive list of so-called double stars, of which the change of position is the result of proper motion. An important paper is contributed by Prof. F. H. Bigelow on the polar radiation from the sun, and its influence in forming the high and low atmospheric pressures of the United States. Prof. E. C. Pickering gives a brief account of the new star that appeared in the constellation Norma last summer, and was discovered by Mrs. Fleming on October 26, while examining a photograph of the spectra of the stars in its vicinity. An excellent plate accompanies the account, showing that the spectra of Nova Aurigæ and Nova Normæ were exactly alike, line for line. Among other articles of interest is one on Prof. Langley's recent progress in bolometer work at the Smithsonian Astro-Physical Observatory, and another on the object-glass grating, by Mr. L. E. Jewell. In the latter paper it is proposed to construct a photographic object-glass grating for use instead of the object-glass prism in obtaining photographs of stellar spectra. The plan suggested is to photograph a series of images of a long narrow slit. This

can be done by having a slit and photographic lens fixed and placing the sensitised plate upon the carriage of a dividing engine. The plate is moved along with the carriage, and when it has been exposed to the slit a desired number of times it is developed and fixed, the result being a photographic grating.

GEOGRAPHICAL NOTES.

A TELEGRAM from Zanzibar, dated January 16, states that over a hundred deserters from Mr. Astor Chanler's expedition had reached the coast and reported that he was left with only eighteen men at Daicho. It has already been mentioned (NATURE, vol. xlix. p. 112) that the expedition was deprived of Lieutenant von Höhnel's services, by an accident. We trust that Mr. Chanler may be able to reorganise his expedition, and push into the unknown country on the borders of which he has been so long detained.

THE *Times* correspondent at St. Petersburg states that Mr. F. G. Jackson, after testing his sledges and other appliances in the neighbourhood of the Yugor Strait, is returning to England *via* Lapland, and that he has not been in the Yalmal peninsula. The proposed North Polar expedition *via* Franz Josef Land, will be, if it starts, as is expected, this year, the fourth in the field. The others are the private American expedition under Mr. Peary, working from the north of Greenland; the private Norwegian expedition of Mr. Ekroll, which left the north coast of Spitzbergen in summer, relying on a new convertible sledge-boat; and Dr. Nansen's expedition, drifting northward from the neighbourhood of the New Siberian Islands.

THE death is announced, on January 20, of General Sir C. P. Beauchamp Walker, the Foreign Secretary of the Royal Geographical Society.

THE memory of Prince Henry the Navigator, to whose persistent efforts the modern revival of oceanic exploration was mainly due, is to be honoured by the celebration of the 500th anniversary of his birth, in March, with great festivities at Oporto. The proceedings will to a certain extent resemble the Columbus celebration recently held in Spain. The event they are to commemorate was even more important, since the Portuguese explorers, as a direct consequence of the encouragement of the half-English prince, discovered the ocean-road to India, and incidentally the coast of South America also, independently of the Spanish voyagers who followed in Columbus' track.

SEVERAL recent experiments on oceanic currents by means of floats have been noticed in the newspapers within the last fortnight. Mr. J. E. Muddock states in the *Times* that a corked soda-water bottle containing an addressed slip of paper which was thrown overboard by him off the entrance to the Strait of Belleisle, on July 12, 1892, was picked up on November 28, 1893, on the Norwegian coast near Kvarno, in latitude 61°.4′ N. The bottle was launched farther north than any of those placed in the water by the Prince of Monaco, but there is no clue to its course beyond that of the time elapsing before it was found, 485 days. Mr. Muddock assumes that the drift was 4000 miles, but the direct distance by sea is only 2500 miles, although it is probable that the bottle drifted south in the Labrador current before turning north-eastward with the Gulf Stream. Mr. Ballingall, of Largo, writes to the *Scotsman* that he launched a cork-covered bottle at Largo, on the Firth of Forth, on November 22, which was picked up at Akre, on the Norwegian coast (lat. 59° 19′), 460 miles distant, on December 29. Being only thirty-seven days in the water, the bottle must have drifted at the rate of not less than twelve miles a day. The bottle probably floated high and was helped by westerly winds; but in any case the rate of movement is rapid, and if the direction of the current was that usually assumed, first southward, then east, and finally north, the velocity is very remarkable.

EARTH MOVEMENTS.

EVERY year, every day, and possibly every hour, the physicist and observer of nature discovers something which attracts attention, causes wonder, and affords material for discussion At one moment we are invited to see solidified air, at another to listen to telephonic messages that are being transmitted without a wire, or to pause with astonishment before a pen which is producing a fac-simile of the writing, the sketches, and the erasures of a person who may be in a distant city. Not a day passes without a new creation or discovery, and novelties for our edification and instruction are brought to our notice at the meetings of societies and conventions which from time to time are held in various parts of the world. At the last meeting of the British Association, held in Nottingham, the attention of members was called to the reports of two committees summarising a series of facts which seem destined to open a new field in the science which treats of movements in the crust of our earth. For thirteen years one of these committees has devoted its attention to the volcanic and seismic phenomena of Japan, with the result that our knowledge of these subjects has been considerably extended. Now we observe that earthquakes, which are referred to as catastrophes in the processes of mountain formation and the elevation or depression along our coast-lines, are spoken of as "vulgar disturbances" which interfere with the observation of certain earth movements which are probably as common to England as they are to Japan.

Earthquake observations, although still capable of yielding much that is new, are for the present relegated to a subordinate position, while the study of a tide-like movement of the surface of our earth, which has been observed in Germany and Japan, earth tremors, and a variety of other movements, which we are assured are continually happening beneath our feet, are to take their place. Only in a few countries do earthquakes occur with sufficient frequency to make them worthy of serious attention. The new movements to which we are introduced are occurring at all times and in all countries, and we are asked to picture our continents as surfaces with a configuration that is always changing. We are told that every twenty-four hours the ground on which we live is gently tilted, so that the buildings in our cities, and the tall chimneys in our manufacturing towns, are slightly inclined like stalks of corn bent over by a steady breeze. The greatest tilting takes place during the night; in the morning all return to the vertical.

Why such a movement should exist, we are not told. All that we hear, is that it is too large for a terrain tide produced by lunar attraction. In Japan it appears possible that it may prove to be a concertina-like opening and shutting of the crumpled strata forming a range of mountains. To determine whether this intermittent puckering of strata, which would mean a daily increase and decrease in the height of mountains, explains the variability in the level of districts where observations have been made, is a matter for future investigation.

A problem which suggests itself in connection with this novel work will be to determine the limiting change in inclination, which we will assume means rock-bending, that culminates in sudden fracture and a jar, causing an earthquake.

Earthquake prophets up to the present appear to have lived upon the reputation of a few correct guesses, the non-occurrence of which would have been contrary to the laws of chance. As observation has shown us that a very large proportion of our earthquakes, like those which occur in the Himalayas and the Alps, and even those which occur in volcanic Japan, are produced by faulting or sudden breakages in crumpling strata, rather than by explosions at volcanic foci, it would seem that a study of the bending which leads to fracture would be a legitimate method to approach the vexed question of earthquake prediction.

Another class of movements to which our attention is called are our old acquaintances, the microseismic or tremor storms, which are now defined as long flat waves which give to the surface of our earth a movement not unlike the swell we so often see upon an ocean. Such disturbances are particularly noticeable whenever a district is crossed by a steep barometrical gradient. It is not unlikely that these movements, which are appreciable at considerable depths, have an effect upon the escape of fire-damp at our collieries, that they may influence the accuracy of delicate weighing operations—as, for example, during the determination of standard weights—that they may interfere with gravitational observations, and that they are a neglected source of error in certain classes of astronomical work. Our attention is next directed to the bending effect produced in certain districts by the rise and fall of the barometer, certain areas under variations in atmospheric pressure behaving as if they were the vacuum chambers of an aneroid.

Then there are the earthquakes of comparatively restful countries like our own. A large fault, by which mountains are suddenly lowered and valleys compressed, takes place in a distant country