

There is a clear passage into the polar area, and probably up to and beyond the pole; and within this area there is a continual diminution of bulk of the entering water as it becomes cooled, as well as a continual subsidence of the surface water, producing a partial depression to be constantly filled by water from the south. Experiment proves that if at one end of a vessel of warm water ice is applied at the surface, the cooled water instantly sinks, and its place is taken, not by water rising upwards from below, but by a horizontal movement of the surface gradually propagated to the other end of the vessel, while the descending cold water creeps along the bottom, and gradually acquiring a higher temperature, rises and completes the circuit. It is somewhat difficult to conceive, theoretically, how such a circulation can commence, because the cooled atoms of water must displace others before they can descend, and these again must displace others, and so on over the whole mass. The amount of energy due to the superior weight of the first-cooled atoms may appear inadequate to perform so much work, but nevertheless circulation does commence and indefinitely continues so long as a difference of temperature of the two ends of the vessel is kept up. The extreme mobility of the particles of water, and the almost total absence of friction between them, seems to be influential in producing this result; and it is not probable that any minute difference of level that may be caused on the surface of the water by difference of temperature has anything to do with the motion; and I cannot help thinking that the supposed six-feet incline from the equator to lat. 60° is, if it exists, by no means an effective cause of the oceanic circulation.

ALFRED R. WALLACE

I THINK the root of Mr. Croll's difficulty (see NATURE, p. 324) is to be found in his overlooking the possibility of energy becoming potential in the distribution of oceanic water.

Water running in any direction in the northern hemisphere tends to swerve to its own right, and if this tendency is checked (as it is in fact by the presence of continents) its layers of equal density will be tilted up on the right, the limit of tilt being the angle whose tangent is the quotient of the tendency to swerve by the force of gravity. This consideration is, I think, sufficient to deprive Mr. Croll's argument of one of the two legs on which it stood.

Mr. Ferrel's argument from the tides is quite conclusive in showing that the forces arising from difference of temperature are of sufficient magnitude to keep up an oceanic circulation. Thus the other leg of Mr. Croll's argument is gone.

Mr. Croll may well retract his previous assertion that the difference of kinetic energy is consumed in friction, for he was in a fair way to bring the earth to a standstill.

Brighton, August 20

J. D. EVERETT

Spectrum of Aurora

A FINE aurora was seen at Bedford on Thursday night between midnight and one o'clock. It was brightest under the Polar Star near the horizon, where the colour was a pale green; whilst overhead the hue often changed to a rosy red. On directing a spectroscope at the most brilliant part, a bright green line (W.L. 557) was very distinct, and two or three faint nebulous bands more refrangible were visible; but the red line was not to be seen, though carefully looked for on the rosy parts of the aurora. Objects around were faintly illuminated as if by a young moon. At one time two very faint pale green streamers were seen stretching from the north to a little east of the zenith.

Blackheath, August 11

J. P. MACLEAR

The Method of Least Squares

As the wording of Prof. Hall's letter in NATURE for July 25 might imply that he was calling attention to evidence that would change the opinion expressed in my letter, it seems to me worth while to state that at the time of writing that letter I was acquainted with the passages in question, and to repeat my assertion that with reference to the *method of least squares* I should not regard the neglect of Lagrange's memoir as an omission. Also in spite of Encke's and Prof. Hall's remarks, I think it has received as much attention as, viewed practically, its importance entitled it to.

With regard to the principle of the Arithmetic Mean, I may add that I have devoted the greater part of a tolerably long memoir to its consideration, and feel sure that no remarks on the subject contained in a few lines could be rendered even intelligible.

J. W. L. GLAISHER

Blackheath, August 11

NOTES

WE are informed that M. Faye will in all probability be M. Delaunay's successor as Director of the Observatory at Paris. In the meantime M. Matthieu supplies his place *pro tem*.

THE French Academy has elected two foreign correspondents in the section of botany—M. Planchon in the place of M. Lecoq, and M. Weddel in the place of Prof. Mohl.

THE American Association for the Advancement of Science was to commence its sittings yesterday at Dubuque, Iowa. Prof. J. Lawrence Smith, of Louisville, had been elected President, and Prof. Alexander Winchell, of Ann Arbor, Vice-President. It was announced that the citizens of Dubuque had determined that all members attending the meeting should be entertained at their private residences free of charge during the session; and their travelling expenses would also probably be remitted by the various railroad and steamboat lines. A very successful meeting was anticipated.

At the recent combined First B.A., First B.Sc., and Preliminary Scientific (M.B.) Examinations of the University of London, Mr. J. M. Lightwood, of Trinity Hall, Cambridge, obtained the Exhibition in Mathematics and Philology; Mr. R. E. Carrington, of Guy's Hospital, the Exhibitions in Chemistry and in Zoology; and Mr. J. C. Saunders, of Downing College, Cambridge, the Exhibition in Botany.

WE regret to announce the death of Mr. Frederick Carpenter Skey, C.B., F.R.S., which took place on Thursday last at his residence, Mount Street, Grosvenor Square. Mr. Skey was in his 73rd year. He was in early life a pupil of the celebrated Dr. Abernethy, to whom he was articled in 1816 by the Royal College of Surgeons. About 1826 he was appointed Demonstrator of Anatomy at St. Bartholomew's Hospital. Subsequently he founded the Aldersgate School of Medicine, which became one of the largest in London. From that time to his death Mr. Skey enjoyed the reputation of being in the first rank of London surgeons. His writings on medical subjects were numerous and important, and on subjects connected with sanitary science his communications to the public journals were frequent.

THE following is the list of candidates who have been successful in obtaining Royal exhibitions of 50*l*. per annum each for three years in the Science and Art Department, and free admission to the course of instruction at the following institutions:—To the Royal School of Mines, Jermyn Street—William Carter, Ambrose R. Willis, and Alexander Gibson. To the Royal College of Science, Dublin—Arthur G. Meeze, Denis Coyle, and Ernest H. Cook.

A NATURAL History Society has been formed at Madrid called "La Sociedad Española de Historia Natural," under the presidency of Don Miguel Colmeiro. The first part of its publication has reached this country, and contains the regulations of the Society, an account of the meetings held by it up to this time, and papers by Poey on Ichthyology, by Colmeiro on the Fumitories of Spain and Portugal, by Espada on the Volcano of Ansango, by Solano on a Meteoric Stone, by Espada on New America Batrachians, and by Perez Arcas on New Reptiles and Insects of the Spanish Fauna. It is extremely well printed, and is illustrated by three capital plates. The subscription to the