Assuming this law, and supposing the relative humidity constant, we can calculate the temperature corresponding to any given pressure, and then find the corresponding vapour-tension by reference to the table. By trying this for each separate inch of pressure from 30 inches down to 0, and calculating the vapour-tension in each inch, I find (on a rough approximation) that the average proportion of the vapour-tension to the dry-air pressure will not exceed one-half of that which we find at the earth's surface. Thus, when the vapour-tension at the earth's surface is half an inch in 30 inches, or $\frac{1}{60}$, the average vapour-tension throughout the aërial column does not exceed $\frac{1}{120}$ of the whole; and when we calculate the weight of the superincumbent vapour, we must further allow for its smaller specific gravity. Making this correction, I believe that when the tension of vapour at sea-level is half an inch, the real weight of the superincumbent vapour-column seldom exceeds that of one-sixth of an inch of mercury. The proportions of course are not fixed. Those which I take from Herschel answer best for a temperature at the earth's surface of about 65° F., or 18° C.

I intend to apply these observations chiefly to the explanation of the annual and diurnal variations of the barometer by the greater or less amount of aqueous vapour in the air. It is supposed, for example, that when the vapour-tension at the earth's surface is an inch, about $\frac{1}{30}$ of the whole air-column consists of vapour. This displaces an equal bulk of air, and thus the column is lighter than a dry-air column of the same height and temperature by the difference in weight of the air and vapour occupying this space, *i.e.* about $\frac{3}{8}$ of an inch, or $\frac{1}{80}$ of the whole. But if my computation is correct, the diminution of weight owing to this cause would only be $\frac{3}{10}$ of an inch, or $\frac{1}{100}$ of the whole. Taking the standard pressure at 30 inches, this would only account for a diminution of 0·187 of an inch when the air from being absolutely dry changed to one inch of vapour-tension. In this country we never experience absolute dryness, and we seldom if ever experience so much as an inch of vapour-tension at the surface. Yet the annual variations of the barometer exceed 0·187 of an inch. Looking, for example, at the table for Greenwich Observatory at the end of Herschel's work, I find the mean monthly pressure varying between 29·923 and 29·602 inches, a difference of 0·321 inches; while the monthly means of vapour-tension vary between 0·466 and 0·195, a difference of 0·271; which, as I have endeavoured to prove, would only account for a change of 0·051 in the mean pressure. The diurnal maxima and minima at the same place exhibit a difference of 0·018, the vapour-tension giving 0·042, which only accounts for about 0·008.

The same thing is more evident in other places. At Madrid for example, the monthly barometric averages vary between 28·003 and 27·701, a difference of 0·302, while the vapour-tension varies between 0·236 and 0·076, a difference of 0·160. At Longwood, St. Helena, the diurnal variation of the barometer gives a mean of 0·067, while that of the vapour-tension is only 0·030. This would only account for a change of 0·006, or less than $\frac{1}{10}$ of the actual change. At Bombay the diurnal variation of the barometer amounts to 0·102 inches, while the corresponding variation of vapour-tension is only 0·004. This would not account for one hundredth part of the change.

The same result is confirmed by taking another view. It is pretty evident that in a country of any considerable extent the diurnal oscillation of the barometer (which is often nearly double the diurnal variation), if produced by changes of vapour-tension, must always be less than the mean diurnal rainfall and dew-fall, since rain often falls at hours when the barometer is on its diurnal descent. Now in this country the mean diurnal rainfall does not exceed $\frac{1}{15}$ of an inch, corresponding in weight to $\frac{1}{200}$ of an inch of mercury. Supposing all this to fall during the hours when the mean barometric pressure is increasing, the subtraction of that amount of aqueous vapour from the column, and the replacing of it by air, would not nearly account for the observed diurnal oscillations.

I therefore conclude that the annual and diurnal variations of the barometer are not due to changes in the amount of vapour present in the aërial column. Indeed it does not seem certain that the vapour displaces air at all. It may simply permeate that column without displacing any of it, and thus add to the weight of it. Again, if it displaced air, condensation or the formation of dense clouds ought always to be attended with a rise in the barometer, since air would rush in to fill up the space which the vapour vacated on condensing. This does not seem to be the case.

W. H. S. MONCK

THE ROYAL SOCIETY OF VICTORIA

WE owe an apology to our scientific friends at the Antipodes for having allowed the president's address, delivered last July, to have remained so long unnoticed. Mr. Ellery, after noticing the most important papers that had been read during the past two sessions (for no address was delivered in 1870 in consequence of alterations being made in the Society's buildings), including eight on physical science, seven on geology, mineralogy, and palæontology, one on natural history, three on medical science, one on social science, and four on arts and manufactures, expresses his regret that the state of their finances has for a time caused a stoppage in the printing of their Transactions which were commenced in 1868. He then proceeds to notice the present state of the chief scientific establishments in Victoria. "Botanical knowledge," he observes, "is largely indebted to the labours of our member, Dr. Von Müller, the head of the botanical department of Victoria. One of the prominent results of Dr. Müller's investigations is the publication of the *Universal Flora of Australia* (under the editorship of Mr. Bentham), to which Dr. Müller is the principal contributor; the fifth volume has, by this time, passed the press in London. This work, when completed, will be the only one extant that deals universally with the flora of a large division of the earth's surface. It will form a permanent basis of all future research with respect to the adaptability of Australian plants to medicine, the arts, or other useful purposes. You will be glad to learn that Dr. Müller is about to establish a permanent phytological collection in our new industrial museum, which will comprise objects illustrative of our natural resources in the vegetable kingdom, and of materials used in the industries obtained from plants in this country as well as other parts of the globe. Such a collection properly arranged and accessible to the public will undoubtedly prove a valuable and instructive addition to the industrial museum, more especially if at the same time Dr. Müller fulfils a project he has in contemplation of publishing in a popular form a volume on the culture of utilitarian plants in the colony not indigenous to it, as well as of plants likely to add to the resources of countries lying under similar latitudes to our own. The preservation and perpetuation of our more extensive forests has already become a question of serious import. A few years ago we thought our forests inexhaustible; but already the bad effects of the indiscriminate stripping of our mountain ranges are becoming visible. The immense and increasing draft on our forests for fuel and other purposes has already denuded the land in the vicinity of towns and other centres of population of its former covering of timber. This, unless replaced by artificial planting, will eventually leave our hills bare, and in all probability the climate will suffer in proportion. Dr. Müller, in introducing and rearing very large numbers of forest trees that will be useful in themselves for the wood and bark, has exercised a wise forethought, of which the colony will reap the fruit in years to come, when the corks, oaks, hickories, red cedars, and firs, shall have in part replaced our eucalypti, mimosæ, and other far less useful trees."

"Our observatory," he adds, "has been engaged with its usual work in astronomy, meteorology, terrestrial magnetism, and general physics. Considerable progress has been made in the Melbourne portion of the survey of the southern heavens; the sky lying between the 60th and 52nd parallels of declination has been carefully surveyed, and the positions of 38,305 stars established and catalogued, of which 29,633 have been reduced to the epoch agreed upon, namely, 1875, and their positions at that date computed. Our staff of self-registering meteorological instruments may now be considered complete, and consist of three magnetographs (that is for declination, dip, and horizontal intensity), a thermograph, a barograph, electrograph, and anemograph. With these instruments a continuous and unceasing record is obtained by the aid of photography of all the variations in the force and direction of the earth's magnetism, of the temperature of the air, and of evaporation, of the state and variations of the pressure of the air, atmospheric electricity, as well as of the direction, changes, and force of the wind."

The great Melbourne telescope, which, when the address was delivered, had been fairly at work for ten months, is then considered, and Mr. Ellery observes that while the Society is disappointed in not getting, as it was hoped, the best telescope in the world, the members may feel satisfied that they have obtained an instrument that, "if it does not exceed, quite equals every other of its sort that has been yet made."

The progress of the survey is then noticed at considerable length. "The coast line from the boundary of South Australia

to Lake Howe has been carefully measured, and, with the exception of the north-west portion of the colony, nearly every district has been emmeshed by the geodetic surveyors. The most important operation of late has been the determination of the termini of the boundary between New South Wales and Victoria." It is much to be regretted that the late retrenchments in the public expenditure have materially interfered with the progress of the survey.

After a few remarks on the commercial importance of local industries, especially the preservation of meat, the president referred to our vastly increased knowledge of the sun since the date of the eclipse of May 1869, to the nature of the sun's spots, and to the connection of the latter with the occurrence of magnificent auroras and magnetic storms, and to the spectrum of auroral light. "During the most brilliant display in April last, I was able," he observes, "to obtain a very bright spectrum of the light with a micro-spectroscope. Unfortunately the dispersion was small, but the light was so intense as to admit of a very narrow slit. The spectrum obtained from the red streamers consisted of a strong red band or line (which I estimated was rather more refrangible than C line), and bands in the green, which I believe to be the same as described by Angström. The spectrum of the green light which formed the lower arch of the aurora, however, contained no red band, and the appearance of it, as the spectroscope was passed up and down, so as to receive the light from the streamers or green arch, was very marked indeed. I am not aware of this red band or line having been noticed by any previous observers; and had it not been so clear and prominent, far brighter than the green ones—and had I not proved that it belonged to the red streamers, and not to any other, of the auroral light, by the method referred to—I might have been doubtful as to the real existence of a line not hitherto noted in the spectra of aurora." The address concludes with a few observations regarding the possibility of our ever being able to ascertain the laws which govern the weather so as to predict with certainty the atmospheric condition of to-morrow. On this point Mr. Ellery does not express himself very hopefully, but he thinks that the greater climatal events, such as dry or wet, hot or cold, seasons may be traced to varying conditions in the sun itself, and will be found to be extraneous to our globe.

G. E. D.

SCIENTIFIC SERIALS

THE *Journal of the Royal Geological Society of Ireland*, vol. xii. Part 3 (vol. ii. Part 3, new series), containing the Proceedings of the Society for the session 1869-70, has just been published. It contains among other memoirs, Prof. Traquair on *Griffithides mucronatus* (M'Coy) Plate xvi., and on *Calamoichthys calabaricus*. Rev. J. D. La Touche on Spheroidal Structure in Silurian Rocks, Plates xvii.-xx. Rev. M. Close on some Corries and their Rock Basins in Kerry, Plate xxi. Edward Hull on the Geological Age of the Ballycastle Coal-field, and its Relations to the Carboniferous Rocks of the West of Scotland, Plate xxiii. W. H. Baily on the Fossils of the Ballycastle Coal-field, Co. Antrim.

Zeitschrift für Ethnologie, 1870, Hefts 3, 4.—A paper by Bastian on the legend of the Amazons, is full of valuable information, but is written with less skill than learning. The footnotes make more than three-fourths of the whole, and the parentheses nearly half of the rest.—Hensel contributes a description of two skulls of Coroado Indians (Brazil) with figures. He agrees with many of our best ethnologists that the dimensions of the cranium afford us no safe ground for making racial or specific distinctions. On the other hand, he regards the structure of the facial bones as of great importance from this point of view.—R. Hartmann continues his studies on domestic animals by an account of the reindeer in its present condition, followed by an interesting discussion on the evidence of its domestication in prehistoric times. This number also contains a short archæological account of the Uglei See (one of the numerous lakes in the east of Holstein, situated in an enclave belonging to Oldenburg), by E. Friedel.—The last number of the same journal (1870, 4) is almost entirely devoted to American Ethnology. Prof. Strobel concludes his contributions to comparative ethnology by an account of the weapons and food of the South American Indians; Dr. Fonck has a paper on the Indians of Southern Chili; Ernst of Carácas one on the Natives of the Peninsula of Goajiro, which forms the western boundary of the entrance to the gulf and bay of Maracaybo, in Columbia; and Erman contributes an account (with a map) of the various races inhabiting what was until lately Russian America, the Aleutian Isles, and the opposite coast of N.E. Asia; he divides them into two great groups according to their system of numeration.

IN the *Journal of the Ethnological Society of London* (October 1870) is an interesting paper by Mr. David Forbes "On the Aymara Indians of the Peruvian highlands." Very full information as to their physical structure is given, together with *exact measurements*. Beside their short stature and capacious thorax (which seems to be constantly fixed in the condition of inspiration) Mr. Forbes's statistics show that the thigh is shorter than the leg, and that the heel is as much shorter than a European's as a Negro's is longer. The half-castes between these Indians and the white population are not believed by the author to be prolific, so that, as in the case of mulattos, the intermediate race would soon die out if not continually recruited by new accessions. Among many interesting details on the food of the Aymaras—especially their method of preparing potato so as to keep it from rotting—on their disposition and habits, their implements, and their language, perhaps the most remarkable is an account of a silver statuette (figured in pl. xx.) of a man in a strange headdress, who holds in one hand a mask, which he has apparently taken off in order to look through an instrument like a telescope. This tube he holds to his left eye (without shutting the other) and directs it upwards. Mr. Forbes believes this to be a unique specimen.

THE last part (Band vii. Heft 1) of the *Zeitschrift für Biologie* contains: 1. The results of an elaborate series of experiments by Gustave Meyer of Oldenburg on the effects of feeding dogs and man on bread alone, and bread mingled with meat and other articles of diet. He shows what indeed has long been known, that to feed either animals or man on bread alone is a great waste of material, and that immense quantities must be given in order that the body should lose no flesh, whilst on the other hand the addition of some, even though a small quantity, of meat is economical. He demonstrates that the tissues of the body become more watery with insufficient food, which renders the whole organism less capable of resisting injurious influences. In his experiments on man he endeavoured to ascertain which of the several kinds of bread in ordinary use (white bread, rye bread, black bread) was absorbed in greatest amount during its passage through the alimentary canal, and found that white wheaten bread occupies the first place, then leavened rye bread, then the bread (rye) prepared by the Horsford-Liebig process, and lastly the Pumpernickel (North German black bread). Nevertheless, the first is not so satisfying to the feeling of hunger as the three latter, and is more expensive in every point of view. He denies the great nutritious value often attributed to bran, since the nitrogenous compounds it contains are mingled with much non-assimilable matter, but admits that if these could be extracted and were then returned to the flour, the best results would be obtained, as the meal already contains abundance of salts. 2. A paper by MM. Ernst Schulze and Max Märcker on the determination of Nitrogen in the Urine of the Ruminants. 3. A paper by Dr. J. Bauer on the Metamorphosis of tissue in poisoning with Phosphorus; and lastly a short paper by Max von Pettenkofer on Typhus and Cholera as connected with the basal water line in Zurich.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, April 6.—Prof. Frankland, F.R.S., president, in the chair. The president, occupying the chair the first time since his election, returned his thanks to the Society for the honour conferred upon him, and expressed his readiness to discharge the duties of his office to the best of his abilities. The following gentlemen were elected fellows:—F. Coles, C. E. Groves, E. W. T. Jones, L. T. MacEwan, and J. L. Shuter. The following papers were read: "On Burnt Iron and Burnt Steel," by W. Mattieu Williams. Iron, which has been damaged by reheating, or excessively heated and exposed after balling in the puddling furnace, is designated "burnt iron" by the workmen. It is remarkable that no amount of heat applied to the iron in the blast furnace or in the early stages of the puddling process produces burnt iron. Burnt iron is brittle, its fracture is