Moon (at Full) rises, 16h. 43m.; souths, 0h. 25m.*; sets, 8h. 14m.*; decl. on meridian, 17° 1′ N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian °
Mercury	9 32	13 9	16 46	25 32 S.
Venus	11 28	15 8	18 48	25 13 S.
Mars	23 31*	6 31	13 31	10 54 N.
Jupiter	1 53	8 0	14 7	0 40 N.
Saturn	18 19*	2 27	10 35	22 21 N.

* Indicates that the rising is that of the preceding and the southing and setting those of the following day.

Occultations of Stars by the Moon

Nov.	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
22	θ^1 Tauri	4½	18 29	19 17	33 272
22	θ^2 Tauri	4½	18 38	19 9	6 299
22	75 Tauri	6	18 49	19 8	133 172
22	B.A.C. 1391	5	19 18	20 17	60 246
22	Aldebaran	1	21 48	22 57	75 257
23	117 Tauri	6	17 59	18 42	29 271
24	130 Tauri	6	2 52	3 58	92 323
24	26 Geminorum	5½	22 59	0 6†	54 241
26	1 Cancri	6	5 40	6 46	107 292

† Occurs on the following day.

For further particulars in regard to the occultation of Aldebaran see NATURE, vol. xxxii. p. 610.

Phenomena of Jupiter's Satellites

Nov.	h. m.		Nov.	h. m.	
22	3 42	I. tr. egr.	26	4 19	II. occ. reap.
23	6 43	III. ecl. disap.	27	4 2	III. tr. egr.
24	7 18	II. tr. ing.	28	5 9	I. ecl. disap.

The Occultations of Stars and Phenomena of Jupiter's Satellites are such as are visible at Greenwich.

Nov.	h.	
24	23	Saturn in conjunction with and 3° 59′ north of the Moon.

A special watch should be kept on November 27 and the days immediately preceding and following, in order to note whether there is any recurrence of the meteoric shower observed on November 27, 1872, and believed to be connected with Biela's comet. The radiant point is near γ Andromedæ.

CHEMICAL NOTES

IN order to obtain constant temperatures easily maintained and completely under control, Messrs. Ramsay and Young (*C. S. Journal, Trans.*, 1885, 640) employ vapours of the following compounds, and alter the pressure to which each vapour is subjected: carbon disulphide, ethyl alcohol, chlorobenzene, bromobenzene, aniline, methyl salicylate, bromonaphthalene, and mercury. By the use of the vapours of these bodies at various pressures, any desired temperature between that of the atmosphere and 360° can be easily obtained. The authors have very carefully determined the vapour-pressures of these compounds for a large range of temperature. The methods of experiment are fully described, and the results are presented in the form of tables, which must prove of much service to those chemists and physicists who have occasion to raise pieces of apparatus to a known temperature, to vary that temperature if required, or to keep it perfectly constant for an indefinite period.

As was noticed in these columns some time ago, Dixon has recently proved that a mixture of perfectly dry carbon monoxide and oxygen is not exploded by the passage of electric sparks; but that the presence of a minute quantity of water suffices to determine the combination of the gases. Dixon supposed that the action of the water was as represented in the following two equations:—

$$(1)\ CO + H_2O = CO_2 + H_2,$$
$$(2)\ 2H_2 + O_2 = 2H_2O.$$

Now Traube (*Ber.* 18, 1890) has shown that carbon monoxide does not decompose water in complete absence of air or oxygen, even at very high temperatures; he has also shown that when moist carbon monoxide and oxygen are exploded together, hydrogen peroxide is an invariable product. Traube suggests that the following three changes probably occur during the explosion in question:—

$$(1)\ CO + 2H_2O + O_2 = CO(OH)_2 + H_2O_2.$$
$$(2)\ CO + H_2O_2 = CO(OH)_2.$$
$$(3)\ 2CO(OH)_2 = 2CO_2 + 2H_2O.$$

When hydrogen is burnt in moist oxygen, hydrogen peroxide is always produced, according to Traube. Whether a perfectly dry mixture of hydrogen and oxygen could or could not be exploded by electric sparks cannot be regarded as settled; Traube thinks that such a mixture would prove to be non-explosible. He regards the mutual action of hydrogen, oxygen and water as in all respects comparable with that of carbon monoxide, oxygen, and water, or with that of zinc, lead, and some other metals, oxygen, and water. The changes which occur in the explosion of moist hydrogen and oxygen are formulated by Traube thus:—

$$(1)\ H_2 + 2H_2O + O_2 = 2H_2O + H_2O_2.$$
$$(2)\ H_2O_2 + H_2 = 2H_2O.$$

The occurrence of the second part of this reaction has been experimentally demonstrated by Traube.

IN continuing his experiments on nitrification, Warington (*C.S. Journal, Trans.* 1885, 758) has shown that the limit of concentration (about 12 per cent.) beyond which urine ceases to be nitrifiable under ordinary conditions may be largely extended by adding gypsum to the liquid. A solution containing 50 per cent. of urine, and 22 milligrams of gypsum for every c.c. of urine, began to nitrify after about five months; solutions containing 15, 20, and 30 per cent. of urine began to nitrify after the lapse of 53, 68, and 78 days respectively. The gypsum prevents the accumulation of ammonium carbonate in the liquid.

J. H. VAN'T HOFF describes (*Berichte*, xviii. 2088) experiments on phenomena, analogous to those exhibited by gases at their "critical points," occurring during chemical decomposition. Phosphonium chloride, PH_4Cl, which melts at 25°, was heated to 50°–51° at a pressure of 80–90 atmospheres in a Cailletet's apparatus; under these conditions the line of separation between liquid and vapour disappeared, and, on cooling, the formation of nebulous streaks became plainly visible. It is well known that the vapour obtained by heating PH_4Cl under ordinary conditions consists of PH_3 + HCl; it is not possible to say to what extent the melted substance in van't Hoff's experiment consisted of a compound of PH_3 and HCl, and the gaseous part consisted of a mixture of these constituents, yet it seems certain that, when PH_4Cl, a compound which is chemically decomposed when vaporised, is heated to 50° under a pressure of 80–90 atmospheres, there exists identity between the vapour and the condensed portion of the body.

LA COSTE describes (*Berichte*, xviii. 2122) a modification of V. Meyer's apparatus whereby the densities of easily decomposed compounds may be determined at low temperatures under small pressures.

GEOGRAPHICAL NOTES

A CATALOGUE of the printed maps, plans, and charts in the British Museum has been prepared by Prof. Douglas, and will be issued in two large volumes. It represents the contents of the manuscript catalogue in 323 volumes, the catalogue of the maps and plans in the Royal Library in two printed volumes, and the manuscript catalogue of charts in the same library. The original manuscript catalogue was made under the superintendence of Mr. Major, late Keeper of the Department of Maps. The orthography adopted in the present catalogue is that used in Keith Johnston's "General Dictionary of Geography," with the exception of India, for which Hunter's "Gazetteer" has been taken as a guide. The utility of this catalogue to the geographical student will be found in the comparatively simple alphabetical arrangements for the headings of countries and places, combined with the names of geographical writers, which last often serve as short cuts to any particular atlas or map. Thus, under the head of "Ptolemy," the pillar and foundation of ancient geography, there are seventy-four entries referring to the various editions and copies of his "Geographica." Turning to the names of the fathers of modern geography, Ortelius and Mercator, we find under the former twenty-nine entries describing the various copies and editions of his "Theatrum orbis Terrarum." The geographical labours of his contemporary and friend, Mercator, will be best realised by a reference to the heading "World: Atlas: Modern," p. 4491, where will be found probably the most complete list of Mercator's atlases extant, ranging from 1495 to 1636.

AT the meeting of the Geographical Society of Paris on the 6th instant, M. Germain, who presided, pronounced a eulogium on Milne-Edwards. M. Duveyrier called attention to a report addressed to the Spanish Government by Capt. Bonelli, relative to the Spanish possessions on the West Coast of Africa, according to which it appeared that the writer claimed on behalf of Spain nearly a hundred kilometres of the coast belonging to the French in Senegal. A letter was read describing the departure from Buenos Ayres of M. Thouar on a new expedition to complete his work on the Pilcomayo. A note was read from M. Venukoff on the recent incidents of Russian geographical exploration. M. Chaffaujon described his late explorations in the basin of the Orinoco, to which we have already made frequent reference.

THE current number of *Petermann's Mittheilungen* has for its first article a lengthy communication by Dr. Theodor Fischer on the development of coasts. His conclusion is as follows:—Wherever the sea by breakers and currents has exercised a preponderating influence on the form and development of coasts, whether flat or precipitous, the line of coast takes the form of a succession of arcs, in the case of steep coasts with a short, and of flat coasts with a long, radius; where the coasts exhibit other features than these, although the action of the sea be not wholly excluded, yet other causes, especially tectonic alterations in the surface and movements of the earth's crust, are more powerful or are very recent. Herr Langhaus gives a map of the Cameroon Mountains, with an accompanying description, containing a short sketch of recent exploration in the region. Dr. Boas writes on the topography of Hudson's Bay and Hudson's Straits, with a map; and Herr Wichmann describes the new republic in South Africa, also with a small but remarkably clear map by Dr. Havernick. The usual geographical and critical notes and lists conclude the number.

M. EUGÈNE AUBERT has been charged by the Ministry of Public Instruction with a scientific mission to the basin of the Amazon.

BEES AND OTHER HOARDING INSECTS[1]

Their Specialisation into Females, Males, and Workers

IN discussing the differentiation of bees into females, males, and workers, I shall have no need to call your attention to any new discoveries in the world of wonders among those minute creatures that we have had with us for all ages, and whose life we are just now beginning faintly to understand. My illustrations will be drawn mainly from other orders, in which it will be impossible for me to make a mistake without its being readily seen by some of the general public as well as the specialists.

The limits of this paper will not permit elaborate definitions, or fine discriminations, and I have therefore to ask that you will kindly make your own definitions, taking care to give to my words in general the narrowest sense compatible with the use to which I apply them.

From the creatures and the plants, that man has domesticated for his use, we have learned nearly all of the lessons in heredity, which we have no good reason to unlearn, and my first illustration shall be from one of these, the barn yard fowl.

If we mate a Black Spanish fowl with a Buff Cochin, and hatch out the eggs as the bees do theirs, in an incubator, till we have a hundred chicks, among these we shall find a very great diversity. Some when fully grown will be nearly, if not quite, as heavy as the Buff Cochin, and some will weigh little, if any, more than the Black Spanish. Their respective weights will probably vary between those natural to their sex in the two varieties to which their progenitors belong, but much the larger number will be very nearly half way between. And as colour is not necessarily correlated with weight, it is quite possible that the heaviest chick will be the blackest; that is to say, that he may take his colour almost entirely from one parent, and his weight and form from the other. In colour every one of the hundred chicks will, when fully grown, be in some degree distinguished from every other; and if we take colour, size and form together for our guide, there will not be one among the whole number that we cannot readily distinguish from every other. Now this particular cross from the great difference in size, form and colour of the parent stock enables us to see very clearly a fact which the closest and most careful investigation shows to be a general law. It is this:

All offspring are variable by heredity. And under some circumstances the variations are wide.

Nearly every youth, who has amused himself with an aquarium, knows that he can dwarf his fish if he chooses to do so. Other things being equal, the weight of a fish depends upon the amount of food it is allowed to consume. This variability is so great among fishes, that of two as nearly alike as possible, either one may be fed so that he shall exceed a pound in weight, before the other, receiving very little food, shall turn the scale at an ounce.

Thus insufficiency of food affects the development of all organs. All breeders of animals have some knowledge of this fact as applied to their own business, and of which our fish merely affords a striking example. It is an inevitable deduction, that when the food is of the general quality which is suitable for the due nourishment of all the organs but is insufficient in amount, the stronger organs, if such there be, will take more than their share, and the weaker organs will go to the wall. From this matter of food supply we have a general law, which may be stated as follows:

Living creatures are variable from the amount and quality of their food. And among some orders the limits of this variation are wide.

It is scarcely necessary for me to go into the fact that the insects, being exposed to more extreme vicissitudes than the larger orders of animal life, are much more variable in almost every respect. It will be interesting, however, and it may be instructive in the line of our inquiry, to point out some powers of variation in sex in a very common plant, which, while they are very much greater than those of the bee, have some points of striking resemblance.

Indian corn is pictured to the unobserving mind as a plant bearing something good to eat at the side and a tassle on the top. The botanist tells us that the tassle on the top is a male plant, that at the side is a female plant or perhaps more than one, that all these are joined upon one stalk, and that the something good to eat is the product of the female plant, fertilized by the pollen of the male. All this is fact as far as it goes; but it gives us no conception of the whole truth.

On going into the field in bloom we find that nearly all of the stalks have tassels on the top; they are male plants. In a good field we shall find perhaps half of them with reproductive females at the side, say two good ears of corn to a hill. There are, therefore, nearly twice as many perfect males as there are of perfect females. We find also that the undeveloped females are very numerous—from one to half a dozen on a stalk. And a close examination shows that the number of females that become developed is almost entirely a matter of food. Such an investigation shows also some plants bearing only a female on the stalk and some that are entirely undeveloped in both sexes.

Thus in our field of Indian corn we have male stalks, male and female stalks, female stalks, neuter stalks. And the stalks that bear developed male and developed female individuals all have (*a*) a male individual on the top, (*b*) one, two, or three females at the side, (*c*) one to six undeveloped females at the side, and possibly with, possibly instead of these (*c*) they may have (*d*) one to half a dozen buds and germs of females at the side.

If, when the corn is ripe, we go with the farmer and gather a basketful, we shall invariably find that on each ear there are kernels less perfectly developed than others, and we shall have every reason to believe that in the basketful there are some kernels that could not reproduce, that some kernels would reproduce but would, under the most favourable circumstances, give but imperfect offspring, and that there would be a very wide range in the degrees of the imperfection of the plants produced from these imperfect kernels.

As a matter of fact, the farmer in planting, selects with care the most perfect ears, and the most perfect parts only of the ears so selected, and yet we have the males, the females, and the neuters or the undeveloped for the result as I have described them.

Indian corn is so extremely variable in this matter of sex, that careful experimenting in this direction would be likely to give most interesting results in a single lifetime.

[1] Read before the Brooklyn Entomological Society, December 29, 1884, by Edwin A. Curley.