THURSDAY, DECEMBER 29, 1881

SUICIDE

Suicide; an Essay on Comparative Moral Statistics. By Henry Morselli, M.D., Professor of Psychological Medicine in Royal University, Turin, &c. International Science Series, Vol. xxxvi. (London: C. Kegan Paul and Co., 1881.)

THIS work enters the International Science Series as an abridged translation of the author's original book, which was written in Italian. As its title implies, it is throughout statistical, and as no pains have been spared in collecting statistics from every available quarter, the results are the most comprehensive and complete that can be obtained with reference to the subject of which the essay treats. These results are interesting, not only because of the light which they shed upon a somewhat sombre topic, but also because they show what a powerful and trustworthy instrument of inquiry we possess in the statistical method, even when applied to what at first sight might appear the most complex and variable of causes leading to the most uncertain or least calculable of effects. For assuredly the most striking feature common to all the multitudinous tables which Dr. Morselli presents to us is the uniformity with which, under a given set of conditions and over a sufficiently wide area of observation, a certain average number of suicides will occur.

Chapter I. is on "The Increase and Regularity of Suicide in Civilised Countries," and it shows that, to use the words of its opening sentence, "from statistics collected up to this time is demonstrated this most painful fact, that suicide has increased from the beginning of the century, and goes on continually increasing in almost all the civilised countries of Europe and of the New World." Thus, for instance, in France from 1827 to 1852 there was a continued increase in the annual number of suicides, from 48·0 to 82·6 per million of inhabitants; and in Italy from 1864 to 1877 there was a similarly gradual rise from 29·2 to 40·6.

Of the "influences which act upon suicide," the first that are considered are the "cosmico-natural." Concerning climate it is shown that "the South of Europe gives the minimum proportion, while that rises by degrees as the centre is approached, reaching a maximum at 50° of latitude, and again gradually declining northwards; "whence it appears that the zone in which are situated the countries where suicide is most frequent is the *temperate*, as might be anticipated from the historical fact of the favourable development of ancient and modern civilisation in the regions furthest removed from the extreme climates." As shown graphically by a shaded map, "the line of suicide crosses the European continent from the north-east to the south-west."

The distribution of suicide in each of the chief countries of Europe is then given. Of the statistics on this head we may quote those which have reference to our own country.

"In Great Britain the average, lowest in Ireland, higher in Scotland and Wales, becomes still more elevated in the North of England, and it acquires its maximum in the South; nor can it be said that this is caused by the metropolis, as it was in France by the irradiation of Paris, because London, on the contrary, gives a smaller proportion of suicides than some of the South and South-west counties, and especially Cumberland. We give in Table VII. the averages of the five years 1872-76 calculated on the population of the census of 1871.

TABLE VII.—*Distribution of Suicide in England-Wales* (1872–76)

Divisions and Counties.	Annual average.	In the million.	Divisions and Counties.	Annual average.	In the million.
I. London.			VI. Central-West.		
Middlesex	199·4	88·6	22. Gloucester	29·0	59·5
Surrey	63·2	85·1	23. Hereford	8·0	66·1
Kent	16·4	72·6	24. Shropshire... ...	15·8	59·1
II. South-East.			25. Stafford	43·0	49·1
			26. Worcester	21·2	62·0
1. Surrey	33·0	90·3	27. Warwick	58·2	92·3
2. Kent	55·0	87·4	VII. Central-North.		
3. Sussex	47·0	111·6	28. Leicestershire ...	23·0	83·2
4. Hampshire	32·8	62·3	29. Rut'and	3·6	153·9
5. Berkshire	17·2	76·0	30. Lincoln	29·4	68·6
III. Central-South.			31. Nottingham ...	29·0	81·6
			32. Derbyshire... ...	27·4	84·3
6. Middlesex	26·2	98·9	VIII. North-West.		
7. Hertford	10·4	53·4			
8. Buckingham ...	9·6	61·9	33. Cheshire	38·0	70·3
9. Oxford	11·4	63·9	34. Lancashire... ...	197·4	69·2
10. Northampton ...	18·0	72·5	IX. York.		
11. Huntingdon... ...	3·2	50·5			
12. Bedford	5·8	38·2	35. West-Riding ...	133·4	71·4
13. Cambridge	12·2	63·5	36. East-Riding ...	26·4	86·1
IV. East.			37. North-Riding ...	16·4	54·2
			X. North.		
14. Essex	27·6	62·6			
15. Suffolk	22·6	65·0	38. Durham	37·2	53·6
16. Norfolk	33·2	77·0	39. Northumberland.	27·2	70·3
V. South-West.			40. Cumberland ...	21·2	96·2
			41. Westmoreland ...	3·8	58·3
17. Wiltshire	11·6	47·4	XI. Welsh.		
18. Dorsetshire	9·6	50·7			
19. Devonshire	38·0	62·6	42. Monmouthshire...	10·2	46·4
20. Cornwall	13·8	38·5	43. South Wales ...	33·6	43·8
21. Somerset	32·0	66·3	44. North Wales ...	16·0	36·7

Why Cumberland, Sussex, Surrey, Warwick, and most of all Rutland, should show such pre-eminence is unaccountable.

Other things equal, the most favourable localities for suicide are flat plains and the courses of large rivers, while mountainous districts invariably yield the smallest percentage. Again, "the regions where suicide predominates are all those formed by alluvial deposits of the more recent epochs; regions, that is to say, which up to the Tertiary period had remained covered by the sea, and which, emerging only in later times, assisted the development of the more recent flora and fauna."

Concerning the influence of seasons, it is shown that—

"The transition period between spring and summer, and especially the month of June, exercises the most positive influence on suicidal tendency, whilst that of winter, particularly of December, would be negative. It is strange that for long an opposite opinion was held; it was maintained that suicide was more frequent in damp, cloudy, and dark weather, such as helps the development of the melancholy passions."

On this subject Dr. Morselli observes that the regular distribution of voluntary deaths in the course of the year, which, taking the chief countries of Europe, he graphically represents by means of curves, "is in evident relation with that of madness. All alienists are agreed as to the greater frequency of mental alienation in the summer season, and this law is confirmed by all the statistics of the asylums for the insane." But—

"It is to be noted that suicide and madness *are not influenced so much by the intense heat of the advanced summer season as by the early spring and summer, which seize upon the organism not yet acclimatised and still under the influence of the cold season.* And this also applies to the first cold weather, as may be seen in the proportional figures of our statistical tables, perhaps better still in the second elevation, which all the curves, as shown by us, offer in the autumn months of October and November, when the change from the warm to the cold season is more severely felt by the human constitution, and especially by the nervous system."

It is a curious fact that everywhere suicides are committed with greater frequency during the first third of any given month than during the second third, and during the second third than during the remaining third. Moreover of the first third, the first two days yield the largest proportional number. "From whence this fact proceeds is not clear, unless it be that in the first days of each month debauchery, dissipation, orgies, especially in large cities, are more numerous."

Again, among men the first days of the week predominate in respect of influences leading to suicide over the later—the order standing Tuesday, Thursday, Monday, Wednesday, Friday, Sunday, Saturday. Among women, however, an inverse ratio obtains—the order here being Sunday, Friday, Thursday, Wednesday, Tuesday, Saturday, Monday. Doubtless the reason of this among men is that Saturday is usually pay-day, and "thus a day of joy, of material well-being, of moral quiet." This lasts through Sunday, but with Monday men's labour begins, with the after effects of satiated gluttony, inebriety, &c. On the other hand, "the high proportion [of suicides] among women on Sunday is of the greatest psychological interest."

As regards the time of day, the hourly distribution of suicides—

"Is parallel to activity in business, to occupations and work, in short with the noise which characterises the life of modern society, and not with silence, quiet, and isolation. Petit and De Boismont then justly note that the influence of the diurnal hours is shown also in the predominance of those months which have the longest days, and are precisely, as we see, June, May, and July. Thus all the influences which we are studying join together and mingle in one single and efficient synthesis, that is to say, the dependence of man upon nature."

One of the most interesting chapters in the book is that on "Ethnic Influences," a general summary of which is given in the appended table.

On this it is remarked :—

"The low position in point of numbers held by the English peoples, with regard to suicides, in comparison with the Germanic, whilst the first place in the civilised world as regards power and riches belongs to them without dispute, is astonishing; it is not modern Rome, it is not England, which gives the greater number of suicides."

And the divergence between England and the countries where the Celtic race remains most pure (Scotland, Ireland, Wales), proves "the influence of the Germanic element infiltrated"—the Celtic races being least addicted to suicide, and the Germanic most so.

Another very interesting section is that on religious influences. The Jews display "an habitual resistance to suicide, though the same cannot be said with regard to madness." Again, "the Catholic nations, Italy, Spain, and Portugal, stand on the last step of the scale of suicide, whilst those exclusively or mostly Protestant, take the first grade; it suffices to cite Saxony, Denmark, Scandinavia, and Prussia. In countries of mixed religions, the inclination towards suicide diminishes in direct ratio to the predominance of Catholicism . . . the most frequent order in which the various religions follow each other is thus: *Protestants, Catholics, Jews;* and the next in order of frequency come *Protestants, Jews, Catholics.*"

In this connection the following is perhaps worth quoting :—

"The very high average of suicides among Protestants is another fact too general to escape being ascribed to

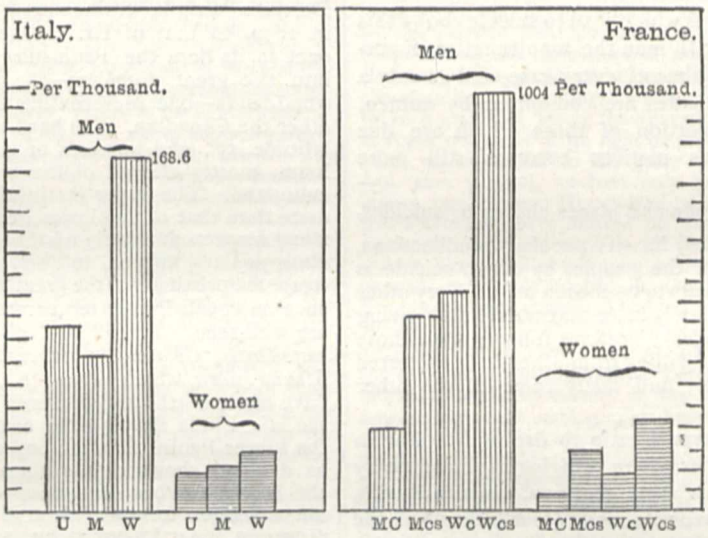
TABLE XIII.—*Synopsis of the Ethnological differences of Suicide*

Races and Stocks.		Countries.	Population.	Annual number of suicides.	Per million. General average.	
Germanic peoples	Scandinavia.	Denmark (1866-75)	1 784,741	468	268	127·8
		Norway (1866-73)	1,741,621	131	745	
		Sweden propr. and Gothia (1866-75)	3 536,799	297	84	
	Germans of the North. (Low-German).	Mecklenburg (1871-75)	553,754	95	167	150
		Lauenburg (1858-65)	49,704	8	156	
		Oldenburg (1865-70)	315 995	62	198	
		Prussia and its conquests (1871-75)	25,772,562	3342	133	
		Hamburg (1873-77)	388,618	113	301	
		Bremen (1875-76)	141,848	36	245	
		Ducal Hesse (1871)	852,843	101	160	
	Germans of the South.	Bavaria (1871-76)	5,023,904	450	90	165
		Baden (1871-75)	1,506,531	231	157	
		Würtemberg (1872-76)	1,881,505	294	162	
		Kingdom of Saxony (1871-76)	2,760,342	752	299	
		Saxe-Altenburg (1858-65)	141,839	(42)	303	
		Saxe-Meiningen (1860-61)	172,341	(37)	264	
		Salzburg (1873-77)	153,159	19	120	
		Upper Austria (1873-77)	736,557	81	110	
		Lower Austria (1873-77)	1,990,708	539	254	
		Styria (1873-77)	1,137,990	115	94	
		Carinthia (1873-77)	337,694	34	92	
		Alsace-Lorraine (1856-60)	1,531,804	230	97	
		Cantons — German - Swiss (1876)	1,357,424	224	165	
	Anglo-Saxon.	England (excluding Wales) (1872-76)	21 290,596	1538	72	70
		United States of America	38,000,000	—	(32)	
		South Australian Colonies (1872-76)	208.950	19	90	
	Flemings.	Netherlands (1869-72)	3,618,016	146	35	50
		Flemish Prov. of Belgium	1,342,297	98	74	
		Circ. d'Aurich of Hanov. (1871)	195.394	—	(100)	
Celto-Romans (Latins?)	Celts.	Wales (1872-76)	1,421,670	60	52	30
		Scotland	3,360,000	—	35	
		Britain (1872-76)	2,947,348	221	75	
		Ireland (1831-41)	7,800,000	79	10	
	Celto-Romans.	France (1871-75)	36,102,291	5256	150	116
		French Prov. of Belgium (1858-60)	3.433,000	119	35	
		French Swiss Cantons (1876)	1,401,420	284	200	
		Northern Italy (Cisalp.) (1864-76)	11,813.515	500	46	
	Western Romans.	Peninsular and Lower Italy	14,248,157	381	26	27
		Spain (1866-70)	16,302,625	—	17	
		Italian-Swiss Cantons	211,401	21	90	
	Eastern Romans.	Transylvania (1873-77)	2,115,124	—	80	(50 ?)
		Roumenia	4,000,000	—	(25)	
Slavs	Slavs of the North-West.	Russia (1875)	69,354.541	1771	30	42
		Bohemia (1873-77)	5,140,544	863	158	
		Moravia (1873-77)	2,017,274	289	136	
		Galicia-Buckovina (1873-77)	5,958,083	589	98	
	Slavs of the South.	Carniola (1873-77)	466,334	22	46	30
		Croatia and Slavonia (1864-65)	876,009	—	30	
		Dalmatia (1860-61)	456,961	—	14	
		Military Frontiers (1860-61)	593,232	—	31	
Ural-Alt	Magyars	Hungary (1864-65)	9,900,785	—	52	52
	Finns and Letts.	Finland (1869-76)	1,732,621	56	31	40
		Norrland (1861-70)	529,128	31	62	
		Russian Baltic Prov.	3,637,000	—	(41)	
	Slavo-Mongols.	South-East Russia or Caspia	—	—	(51)	(51)

the influence of religion. Protestantism, denying all materialism in external worship and encouraging free inquiry into dogmas and creeds, is an eminently mystic religion, tending to develop the reflective powers of the mind and to exaggerate the inward struggles of the conscience. This exercise of the thinking organs which, when they are weak by nature, is always damaging, renders them yet more sensible and susceptible of morbid impressions. Protestantism in the German States further exercises this exciting influence on the cerebral functions in yet another manner; it originated those philosophical systems which are based on the naturalistic conception of human existence, and put forward the view that the life of the individual is but a simple function of a great whole. These philosophical ideas are harmless enough to strong minds and those stored with a fit provision of scientific culture, but in the democratic atmosphere of our times the heart is not educated *pari passu*. The religious apathy with which the present generation is afflicted does not arise from a reasoned inquiry into the laws of nature or a scientific appreciation of its phenomena; it is not in short a deep conviction of the mind, but springs from a physical inertia and from the little hold obtained by any ideas but such as are directed to material improvement and the gratification of ambition. To our mind therefore the great number of suicides is to be attributed to the state of compromise which the human mind occupies at the present time between the metaphysical and the positivist phase of civilisation, and as this transition is more active in countries of marked mystic and metaphysical tendencies, such as is the case with Protestantism, it is natural that in them suicide should have the greatest number of victims."

Another feature of interest which a comparison of the statistics of all countries brings out is that "it is those countries which possess a higher standard of general culture which furnish the larger contingent of voluntary deaths,"—a fact which finds its curious expression in the following:—"The scale of these countries according to suicide is nearly the same as that of the periodical press." It is likewise higher in towns than amongst the more scattered inhabitants of the country.

Concerning sex, "in every country the proportion is one woman to three or four men, as in crime it is also one to four or five"—a proportion which the tables show to be everywhere maintained with wonderful constancy, save in a few cases, the most remarkable of which is that of



Spain, where "one woman commits suicide against only two and a half men." This strong tendency towards suicide shown by the women of Spain our author attributes "to the force of their passions, which brings them nearer to the male sex."

In both sexes the suicidal tendency augments in direct ratio with age up to the fifth decennial period for men, and up to the fourth for women, beyond which they diminish with as much uniformity. In England, however, the number of young women who commit suicide between fifteen and twenty years is so large as to exceed by more than a tenth the number of men. This "precocity of suicide in English women lasts up to the thirtieth year, when the proportional relation between the two sexes becomes nearly equal to the average. The masculine excess also seems to diminish in extreme old age, so that at above seventy the two sexes tend to draw near again." But—

"The diminution in the last period of life is much more irregular than in all the other conditions: strongest in Würtemberg, less so in Sweden, Belgium, and England; very weak in France, Bavaria, and Italy; failing almost entirely in Denmark (1835-44), Saxony, Austria, and perhaps Prussia. This diminution of suicide amongst the old belongs to the weakening of their character and to that want of energy natural to the last period of existence, in which man returns almost to childhood, and not having a long future before him, and even if overtaken by misfortune, he prefers to await the natural end of his days. Moreover, the religious sentiment awakens and revives in old age, acting as a curb to the passionate emotions and as a supreme comfort in adversity."

The remarkable effects of marriage, widowhood, and presence or absence of children may be best appreciated by transcribing one of Dr. Morselli's diagrams, where U. means unmarried, M. married, W. widowed, Mc. married with children, Mcs. married childless, Wc. widowed with children, and Wcs. widowed childless.

A number of tables are given showing the effects on suicide of different occupations. "First of all are the literary, scientific, journalists, engineers, geometricians, all those, in short, who make the greatest use of their brain power. Next come the military, of whose very high

inclination towards suicide we shall speak in the following section; and then the true professionals, tradespeople, and all those reckoned in the vagrant professions." The statistics with regard to the military are remarkable. Thus in Prussia the average suicide over the whole male population is 394 per million, while in the army it rises to 600 or 620. In Austria the proportion is still higher, viz. 866 per million as against 122 of the civil population, and in the Belgian army the case is nearly as bad. In the English army from 1862-71 the suicidal tendency was more than triple that of the male civilian population. "This tendency, moreover, augmented as time advanced; from 1862-71 it grew from 278 per million to 400, and even reached 569 in 1869. The tendency increases with the sending away the troops from Europe, so that in the kingdom (*at home*) the number is 339 per million, but in the English possessions in India it rises to 468." Of the different sections of the British army members of the cavalry are most addicted to suicide (in one year the percentage among the dragoons being as high as 785 per million), next the artillery, then the infantry, foot-guards, engineers, and lastly the household cavalry.

Analysis of the motives which lead to suicide shows this as a general result:—"In man the manifestation of personal interest rules in [almost] every case, and as only a fourth or fifth of the suicides are committed by women, the already small proportion of those which are due to noble and generous motives becomes still more attenuated."

Concerning the methods and places chosen by suicides,

"Each country certainly has its peculiar predilections, but in the aggregate of the peoples by whom suicide is practised, the rope appears to be chosen before every other instrument, and immediately after that water (both giving 5-10ths to 8-10ths of cases); firearms follow; then those arms which cut or stab; falling from a height is preferred to charcoal and poison; and lastly come all the other means."

Hanging stands in inverse ratio to drowning. For in Italy and other countries where hanging is most rarely resorted to, drowning is most common, while in Russia, where hanging is the favourite mode (four-fifths of all the suicides) drowning is very rare (hardly 6·9 per cent.). Firearms are preferred in the South of Europe and by the military everywhere, while in England poison and throatcutting are most favoured. It is curious that "there is a constant difference between the sexes in falls from heights and crushing under railway trains, the former being proportionally more frequent among women, the latter, on the contrary, much more so amongst men." There are other "sexual divergences" of the same kind, and as showing the combined influence of sex and age we may quote one other passage:—

"Males under 15 years of age choose hanging (86 per cent.), and women choose drowning (71 per cent.); in the ages between 15 and 20 the same predilection of the two sexes continues, but it lessens (hanging amongst males is 72 per cent.; drowning among women 65), and it grows still less between the ages of 20 and 30. With the diminution of the tendency towards hanging, that towards drowning increases amongst the men, the greatest number of deaths by this means falling between the ages of 40 and 50; but in advanced age the old people return to a preference for hanging, even more than children (91 per cent.)."

The book concludes with a short "Synthesis," which leads to the proposition that "Suicide is an effect of the struggle for existence and of human selection [*i.e.* natural selection operating in the human species], which works according to the laws of evolution among civilised people." From the present sketch it will be seen that the work as a whole contains many facts of interest to sociologists, although to the rest of the world its somewhat repulsive details will appear useful only as showing the practically emphatic answer which sundry classes of the community respectively give to the question "Is life worth living?"

GEORGE J. ROMANES

OUR BOOK SHELF

Catalogue of the Phænogamous and Vascular Cryptogamous Plants of Michigan—Indigenous, Naturalised and Adventive. By Chas. F. Wheeler and Erwin F. Smith. (Lansing: George and Co., 1881.)

THIS excellent contribution to the flora of the United States has been compiled at the suggestion of the State Horticultural Society of Michigan. It is prefaced with a list of the various catalogues, from that by Dr. Jno. Wright, embracing 850 species, and published in 1839, to that of Dr. Palmer in 1877. With reference to its flora the Peninsula may be roughly divided into two great divisions—the hard wood and the soft wood-lands—one representing the Appalachian flora, the other the Canadian. The hard-wood country lies south of latitude 43°, and consists of very fertile sand, clay, or loam, mostly cleared of the original forest and largely cultivated. The upper Peninsula has a much colder climate than that of the lower Peninsula, and its flora is in many respects decidedly northern. Pines, fir, cedar, larch, elms, poplars, maples, and birch, are among the principal trees; the proximity of the great lakes exerts a marked influence on equalising the temperature, and the effects thereof are well seen. Trees like *Liriodendron tulipifera*, *Cercis canadensis*, *Gleditschia triacanthos*, *Cornus florida*, and *Morus rubra*, which belong to Ohio and Central Illinois, have crept northward, favoured by the mild influence of the lake winds through the central and western part of the Lower Peninsula often beyond the middle. The flora as detailed shows 1634 species. The composites claim the larger number of species—182—about one-ninth of all. Sedges follow with 176 species; Grasses, 139; Rosaceæ, 61; Leguminosæ, 55; Scrophulariaceæ, 46; Umbelliferæ, 27. Of the 165 species of trees and shrubs about twenty are valuable for their timber. About twenty species of woody and herbaceous native climbers are frequent, and some seem worthy of cultivation. The arrangement followed is that of the fifth edition of "Gray's Manual," and a coloured map of Michigan is annexed.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Pendulum Observations in London

THE reference by the President of the Royal Society in his recent annual address to the subject of contemplated pendulum operations permits me to assume that enough interest exists in those operations to render the offer which I now wish, with your kind assistance, to make, not altogether inopportune. I am now engaged in swinging pendulums, *in London*, under conditions

which enable me to invite any person who may wish to make themselves acquainted with the *modus operandi* by actual inspection, to come and witness the same. The only formality I would impose is the communication of the visitor's card and address, and a few hours' notice, in case the intended visit should promise to be inopportune. To reduce the likelihood of this I would intimate that the regular observations are made (in the present case) within about half an hour before and after the hours of six and twelve, morning, noon, evening, and midnight, during which the attention of the observer may be understood to be entirely preoccupied. At any other hour of the day or night, either I or my assistant will be desirous of explaining to the best of our ability whatever may be needful.

My reasons for making this offer so publicly are, in the first place, entirely scientific. I wish to give those who are curious on the subject a fair opportunity, and I hope to derive information or suggestions from those whose attention is for the time engaged in comprehending the details by means of which the general result is sought to be obtained. Beyond this, I am also desirous of obtaining some indications as to the degree of interest actually existing in England on the subject of gravity-measures of this kind.

The present site has a peculiar interest. It is a cellar which I have been lucky enough to find very near the desired spot—which is that which was occupied in the early part of this century by Kater, Sabine, Foster, and others; but was afterwards necessarily abandoned on the decease of Mr. Browne, of Portland Place, whose house was the *rendezvous* of those observers. It was in consequence of this abandonment that the intention was formed of founding a more permanent central point of reference; and as the establishment of a magnetical observatory at Richmond was at that time under consideration, the transfer of what may be called the English home of pendulum investigations from Portland and Tavistock Places to the new Richmond (or "Kew") Observatory was decided upon, and accordingly when next pendulum experiments were instituted, their site was in the Richmond Observatory. It is only recently, however, that the necessity of ascertaining the physical relation between the two sites has become a practical one.

Something of the same sort had been experienced in the earlier days, when, partly owing to Greenwich Observatory having formed the base or *point d'appui* on English soil, of one or two foreign series of operations; partly because of the obvious anomaly of having the principal English pendulum station in a private house; special observations were instituted for determining the relation of that site to the Greenwich one. Greenwich was thus incorporated on the one hand with those series which depended on the Portland Place site, while the latter was connected with those dependent (if one may use the term where all are mutually dependent) on the Greenwich site. They were all, in fact, to a certain extent linked together.

This should explain why re-observation at Greenwich, in connection with re-observation at Kew, seems likely to meet the present want best if supplemented by re-observation also at, or very near, the old Portland Place site. I have made the requisite observations (subject to some doubt) at Kew, *i.e.* at the Richmond Observatory, and at Greenwich Observatory, and I am now doing the same in the cellar above referred to, as representing Portland Place. Its exact situation is immediately in rear of All Souls' Church, Langham Place.

The Kew (or Richmond) Observatory is not a very convenient place for observations of this nature. They require attendance at all hours, whereas the observatory is situated so far from the inhabited part of Richmond as to permit of such attendance only at great personal inconvenience.[1] Also, though a precise knowledge of time is of the first importance, the absence of telegraphic communication with Greenwich Observatory and the distance from the nearest telegraph station combine at Kew to make one dependent on local transits. This is of itself a very serious objection. If to this we add that the pendulum-room at the Kew Observatory is too small to allow of the introduction of any portable stand or framework such as must of necessity be used on voyages—the very restricted space being permanently occupied by a fixed support, which does not admit of the same dispositions as would be made elsewhere for convenient observations, it remains a serious question whether Kew ought to continue to be regarded as the fundamental English pendulum station. There can be very little doubt, having regard to the paramount importance of *time* in pendulum experiments, that the fundamental station should have a perfect command of that element, such as can rarely be obtained except at a fixed astronomical observatory.

[1] I estimate that I walked fully 200 miles to and from my work, in all weathers and at all hours, while carrying on the observations at Kew in September and October last.

At the Langham Cellar, after due consideration, I have concluded to rely on Greenwich alone for time; sending a chronometer for the purpose every day. So far, the plan seems to be quite satisfactory, being more reliable than noting a transmitted signal at the nearest post-office.

Although I do not think I have touched on any point in this letter which is not closely connected with its primary object, I must nevertheless apologise for its length. In conclusion I have now only to repeat the offer with which I commenced it, that any one interested in, or desirous of becoming practically acquainted with pendulum swinging of this particular kind, may, at any time within the next fortnight, visit and inspect the apparatus in action, by communicating with me, at the address here given.

J. HERSCHEL

1, Langham Street, Portland Place, W., December 28

Dante and the Southern Cross

". . . vidi quattro stelle
Non viste mai, fuor ch'alla prima gente."
Purg. i. 23.

No one will accuse me of excessive patriotism when I say that Dante was one of the very few chosen spirits of the fourteenth century who were thoroughly acquainted with all natural phenomena, so far as they were then known and understood, whilst he was perhaps the only one who manifested a decided contempt for all the pretensions of astrologists and necromancers (Inf. xx.). The words of such a man are deserving of the best consideration, alike of literary and scientific men; it is therefore to be hoped that before the discussion ends those best qualified to speak will throw more light on the lines in question.

As yet in answer to the query which appeared in NATURE (vol. xxv. p. 152), we have only had a quotation of a well-known passage from Humboldt's "Cosmos," and the suggestion that Dante must have derived his knowledge of the Southern Cross—evidently indicated in the lines at the head of this note—from Arabian Globes—a suggestion which, by the way, is expressed, or clearly implied, in the "Cosmos," within a page from the passage quoted. As to the remark with which both Mr. Walker and Mr. Wilks end their notes (NATURE, vol. xxv. p. 173) that "prima gente" does not refer to Adam and Eve, but to the early races which inhabited Europe and Asia, though not new, it is obviously correct to the mind of those who know how great was the cosmographic knowledge of Dante. Yet, as Count de St. Robert states in an ably-written pamphlet on the point in question (Torino, 1866), strange to say, Humboldt (who has so unhesitatingly stated the opinion of Dr. Galle that in 52° 30′ north latitude in consequence of the precession of the equinoxes, the Southern Cross might have previously reached more than 10°, and that it began to become invisible in that latitude 2900 years before Christ), believed that "prima gente" referred to our first parents.

Now, whilst admitting as possible that Dante obtained his knowledge of the stars which form the Southern Cross from the catalogue of Ptolemy (Almagest, Book vii.), on reading the passage, in which occur the two lines quoted above, especially in the original, one is irresistibly brought to think that Dante's enthusiastic description of the "quattro stelle" was inspired by the vivid description of a Christian witness of the glorious spectacle. The person most likely to have imparted such knowledge to the great poet was Marco Polo. That celebrated Venetian traveller returned from his last voyage in 1295, and lived in his native town till 1324 (Col. Yule, "The Book of Ser Marco Polo"). Dante did not visit Venice till 1320, after he had finished his "Divina Commedia," but there are many reasons for the belief that the two great men met or corresponded together.

With regard to the lines:—

". . . quelle tre facelle,
Di che 'l polo di qua tutto quanto arde."
Purg. viii. 89.

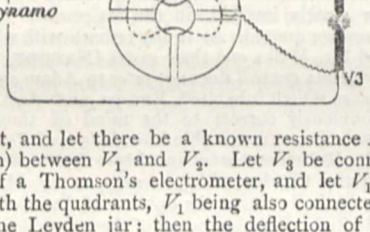
which Dante says were high when the "quattro stelle" were low, it is difficult to agree with any of the commentators, because neither the Magellanic clouds, nor Achernar, nor any three prominent southern stars, correspond satisfactorily to the "tre facelle" alluded to. It must not be forgotten that accurate

astronomical and geographical knowledge is but of recent date, and, as already stated, Dante formed many of his cosmographic conceptions chiefly from hearsay. N. PERINI

The Horse-Power given to any Part of a Circuit by Intermittent Light

SOME time ago, with Prof. Ayrton, I designed and constructed an instrument to measure the horse-power given electrically to any incandescent or arc lamp, or to any part of a circuit, an improvement on the instrument previously devised by M. Deprez; the pointer of a suspended coil moves at once to a mark on a scale which tells the horse-power. The instrument is dead beat, and, what is very important, by a special commutator arrangement it can be calibrated with much smaller forces than it is intended to measure. The current in the suspended coil is proportional to the difference of potential at the ends of a part of the circuit, and the fixed current which causes its deflection is the total main current in the circuit, so that the deflection represents the product of these two factors. The instrument was described at the Society of Arts in March last, and was exhibited at the British Association meeting at York. It will, however, necessarily only work accurately with non-reversed currents because of the self-induction of the suspended coil of fine wire, and it is very important to be able to make the same measurement for reversed currents.

At the Electrical Congress at Paris, soon after the reading of M. Joubert's paper, in which he showed how to measure the mean value of the square of the difference of potential at two ends of a part of a circuit in which reversed currents are flowing, Prof. Ayrton described to me a method of performing the measurement of the horse-power for reversed currents which seemed to have suggested itself to him and to Prof. Fitzgerald of Dublin simultaneously when hearing M. Joubert's paper. It was this: Let there be three points in the circuit at potentials V_1, V_2, V_3,



at any instant, and let there be a known resistance R (with no self-induction) between V_1 and V_2. Let V_3 be connected with the needle of a Thomson's electrometer, and let V_1 and V_2 be connected with the quadrants, V_1 being also connected with the outside of the Leyden jar: then the deflection of the needle measures the mean value of

$$(V_2 - V_1)\left(V_3 - \frac{V_2 + V_1}{2}\right).$$

Now let the needle and a pair of quadrants be connected with V_2, the other pair with V_1, and we measure the mean value of the square of $(V_2 - V_1)$. The difference of these measurements is easily seen to be R times the expended energy which we want to know.

I was not present when Professors Ayrton and Fitzgerald communicated their idea to one another, but immediately afterwards Prof. Ayrton explained it to Sir William Thomson and to me together, making sketches of the necessary connections. Sir William thought well of it, but feared that perhaps the present quadrant electrometer would not be sensitive enough for the measurements. We suggested, however, the use of our multireflex arrangement (see *La Lumière Electrique*, October 5, 1881) for creating greater sensitiveness, and as he was pleased with the idea, we have, since that time, in our very short intervals of leisure, been trying to arrange an electrometer which shall be sensitive enough for the purpose.

I observed to-day that M. Potier in the October number of the *Journal de Physique* publishes the same idea, and I wish to place it on record that the fundamental idea of the new process, which seems to me very feasible and of considerable practical importance, occurred to Messrs. Ayrton, Fitzgerald, and Potier independently. JOHN PERRY

Talgarth Road, West Kensington, December 6

The New Red Star in Cygnus

THE above star, which I found on the 22nd of May last, and which then appeared of the 9th magnitude, and reached 8 m. on June 8, seems now no more than 12 m. Estimations of very small magnitudes are, of course, very difficult, but I believe I am not under the mark in saying 12 m., as I found the star not easy with a 4½-inch O.G. At the same time its deep crimson seemed very striking by glimpses, and in its present state it is, perhaps, the smallest among the stars whose red colour has been observed. It will probably have to be classed among the most remarkable variables. J. BIRMINGHAM

Meteor

TAKING a look at the eclipse of the moon on December 5, about 5.44 p.m., I happened to see a meteor that is, I think, very noteworthy, though, perhaps from distance, its apparent size was so small that I might have scarcely seen it but for the temporary lessening of the light of the moon. Its motion was, throughout its visible course, horizontal and slow. When it met my eyes, it was just below the Pleiades. I followed its flight to the northern end of the eastern sky; there it seemed to go on out of my sight, without fall or collapse: for aught I know, I might have observed it even from the extreme south, had my eyes been turned thither at the outset; I would draw attention to this fact, as well as to its horizontal motion and its seemingly slow progress. The grandeur of the glories displayed by that night's clear sky was at its height as this mysterious stranger passed above our winsome satellite—then a thing of "eerie beauty," its glistening golden ring half-clasping, like "the old moon in the new moon's arms," the earth-shadowed orb over it, and the latter shimmering with the maroon ember-like sheen called by the French *la lumière cendrée*.

JOHN HOSKYNS-ABRAHALL

Combe Vicarage, near Woodstock, December 16

SEA-SICKNESS.—This must be declined as a subject for correspondence.

A NEW ELECTRICAL STORAGE BATTERY[1]

THE great utility of some thoroughly practical method of conserving electric force has caused a great deal of attention to be applied to the subject; no system of electric supply can be considered as perfect until some means is used to so store the force generated that it may be drawn off equally and regularly, and this whether the generator be on or off. If we take, as an example of electric supply, the present systems of electric lighting, it is at once seen, should an accident or stoppage take place in the machinery generating the current, the whole of the apparatus such as lamps or motor-machines are influenced; should there be a reservoir of electricity between the generator and the apparatus of whatever sort for utilising the force this inconvenience would not occur.

All the present systems of storing electricity depend on certain chemical changes produced by electrolysis.

I have gone through a long series of experiments on storing electricity and made many forms of cells, one being a porous pot containing dilute hydric sulphate and a sheet of lead, in an outer vessel containing a sheet of lead in solution of acetate of lead, the plate in the porous pot being made the positive electrode; this cell had the power of storing electricity, by peroxidising the positive electrode, and depositing from the acetate of lead solution metallic lead on the negative electrode, the hydrogen having combined to form acetic acid. On discharging the peroxide is reduced, and the oxide formed during discharge on the other plate dissolves in the acetic acid, forming the original solution of acetate of lead; by this means I eliminated the injurious effects of the hydrogen on charging.

During my experiments I found that red oxide of lead is a very bad conductor of electricity, and the peroxide a good conductor. I also discovered that by amalgamating lead plates with mercury a marked increase was

[1] "On a New Electrical Storage Battery." By Henry Sutton (Ballarat Victoria). Communicated to the Royal Society by the President.

immediately manifest in polarisation effects, the plates becoming more uniformly and rapidly peroxidised when used as positive electrodes, and local action entirely disappearing. These mercury amalgamated plates at once give me an advance of other cells. I used them in many ways, constructing cells in which the positive plate was amalgamated, and the negative coated with red oxide, or with peroxide, produced by treating red oxide with dilute hydric nitrate till the brown precipitate of peroxide fell, the precipitate being washed and painted on the electrode. I also amalgamated the negative electrode simply. I found that in every way positive electrodes amalgamated produced the best results. I also made cells in which either peroxide or red oxide was formed into a porous conglomerate, using the conglomerates as electrodes, immersed in dilute hydric sulphate. I constructed cells with parallel plates, red oxide or peroxide being filled in between the plates; in this experiment red oxide is useless and peroxide efficient. In all these experiments I succeeded in storing electricity to different extents.

Having thoroughly satisfied myself that positive electrodes amalgamated with mercury were the best, I investigated the behaviour of various forms of negative electrode, having in view the conservation of the hydrogen; this I thought to do by occluding the hydrogen in suitable electrodes, as spongy platinum or metallic palladium; but as both these methods would be useless owing to expense I did not even experiment on them.

I further thought of having negative electrodes, whose oxides should be soluble in the solution, and which could be redeposited from the solution, or of having metallic solutions from which metal could be deposited, the resulting solution being such that should, on the oxidation of the deposited metal, combine with the oxide and again form the original solution.

I thought that success in this manner would result in a powerful and constant source of stored energy, the cell would not polarise itself during discharge, as is the case in both Planté and Faure cells; in these cells the peroxide formed by the discharge produces a contrary electromotive force.

Experimenting from this train of thought, the results I have obtained are such as to have an important practical bearing on the future of electric work.

The experiments comprised amalgamated lead as a positive electrode with negative electrodes composed of either zinc, iron, or copper, in each case the solution between the electrodes being a salt of the metal composing the negative electrode. With zinc, sulphate of zinc was the solution; with iron, sulphate of iron; and with copper, sulphate of copper. In all these cases the results were not only far more powerful than with any form of cell I had previously devised, but also very constant, the polarisation lasting many times longer than in any other form of cell. The cell with zinc negative electrode I discarded, owing to the necessity there would be to keep the zinc plate amalgamated to prevent local action; the iron negative electrode was set aside owing to the iron oxidising when the cell was not in use. The cell having a negative electrode of copper, a positive electrode of lead amalgamated with mercury and a solution of cupric sulphate, I have adopted as a thoroughly economical, lasting, and practical form of storage reservoir. The chemical changes in this cell are exceedingly interesting and beautiful, the cell being composed of a sheet of lead cleaned with dilute sulphuric acid and amalgamated thoroughly with mercury, and a sheet of thin copper a little shorter; the two sheets are perforated with a number of holes and then rolled in a spiral, separated by rubber bands cut every five inches, the holes in plates and cuts in rubber bands being to allow free circulation of the solution (the short plate being uppermost before rolling). This combination is immersed in a solution of cupric sulphate, and the amalgamated lead plate made the positive electrode of a suitable source of electricity, the chemical action being that the oxygen of the decomposed solution combines with the lead, forming a perfectly even coating of the insoluble peroxide, the hydrogen replacing the copper of the solution, and the copper being deposited in the metallic state on the negative electrode. As the decomposition of the cupric sulphate proceeds the solution gradually loses its azure blue colour, becoming more acid, and finally when the whole of the copper is deposited, we have the solution colourless and transformed into hydric sulphate and water, the positive electrode peroxidised and copper deposited on the negative electrode. During discharge the peroxide is reduced and the copper element oxidised, the oxide combining with the acid and forming cupric sulphate, the solution returning to its original colour. This change of colour forms a beautiful means of telling when the cell is charged; it is a veritable charging gauge. The power of this cell is very great and very constant; it can be made to last for hours, the time being dependent on the quantity of cupric sulphate decomposed.

I have, by the decomposition and recomposition of one pint of cupric sulphate, obtained over two hours' effective work in heating to a red heat one inch of No. 28 iron wire, the cell measuring internally 4 inches deep and 4 inches diameter.

I constructed cells with free crystals of cupric sulphate suspended in the solution, and found that the presence of free crystals prevented the oxidation of the amalgamated lead electrode, it being essential that the solution become slightly acid before the peroxide will form. The cell during charging gives out a peculiar rattling noise, which I consider due to the deposition of copper on the negative electrode altering the form of the spiral.

A practical form of cell for storing purposes ought to be made, by fixing a series of amalgamated lead plates in a box in grooves, as in Cruikshank's trough battery, filling the interval between the plates with solution of cupric sulphate, and passing a current through of sufficient tension to overcome the contrary electromotive force of the series, the positive sides of the plates being peroxidised and copper deposited on the negative sides. I have two boxes on this plan, each containing twenty-five plates, the total being equivalent to fifty cells. By this means batteries of great tension can be charged from thirty Bunsens. A number of twenty-five plate boxes can be coupled for quantity of charging, and for tension during discharge. Twenty such boxes, one foot square, internal measurement, will give in series a battery of 500 pairs of one foot square plates.

It will be seen from the foregoing that this method of conserving energy has a wide field before it, and as it will benefit fellow-workers in science, placing in their hands a means of experimenting with powerful electric currents, I give it without reservation, freely and untrammelled by patent rights, for their use.

THE BISCHOFFSHEIM OBSERVATORY

THIS observatory built at the expense of M. R. Bischoffsheim, the member of the French Lower House for Nice, is situated on Mont Gros, at an altitude of about 370 metres, and at a distance of eight English miles on the old Route de la Corniche, so well known and appreciated by the tourists travelling by road from Nice to Genoa. M. Celora, Milan astronomer, Commander Bahat of the French Staff, and M. Perrotin, the present director of the Bischoffsheim Observatory, have ascertained electrically and astronomically, the longitude and latitude of the new establishment which has been connected with Paris and Milan, by unquestionable observations.

The buildings have been constructed under the direct supervision of M. Garnier, the architect of the Paris

Opera, and distributed skilfully in several favourable sites of a large park having a surface of 80 acres.

The smaller meridian circle by Gauthier is in its place, and can be used for daily determinations. The large meridian circle by Brünner will be finished in the first month of 1882. The object glass has 8 inches diameter, and has been focussed to a distance of 10 feet. The smaller equatorial with an object-glass of 14 inches, and focussed to 27 feet, has been made by Eichens, and will be ready for observations at the same time as the larger meridian circle. The larger equatorial will have an object-glass of 28 inches, and will be focussed to 52 feet. The glasses have been made by Feil; Henry Brothers are polishing them. The instrument will be constructed by Eichens and Gauthier. The work is proceeding favourably, but it is impossible to state when it will be completed.

M. Lœwy, sub-director of the Paris Observatory, has designed an apparatus for preventing the perturbations produced by the flexion of the axis when observations are taken at a large angular distance from the zenith. The building will have a diameter of sixty-four feet, with a rotating roof of copper, worked by hand-machinery, as designed by Gardiner.

The Bischoffsheim observatory will not be confined to astronomical observations. The donor having been taught by Leverrier in astronomy has felt it a duty to extend his donation to magnetical and meteorological observations, too often neglected in French observatories. A magnetical pavilion has been built with extensive cellars, for continuous self-registering apparatus. The registration takes place by photography as in Kew, and is made with instruments by Adie, the maker of the Kew set of registers. As in Kew, a "rez-de-chaussée" has been built for direct force and direction observations. The instruments have been made by Brunner.

The installation of the meteorological instruments has been made under the direct supervision of M. Mascart, the director of the French Meteorological Office. A constant staff has been selected by M. Bischoffsheim, and is now on duty. The direction has been given to M. Perrotin, formerly assistant astronomer to M. Tisserand when he was director of Toulouse Observatory. The assistant astronomer is M. Carvallo, formerly a pupil in the Polytechnic School, and who has taken his astronomical honours in the special school established by Rear-Admiral Mouchez at the Paris Observatory. M. Puiseux, formerly pupil of the Polytechnic School, will have the control of magnetical and meteorological observations.

Two houses have been built—one for the administration and the other for the direction. The first floor of this staircase has been fitted up entirely for boarding foreign astronomers who are desirous of making observations in this magnificent astronomical "caravanserai." M. and Mdme. Struve and M. Tachini have promised already to spend some time there next winter.

It should be noted that it was probably in a tour made in England with Leverrier, when the great astronomer was made an honorary doctor of Cambridge University, that M. Bischoffsheim meditated on the opportunity of establishing an observatory entirely of his own. Up to that time he had spent his time in the observation of stars which shine in a less elevated sphere than the heavenly skies. But Leverrier's conversation and intimacy led him to appreciate other unfading beauties.

The Bureau des Longitudes has agreed to take possession of the observatory, which will be handed over to it with a sufficient endowment to keep it decently. It is estimated that the money spent in purchasing the estate, &c., will exceed 120,000*l.*, and that the endowment will be more than 2000*l.* a year. This handsome donation must be noted as being a revolution in French generosity towards science. Up to this time our neighbours confined themselves to bequeathing legacies and lavishing posthumous generosities.

FOSSIL FLORA OF SUMATRA[1]

THIS is a paper of some twenty pages and six plates. Herr Verbeek sent in 1874 a small collection of fossil plants from Sumatra to Switzerland, which were described by Heer, and in the following year the second collection, now described, was received, no others having been found in the interval. The plates contain twenty-two figures, most of them representing fragments of simple ovate leaves, supposed, with two exceptions, to be allied to existing species of the Indian mainland or archipelago. The mollusca in the overlying strata point to an Eocene age. The exceptions are a Eucalyptus and a small leaflet ascribed to Cassia, and now represented, it is here supposed, by *C. lævigata* of tropical America, but the determination rests on slender grounds. The majority of them, in fact, though doubtless the best that could be made from such material, must necessarily be almost mere guesses. The value of such guesses may be inferred from a similar work by the same author on the fossil flora of Madeira.

In this case several of the commonest indigenous plants of Madeira were referred to extra-Madeiran plants. For instance, the terminal leaflets of *Rubus discolor* were referred to *Corylus australis*, and various leaflets of *Rubus grandiflora* are figured as *Corylus australis*, *Ulmus suberosa*, and *Psoraleadentata;* the so-called *Pistacea Phœacum* is the common myrtle, the *Ilex Hartingi* is the Madeira *Vaccinium*, and the figures of *Myrica Faya* belong to *Ardisia excelsa*. In this case the mistakes are the more singular, as Prof. Heer had actually sojourned in Madeira, and the plants are the commonest on the island. If with even exceptionally favourable circumstances such mistakes can be made, generalisers should surely be cautious in building theories upon the ages of formations, &c., when they have been determined upon the evidence of fossil plants. It is unfortunate that on evidence as trivial, and even more questionable, we read in Lyell of the MIOCENE outbursts of Mull, of Iceland, and Greenland, of the MIOCENE deposits of Bovey Tracy, &c.

It is important, however, that fossil plants should be figured and described, for if the generic and specific names, except when based on ample material, are regarded merely as an individual opinion, the determinations become of use. Whatever is unsatisfactory in the work is inherent to the subject, for few possess the zeal and untiring industry of Heer. If he would only make clear to his readers the reasons which enable him in his own mind to determine the genus to which an ordinary type of leaf, with neither top nor base, belongs, and would be less positive where nothing positive is possible, his works would acquire a scientific value which some justly think they hardly at present possess. J. S. G.

THE VOYAGE OF THE "VEGA"[2]

II.

BARON NORDENSKJÖLD frequently refers to what Mr. Leslie renders "self-dead" animals, meaning animals that have died a natural death, in distinction to those that have been killed by hunters or by other animals. The rarity of such "self-dead" animals is remarkable, especially along the north coast of Asia, where there are few hunters and fishers, and where immense numbers of animals must die. While sailing along the Taimur coast, large numbers of dead fish (*Gadus polaris*) were seen lying on a block of ice, and strewed along the bottom of the sea, which Baron Nordenskiöld notices as being very unusual.

[1] By Dr. Oswald Heer (*Neue Denkschriften der schweizerischen Gesellschaft*, vol. xxviii. Zürich, 1881).

[2] "The Voyage of the *Vega* round Asia and Europe; with a Historical Review of previous Journeys along the North Coast of the Old World." By A. E. Nordenskjöld. Translated by Alexander Leslie. Five steel portraits, numerous maps and illustrations. Two vols. (London: Macmillan and Co., 1881.) Continued from p. 183.

"They had probably perished from the same cause, which often kills fish in the river Ob in so great numbers that the water is infected, namely, from a large shoal of fish having been inclosed by ice in a small hole, where the water, when its surface has frozen, could no longer by absorption from the air replace the oxygen consumed, and where the fish have thus been literally drowned. I mention this inconsiderable *find* of some self-dead fish, because self-dead vertebrate animals, even fish, are found exceedingly seldom. Such *finds* therefore deserve to be noted with much greater care than, for instance, the occurrence of animal species in the neighbourhood of places where they have been seen a thousand times before. During my nine expeditions in the Arctic regions, where animal life during summer is so exceedingly abundant, the case just mentioned has been one of the few in which I have found remains of recent vertebrate animals which could be proved to have died a natural death. Near hunting-grounds there are to be seen often enough the remains of reindeer, seals, foxes, or birds that have died from gun-shot wounds, but no self-dead Polar bear, seal, walrus, white whale, fox, goose, auk, lemming or other vertebrate. The Polar bear and the reindeer are found there in hundreds, the seal, walrus, and white whale in thousands, and birds in millions.[1] These animals must die a "natural" death in untold numbers. What becomes of their bodies? Of this we have for the present no idea, and yet we have here a problem of immense importance for the answering of a large number of questions concerning the formation of fossiliferous strata. It is strange in any case that on Spitzbergen it is easier to find vertebræ of a gigantic lizard of the Trias, than bones of a self-dead seal, walrus, or bird, and the same also holds good of more southerly inhabited lands."

Another problem of great importance is suggested by the finding of some yellow specks on the snow of the Taimur coast, which turned out to be carbonate of lime of an unusual form of crystallisation, and which the Baron believes were probably of interplanetary origin. He gives a brief sketch of his previous observations in the high north on this subject, referring also to what has been done by M. Tissandier, and during the last English polar expedition, and to the special suitability of the uninhabited Arctic regions for the collection of what is believed to be cosmic dust. It is certainly a subject which deserves the attention of future expeditions, and especially of the polar observing stations which are in a fair way of being established.

"It may appear to many that it is below the dignity of science to concern one's self with so trifling an affair as the fall of a small quantity of dust. But this is by no means the case. For I estimate the quantity of the dust that was found on the ice north of Spitzbergen at from 0·1 to 1 milligram per square metre, and probably the whole fall of dust for the year far exceeded the latter figure. But a milligram on every square metre of the surface of the earth amounts for the whole globe to five hundred million kilograms (say half a million tons)! Such a mass collected year by year during the geological ages, of a duration probably incomprehensible by us, forms too important a factor to be neglected, when the fundamental facts of the geological history of our planet are enumerated. A continuation of these investigations will perhaps show, that our globe has increased gradually from a small beginning to the dimensions it now possesses; that a considerable quantity of the constituents of our sedimentary strata, especially of those that have been deposited in the open sea far from land, are of cosmic origin; and will throw an unexpected light on the origin of the fire-hearths of the volcanoes, and afford a simple explanation of the remarkable resemblance which unmistakably exists between plutonic rocks and meteoric stones."[1]

After leaving Cape Chelyuskin, the *Vega* sailed for a considerable distance over what, in existing maps, is set down as land; and although there was necessarily little time for accurate surveying, still it will be found that the expedition has done much to render accurate the geography of the north coast of Asia. After sailing down the east side of the Taimur Peninsula, close by the land, the vessel was directed almost straight eastwards towards the most southerly of the New Siberian Islands, still keeping as near the coast of the mainland as practicable. Off the delta of the Lena, which within the last week has come so prominently before us in connection with the *Jeannette* expedition, the *Vega* parted with the *Lena*, which entered the river, to establish regular traffic by steamer. It was only after leaving Cape Chelyuskin that ice in any quantity was met with so as to hamper the progress of the vessels, and Baron Nordenskjöld states that had the coast-water been better known so that he could have kept closer to land, the latter part of the voyage would have been as free from obstruction as the former.

Here follows an interesting chapter on the commercial navigation of the great Siberian rivers, and on the geography and economical condition of Siberia. It contains indeed a summary of all that is known to science of the immense country, with much that is the result of Baron Nordenskjöld's own research or observations, and with speculations on geology that are not likely to be let pass unchallenged. The *Lena* had some difficulty in navigating the delta of the river, for the old maps of 140 years ago were useless, the changes at the mouth of the river in that time has been so great. The Baron draws an interesting parallel between Siberia and America north of the 40th parallel.

He then gives a sketch of his own journey up the Yennissi in 1875, in connection with which we give a view on that river (Fig. 7).

"As is the case with all the other Siberian rivers running from south to north,' the western strand of the Yenisej, wherever it is formed of loose, earthy layers, is also quite low and often marshy, while on the other hand the eastern strand consists of a steep bank, ten or twenty metres high, which north of the limit of trees is distributed in a very remarkable way into pyramidal pointed mounds. Numerous shells of crustacea found here, belonging to species which still live in the Polar Sea, show that at least the upper earthy layer of the *tundra* was deposited in a sea resembling that which now washes the north coast of Siberia.

"The *tundra* itself is in summer completely free of snow, but at a limited depth from the surface the ground is continually frozen. At some places the earthy strata alternate with strata of pure, clear ice. It is in these frozen strata that complete carcases of elephants and rhinoceroses have been found, which have been protected from putrefaction for hundreds of thousands of years. Such *finds*, however, are uncommon, but on the other hand single bones from this primeval animal world occur in rich abundance, and along with them masses of old drift-wood, originating from the Mammoth period, known by the Russian natives of Siberia under the distinctive name of 'Noah's wood.' Besides there are to be seen in the most recent layer of the Yenesej *tundra*, considerably north of the present limit of actual trees, large tree-stems with their roots fast in the soil, which show that the limit of trees in the Yenesej region, even during our geological period, went further north than now, perhaps as far as, in consequence of favourable local circumstances, it now goes on the Lena.

"On the slopes of the steep *tundra* bank and in several

[1] I can remember only one other instance of finding self-dead vertebrate animals, viz. when in 1873, as has already been stated (p. 110), I found a large number of dead rotges on the ice at the mouth of Hinlooper Strait.

[1] Namely, by showing that the principal material of the plutonic and volcanic rocks is of cosmic origin, and that the phenomena of heat, which occur in these layers, depend on chemical changes to which the cosmic sediment, after being covered by thick terrestrial formations, is subjected.

of the *tundra* valleys there is an exceedingly rich vegetation, which already, only 100 kilometres south of Yefremo-Kamen, forms actual thickets of flowering plants, while the *tundra* itself is overgrown with an exceedingly scanty carpet, consisting more of mosses than of grasses. Salices of little height go as far north as Port Dickson (73°

FIG. 7.—River view on the Yennissi.

30′ N.L.), the dwarf birch (*Betula nana*, L.) is met with, though only as a bush creeping along the ground, at Cape Schaitanskoj (72° 8′ N.L.); and here in 1875, on the ice-mixed soil of the *tundra*, we gathered ripe cloudberries. Very luxuriant alders (*Alnaster fruticosus*, LEDEB.) occur already at Mesenkin (71° 28′ N.L.), and the Briochov

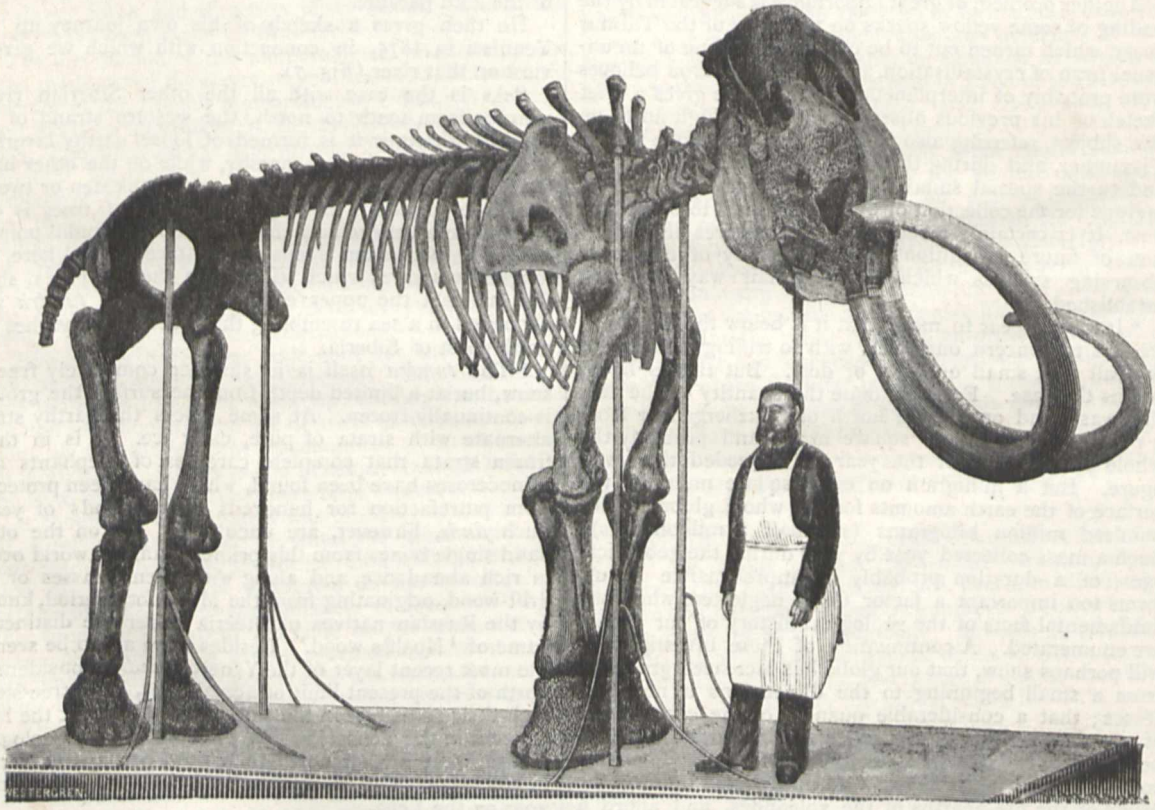


FIG. 8.—Mammoth Skeleton in the Imperial Museum of the Academy of Sciences in St. Petersburg.

Islands (70° to 71° N.L.) are in several places covered with rich and luxuriant thickets of bushes. But the limit of trees proper is considered to begin first at the great bend which the river makes in 69° 40′ N.L., a little north of Dudino. Here the hills are covered with a sort of wood consisting of half-withered, grey, moss-grown

larches (*Larix sibirica*), which seldom reach a height of more than seven to ten metres, and which much less deserve the name of trees than the luxuriant alder bushes which grow nearly 2° farther north. But some few miles south of this place, and still far north of the Arctic Circle, the pine forest becomes tall. Here begins a veritable forest, the greatest the earth has to show, extending with little interruption from the Ural to the neighbourhood of the Sea of Ochotsk, and from the fifty-eighth or fifty-ninth degree of latitude to far north of the Arctic Circle, that is to say, about one thousand kilometres from north to south, and perhaps four times as much from east to west. It is a primeval forest of enormous extent, nearly untouched by the axe of the cultivator, but at many places devastated by extensive forest fires.

"On the high eastern bank of the Yenisej the forest begins immediately at the river bank. It consists principally of pines: the cembra pine (*Pinus Cembra*, L.), valued for its seeds, enormous larches, the nearly awl-formed Siberian pine (*Pinus sibirica*, Ledeb.), the fir (*Pinus obovata*, Turcz.), and scattered trees of the common pine (*Pinus sylvestris*, L.). Most of these already north of the Arctic Circle reach a colossal size, but in such a case are often here, far from all forestry, grey and

FIG. 9.—Notti and his wife Aitanga.

half-dried up with age. Between the trees the ground is so covered with fallen branches and stems, only some of which are fresh, the others converted into a mass of wood-mould held together only by the bark, that there one willingly avoids going forward on an unbroken path. If that must be done, the progress made is small, and there is constant danger of breaking one's bones in the labyrinth of stems. Nearly everywhere the fallen stems are covered, often concealed, by an exceedingly luxuriant bed of mosses, while on the other hand tree-lichens, probably in consequence of the dry inland climate of Siberia, occur sparingly. The pines, therefore, want the shaggy covering common in Sweden, and the bark of the birches which are seen here and there among the pines is distinguished by an uncommon blinding whiteness."

After parting with the *Lena* the *Vega* made for the New Siberian Islands, of great interest to science on account of the abundant remains of the extinct mammoth found thereon. "We know by the careful researches of the Academicians Pallas, von Baer, Brandt, von Middendorf, Fr. Schmidt, &c., that the mammoth was a peculiar northern species of elephant with a covering of hair, which, at least during certain seasons of the year, lived under natural conditions closely resembling those which now prevail in middle and even in northern Siberia. The

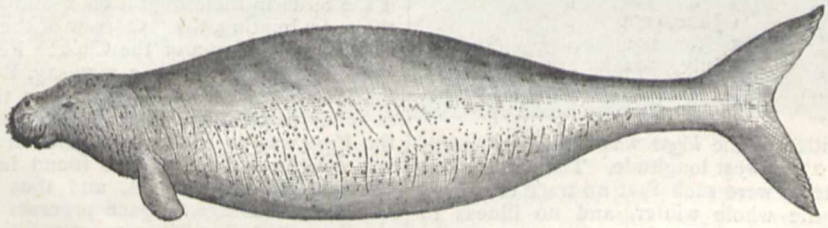


FIG. 10.—Reconstructed form of the sea-cow.[1]

widely extended grassy plains and forests of North Asia were the proper homeland of this animal, and there it must at one time have wandered about in large herds." The mammoth remains the Baron shows are derived from a gigantic animal form, living in former times in nearly all the lands now civilized, and whose carcase is not yet everywhere completely decomposed. Hence the great and intense interest which attaches to all that concerns this wonderful animal (Fig. 8).

Baron Nordenskiöld then gives an interesting account of all the leading mammoth finds from the earliest period down to the present day. Portions of skeletons of other animal forms have been found in considerable numbers in the New Siberian Islands, and also certain remarkable "wood-hills," highly enigmatical as to their mode of formation.

"These hills are sixty-four metres high, and consist of thick horizontal sandstone beds alternating with strata of fissile bituminous tree stems, heaped on each other to the top of the hill. In the lower part of the hill the tree stems lie horizontally, but in the upper strata they stand upright, though perhaps not rootfast.[1] The flora and fauna of the island group besides are still completely unknown, and the fossils, among them ammonites with exquisite pearly lustre,

[1] Hedenström, *loc. cit.* p. 128. To find stranded driftwood in an upright position is nothing uncommon.

which Hedenström brought home from the rock strata on Kotelnoj Island, hold out inducement to further researches, which ought to yield the geologist valuable information as to the former climate and the former distribution of land and sea on the surface of the globe."

In connection with the state of the ice and the sea here, and the absence of glaciers on the coast, Baron Nordenskiöld gives a classified account of what he deems the various forms of ice. We can only here give a list of the various forms, referring the reader to the book itself for details. We have (1) icebergs, (2) glacier ice-blocks, (3) pieces of ice from the ice-foot; (4) river-ice; (5) bog-ice; (6) sea-ice or heavy ice. After passing Cape Chelgaskoi, on the east of Chaun Bay, on September 6, progress became much slower, and they had become heartily tired of "new ice, shallow water, and fog, and fog, shallow water, and new ice." Here for the first time since leaving Yugor Schar, signs of humanity were seen in the shape of some Chukchi natives who came out to the ship in their boats. A detention of six days at Cape Irkaipi (180° east longitude) afforded an opportunity for examining the games of the race known as Onkilon, who formerly inhabited these regions, and some centuries ago were driven by the Chukchis, according to tradition, to some remote islands in the polar sea. Kolyuchin Bay, just at the north entrance to Behring Strait, was reached on September 28, and just beyond it, and a mile from the shore, the *Vega* was caught in the ice and detained for ten months, till July 18, 1880. It was only after the lapse of some time that the expedition realised that they were caught at last, and serious preparations made for spending the winter. Meteorological and astronomical observatories were erected on shore, and a well-arranged method adopted for carrying out observations of various kinds. To some of the specially scientific results we shall probably refer in separate articles, and particularly to the interesting auroral observations both here and during other expeditions under the guidance of Baron Nordenskjöld. Some accurate notes as to ice-measurements are given in the neighbourhood of the *Vega's* winter quarters, which we give here, as statements on the subject are sometimes so vague.

"When it had become evident that we could make no further advance before next year, Lieut. Brusewitz occasionally measured the thickness of the newly formed ice, with the following results:

THICKNESS OF THE ICE.

1 Dec.	56 centimetres.		1 May,	154 centimetres.	
1 Jan.	92	,,	15 ,,	162	,,
1 Feb.	108	,,	1 June,	154	,,
15 ,,	120	,,	15 ,,	151	,,
1 Mar.	123	,,	1 July,	104	,,
1 April	128	,,	15 ,,	67	,, (full of holes).
15 ,,	139	,,	18 ,,	The ice broke up."	

"The exact position of the *Vega* was 67° 4′ 49″ north latitude, and 173° 23′ 2″ west longitude. The dietary and hygienic arrangements were such that no trace of scurvy occurred during the whole winter, and no illness to speak of.

"The greatest cold which was observed during the different months was in

Oct.	the 24th—20°·8	March	the 29th—39°·8
Nov.	the 30th—27°·2	April	the 15th—38°·0
Dec.	the 23rd—37°·1	May	the 3rd—26°·8
Jan.	the 25th—45°·7	June	the 3rd—14°·3
Feb.	the 2nd—43°·8	July	the 2nd—1°·0

"Twice we had the barometer uncommonly high, viz.:

On the 22nd December 6 A.M. 782·0 (0°) mm.
On the 17th February 6 A.M. 788·1 (0°) mm.

"The lowest atmospheric pressure, 728·8 (0°) mm., occurred on the 31st December at two o'clock P.M."

The ship was beset in the neighbourhood of a number of Chukchi encampments, and with the natives the most friendly intercourse was kept up during the whole year. Chukchi trading parties from a distance passing on to trade in one of the islands in the strait, made the *Vega* a regular place of call, and thus a great amount of information was gathered from these people of much ethnological value. They have evidently no connection with the Eskimo, whose origin must be sought within the American continent itself. The Chukchis would seem to have been driven up to their present inhospitable abodes a few centuries ago, by commotions in Central Asia; and when the Russians first came into contact with them they were found to be a brave and warlike race whom it was very difficult to subdue. At present they are quiet, harmless, good-natured, and dirty, some having flocks of reindeer and living inland, while the coast Chukchis live largely by fishing. Lieutenant Nordquist learned the language of the people, and was thus able to have important intercourse with them. Large collections were made of their clothing, implements, weapons, utensils, &c., as also of their drawings, for like the Eskimo they have a wonderful capacity for art of a rude and elementary but genuine kind. We give on the preceding page the portraits of a Chukchi and his wife, of such portraits the volume contains many (Fig. 9). Animal lifewas not specially abundant in the land; no bears, an occasional wolf, with a number of foxes, white, red, and black, and hares.

"On our arrival most of the birds had already left these regions, so inhospitable in winter, or were seen high up in the air in collected flocks, flying towards the south entrance of Behring's Straits. Still on the 19th October an endless procession of birds was seen drawing towards this region, but by the 3rd November it was noted, as something uncommon, that a gull settled on the refuse heaps in the neighbourhood of the vessel. It resembled the ivory gull, but had a black head. Perhaps it was the rare *Larus Sabinii*, of which a drawing has been given above. All the birds which passed us came from the north-west, that is, from the north coast of Siberia, the New Siberian Islands or Wrangel Land. Only the mountain owl, a species of raven and the ptarmigan wintered in the region, the last named being occasionally snowed up."

Additional observatories were built during the winter, so that there was a regular collection of them on shore. And so with regular work and amusement, and occasional visits to the Chukchis, the winter passed happily; and on April 23, returning spring brought with it the birds in their migration northward, beginning with the snow-bunting, the "sparrow of the north." The bird and mammal fauna of the Chukch Peninsula and north-east Siberia generally, we may say, Baron Nordenskjöld found to be markedly different from those which prevail in other parts of the Arctic Regions. On July 18, 1880 the *Vega* was as suddenly released from the ice as she was caught, and all at once found herself free to pass through Behring Straits, and thus accomplished the North-east Passage. Space prevents us from following the Expedition in their cruise round the rest of the coast of the Old World. The members of the expedition continued their observations up to the last, and even in Japan, China, Ceylon, and other places were able to add something to our existing knowledge. Considerable time was spent in visiting the north-east coast of Asia, the north-west coast of America, and the islands between. The results are much important information on the natural history and geology of those regions, and a long account of our knowledge of the north coast of Asia from the earliest time including the extensive series of Russian voyages of discovery with which the names of Behring, Steller, and others are associated. Of Steller, Baron Nordenskjöld has the highest opinion, as well as of the value of his work in natural history on Behring Island, and his death

at thirty-seven years of age, through the jealousy and tyranny of Siberian officials was a cruel loss to science. In these chapters, all that is known to science concerning North Siberia and the neighbouring islands has been carefully epitomised, and will form a valuable manual for future scientific work. In cruising from the Asiatic to the American coast, Baron Nordenskjöld makes a remark which has an important bearing on a recent correspondence in these columns. "As in all the Polar Seas," he states, "of the northern hemisphere, so also here, the eastern side of the Straits was ice-bestrewn; the western, on the other hand, clear of ice." We regret that we cannot enter in detail on the many interesting facts given by Baron Nordenskjöld on the natural history of St. Lawrence, Behring, and other islands between Asia and America. He has collected all the information attainable on Steller's sea-cow (*Rhytina Stelleri*), which on Steller's visit to Behring Island in 1741 was found pasturing in large herds on the abundant sea-weed on the shores of the island. Twenty-seven years after, not a specimen was to be found, and it was believed to be then extinct. But Baron Nordenskjöld adduces evidence to prove that a specimen was seen twenty-seven years ago, though there can be little doubt that it has really gone the way of the mammoth. The Baron does not believe that its extinction is due to the destruction by hunters, but that it was a survival from a past age doomed to extinction, which overtook it when driven from its pastures on the shores of Behring Island.

"*Steller's sea-cow* (*Rhytina Stelleri*, Cuvier) in a way took the place of the cloven-footed animals among the marine mammalia. The sea-cow was of a dark-brown colour, sometimes varied with white spots or streaks. The thick leathery skin was covered with hair which grew together so as to form an exterior skin, which was full of vermin and resembled the bark of an old oak. The full

FIG. 11.—"Seal-rookery" on St. Paul's Island, one of the Pribilov Islands.

grown animal was from twenty-eight to thirty-five English feet in length and weighed about sixty-seven cwt. The head was small in proportion to the large thick body, the neck short, the body diminishing rapidly behind. The short fore-leg terminated abruptly without fingers or nails, but was overgrown with a number of short thickly placed brush-hairs; the hind-leg was replaced by a tail-fin resembling a whale's. The animal wanted teeth, but was instead provided with two masticating plates, one in the gum the other in the under jaw. The udders of the female, which abounded in milk, were placed between the fore-limbs. The flesh and milk resembled those of horned cattle, indeed in Steller's opinion surpassed them. The sea-cows were almost constantly employed in pasturing on the sea-weed which grew luxuriantly on the coast, moving the head and neck while so doing much in the same way as an ox. While they pastured they showed great voracity, and did not allow themselves to be disturbed in the least by the presence of man. One might even touch them without their being frightened or disturbed. They entertained great attachment to each other, and when one was harpooned the others made incredible attempts to rescue it."

We give a sketch of the sea-cow (Fig. 10), as also of the "rookery" of the sea-bears, still found in abundance on St. Paul's Island (Fig. 11).

But we must take leave of a work abounding in interest, and in every way worthy of the important expedition of which it is the outcome.

NOTES

ONCE more we are glad to chronicle the opinion of a prominent politician on the value of science in education. The unanimity of our public men on this point is gratifying, and is a hopeful change from the ignorance of a few years ago. Sir Stafford Northcote, on Tuesday, in distributing the prizes to the students of Exeter School of Science and Art, maintained that the teaching of science cannot be begun at too early an age, as it is now recognised that a knowledge of science is indispensable in all handicrafts. Whilst acknowledging the great value of central agencies in London, yet he thought it desirable that still greater encouragement should be given to the establishment of museums and to the promotion of scientific research in the provinces. Of course, Sir Stafford stated, the great end attained by science classes was not so much the knowledge of a particular study as the development of the powers of the human mind, and training men to apply the utmost reasoning powers to the everyday work of life. It was the development of this mental vigour that would maintain the supremacy of the English race.

FROM the Report of Kew Gardens for 1880 we learn that the number of visitors during last year was 723,681, being an increase of 154,547 over the previous (very inclement) year, and nearly the same as in 1878. Only a comparatively small proportion of visitors take advantage of the early opening on bank-holidays. The scientific lessons given to the young gardeners have been well attended and successful. The Reports from Indian and Colonial Botanical Gardens are specially favourable this year. "A great increase of activity, arising from a variety of causes, has characterised almost all these institutions with which we are in regular correspondence, entailing a very great extension of the official work transacted at Kew, independent of the purely administrative work of the establishment itself." The numerous experiments described in the Report on various economical plants, both in our Colonial Gardens and at Kew itself, prove the great importance of the work carried on at the establishment to the whole empire. The addition of the Economico-botanical collection from the Indian Museum was a notable event of the year, adding so greatly to the resources of the establishment, and entailing much additional work. Other important additions were the collections of the late Prof. Schimper of Strassburg, and General Munro, C.B. It is to be regretted that Government declined to grant a small retaining fee for an entomologist, whose services are indispensable to such an institution as Kew. Mr. R. McLachlan, F.R.S., has hitherto acted as consulting entomologist without fee.

THE Marchese Corsi-Salviati has presented to the Royal Gardens life-size distemper drawings of the gigantic Aroid discovered by Beccari in West Sumatra, and described by him under the name of *Amorphophallus Titanum*. The dimensions of this plant are probably the most gigantic assumed by any herbaceous plant in one season's growth. The underground tuber is 5 feet in circumference. This produces, except when flowering, a single leaf whose stem is 10 feet high; above, this divides into three branches, each as thick as a man's thigh, and the ultimate segments of the much-divided leaf cover an area of 45 feet in circumference. The inflorescence is on a corresponding scale. The drawings are for the present hung for exhibition in the Wood Museum (No. 3).

THE submarine cable between Dover and Calais was carried out during the month of December, 1851, just thirty years ago, and it was on the 31st that the first message was sent from France to England and the traffic opened to the public. The first message was handed to Louis Napoleon, then Prince-President of the French Republic. It was simply a congratulatory salutation. The second was sent by an English banker to his correspondent in Paris, and related to the price of Consols. The Paris firm sent in return the Côte de la Bourse. This exchange of messages, including conveyance to the several offices did not take more than an hour. Before regular messages were sent experimental sparks were tried. The first which came over from the French shores fired an English gun which saluted the Duke of Wellington when leaving Dover by an express train. It was the last time he visited the place in his capacity of Lord Warden of the Cinque Ports.

MUCH has recently been written on the labours of medical women in India, and we find that such work is not without its reward also in China. According to the *Celestial Empire*, in the summer of 1879 the wife of Li Hung Chang, the great Viceroy of Chihli, was dangerously ill at Tientsin, and foreign medical assistance was called in. Chinese etiquette forbade the two doctors engaged obtaining sufficient knowledge of the case for treatment, and Miss Howard, an American lady with a medical diploma, was at once called in. Under her care Lady Li soon recovered. The result of this successful treatment of the illustrious Chinese lady was the establishment of a large hospital, under a foreign physician, the funds for which were provided by voluntary contribution from the native literati and gentry. The institution has just been opened by the Viceroy himself. When the news of Miss Howard's success reached America a wealthy gentleman of Baltimore subscribed funds to build a hospital for Chinese women at Tientsin, and the two buildings—one erected by Chinese, the other by American philanthropy—now stand side by side in that town. Li Hung Chang and his lady have both presented commemorative tablets to the hospital. One of them runs thus: "The skilful statesman and the skilful physician are alike in this: that they give their thought to cure what is ill. In the act of administering government and of dispensing cures, what hinders China and other lands from being one family?"

M. LISTON having made a series of very interesting observations on the temperature of water and on the conditions of freezing and thawing of a salted lake, Kupalnoye Ozero, in the province of Orenberg, Dr. Woeikoff contributes to the *Archives des Sciences Physiques et Naturelles* a note, with some remarks of his own on these observations which appeared in the eighth volume of the *Memoirs* of the Russian Geographical Society. This Lake Kupalnoye has a surface of 473 square metres and a depth of 1·42 metres, and its water contains 16 per cent. of salt, its bottom being covered with mud very rich in sulphide of hydrogen. The temperatures of the air having been, during the month of January, 1879, from − 6°·3 to − 28°·2 Celsius, with one interruption, when the thermometer reached for one day 0°·2; the temperature of the water at the surface was from − 3°·4 to − 13°·0, and at the bottom, from − 3°·8 to − 12°·8. On December 27, with a temperature of air as low as − 21°, the lake was covered with a viscous ice, which soon began, however, to thaw when the temperature of the air rose to − 6°, and the temperature of water was as low as − 7°·8. On January 3 all ice had disappeared, but the temperature of the water was still 7°·2 below the freezing point. On January 11, the temperature of the air being − 22°, and that of water being − 9°·8 at the surface and − 5°·6 at the bottom, the lake began again to be covered with viscous ice, and soon froze, the ice having a thickness of 38 millimetres, which thickness reached 153 mm. ten days later. But the remainder of the water was still unfrozen, notwithstanding that its temperature regularly decreased to − 10° on January 17, and even − 12°·8 on January 30. It was never observed before, M. Woeikoff says, in laboratories that salt water was cooled below − 4°, without being frozen, and here we have salt water which remains unfrozen at 13° below zero. However, former experiments, especially those of M. Zöppritz, proved that there is no diffusion of salt before congelation; it seems that in Lake Kupalnoye there is such a diffusion of salt towards the lower strata of water, even before the freezing be-

gins ; otherwise it would be difficult to explain how colder water might remain on the surface, were it not for the greater amount of salt in the lower strata. It was always difficult to explain, M. Woeikoff observes, how ice is formed on the surface of oceans, the temperature of the maximum of density being lower than that of the congelation ; but the question is complicated in oceans by many causes, and therefore M. Woeikoff asked M. Liston to make observations on a salt lake : but Lake Kupalnoye contains too much salt to be compared with oceanic water, and thus it would be desirable to make experiments on this subject on large tanks filled with salt water, and exposed during the winter in rough climates to the action of low temperatures and of radiation.

In the last number of the Geneva *Archives des Sciences Naturelles*, M. W. Meyer gives an account of the applications of the microtelephone in the Observatory of Geneva for the transmission of the beats of a clock to observers occupied in different rooms of the Observatory. The experiments have been carried on for eighteen months, and although at first there were many difficulties, satisfactory results have been reached. During last year all comparisons of clocks were made by means of the microtelephone, with the same accuracy as if they had been made directly. The average error of each observation does not exceed 0·06 of a second, and the constant error, deduced from fifty-nine series of observations, is very small (0·001 of a second). Another very interesting experiment was made in connection with the determination of longitudes between Vienna and Geneva, which was undertaken by MM. Oppolzer and Plantamour. By a new application of the microphone, M. Meyer caused the beats of the Observatory clock to be inscribed automatically on a chronograph ; and afterwards, by putting this clock into communication with the Vienna Observatory, he made it inscribe its beats automatically on both chronographs, at Vienna and at Geneva, avoiding thus the auxiliary movement which usually establishes the contact in electrical clocks, and may be a cause of inaccuracy. MM. Plantamour and Oppolzer, being both at the time in Vienna, were able to ascertain the accuracy of this new combination, and they afterwards made use of it for the comparison of the Geneva clock with the electrical chronometer. A few improvements in the microphone add very much to the accuracy of the signals and the ease with which they are transmitted to the chronograph.

On the sensitive surface of the body small spaces (it is known) can be distinguished within which two or more stimuli appear as one or simple ; these vary in size and form in different parts. The retina must here be included. Now, the rods and cones forming the mosaic of the retina were recently counted by Herr Salzer, and in the central and most sensitive part—the yellow spot, where are only cones—he found a hundredth of a square millimetre to contain 132 to 138 of these. Dr. Du Bois Reymond has lately tested by experiment the supposition that these elements correspond to the "circles of sensibility" for the retina. If so, the number of light-points which, on the same extent of retinal surface (0·01 sq. mm.) give separate visual impressions, should correspond to Salzer's number of cones. The manner of experiment was this : The observer looked through a tube, blackened interiorly towards a perforated screen which could be shifted in the line of a beam of reflected sunlight coming towards the eye. The screen had, in a frame, a piece of tinfoil 5 ctm. square, perforated regularly with a fine sewing-needle in 460 places. This, while looked at, was gradually withdrawn in the line of sight. A point is reached, at which the light-points tend to unite in short lines ; with further removal the lines are continuous, as in a grating ; and with still further, the distinction of lines is lost. The distances corresponding to such effects were noted, and again, in bringing the screen back. The results are considered to confirm the view under trial, viz. that the number of circles of sensibility in the yellow spot is equal to the number of cones. When there were seventy-four light-points (or half the number of cones) in 0·01 sq. mm., they could just be distinguished, and beyond 149 the lines disappeared.

In a recent number of *Naturen*, Prof. Axel Blytt concludes the highly interesting series of papers in which he has at some length expounded his theory of the immigrations into Norway of different floras during early dry and wet periods. On carefully examining the oldest Norwegian turf bogs, he finds, as Prof. Steenstrup has shown in Denmark, that four distinct turf layers may be traced between which there are frequently two, or even three, equally distinct deposits, composed of the roots and other remains of trees. The latter are found *in situ*, and by the undisturbed condition of the turf-beds above and below them they afford a conclusive proof that such severed trunks cannot have been cut down by human agency. These separate tree beds the author regards as mementoes of long periods of dryness, which may have endured for thousands of years, and during which the formation of turf was arrested, to be resumed again when a wet period supervened. Such interrupted periods of dryness and wet he considers to be closely related to the several long interrupted glacial periods, which, according to Geikie, have succeeded one another. In accordance with Herr Blytt's view the close of the first glacial age was followed by a dry period in which an Arctic flora appeared in Scandinavia, traces of which, as leaves of *Dryas octopetala* and *Salix reticulata*, have been found in the clay underlying the bogs in Denmark and Southern Sweden, in the latter of which the same flora is to be seen interposed between two ancient moraines. The boreal flora, the author is of opinion, we may refer to a dry period, characterised by great summer heat ; and in the deposits belonging to this age we find abundant remains of such deciduous trees as, *e.g.* the hazel and the *Prunus avium*, which are now of rare occurrence in Norway, while many other vegetable forms represented in these beds have been long extinct. The differences observable in the bogs of Denmark and Norway Herr Blytt refers to the fact that while the former has undergone very little if any alteration of elevation, the latter has risen since the glacial age 600 feet above the level of the sea. In Norway the formation of the turf beds may be gauged by their varying elevations. Thus in South-East Norway, where the old sea-level has been raised to a height of 600 feet, the turf is from 20 to 26 feet deep, while at low levels, as 30 feet above the strand, the bogs are seldom more than from 2 to 4 feet deep. The author believes that we are justified in expecting that a more careful working out of the theory of the alternation in early times of dry and wet periods will help to elucidate many hitherto unexplained geological and botanical relations, including the distribution of plants ; and he considers it probable that the temperature of the ocean, on which climate so largely depends, may similarly be subjected to periodic changes dependent on cosmical laws not less firmly fixed than those which control the movements of the planetary worlds.

We have received from the editor of the *Natural History Journal* various forms for the entry of observations on meteorology and natural history, which are issued to their correspondents in different parts of the country, the meteorological forms being returned to Mr. J. E. Clark, 20, Bootham, York, while those referring to natural history are communicated to Mr. F. A. Lees, Wetherby, Yorkshire. The proposed meteorological observations are fairly satisfactory as regards the natural phenomena in connection with which they are made. The mean date of flowering of each of the thirty selected wild plants for the last three years is given, a feature in the forms well calculated to awaken and sustain the interest of the observers. By these observations carefully made and recorded from year to year,

important data will be collected of no little practical and scientific value.

THE Perthshire Natural History Society has had a most successful bazaar in aid of its Natural History Museum, for which it has now secured in all 3300*l*. As they already have a building, the Society ought soon to be able to show an excellent local museum, and make a fair start in the educational enterprise which they have in view. Did "John Stewart's Wines and Spirits," "B. Smith's Sparkling Burgundy," "Peter McIntyre's Buns and Shortbread," "Donald Laing's 2*s*. Tea of Extraordinary Quality," and such like articles, form part of the exhibits at the bazaar? We would infer as much from the style in which the programme is printed.

THE fifth associated *soirée* of the Literary, Scientific, and Art Societies of Liverpool took place on the 21st inst. at St. George's Hall, under the presidency of the Mayor of Liverpool. Of the societies represented, no less than nineteen have distinctly scientific objects, and number 2700 members. In the objects exhibited in the Great Hall were many of considerable biological and geological interest, especially entomological specimens from the neighbourhood of Liverpool, collected by the Rev. H. H. Higgins, and a set of types of the genus *Nassa*, arranged and named by Mr. F. P. Marrat, of the Free Museum, who has done much to elucidate this group of Mollusca. Numerous lectures were given during the *soirée;* those of scientific interest were—"On the Storage and Transmission of Electric Force," by Mr. Fletcher, H.M. Inspector of Alkali Works; "On the Mersey Tunnel, and its Geological Aspects," by Mr. De Rance, H.M. Geological Survey; "On Life at Great Depths in the Ocean," by Prof. Herdman; "On the Life-History of Shell-Fish," by Dr. Hicks. Prof. Herdman described several new forms of life obtained by the *Challenger*, while Mr. De Rance foretold a probably successful termination to the Mersey Tunnel, now one-quarter completed. Nearly 4000 people attended the *soirée*.

WE are glad to see that a Natural History Society has been established in North London, under the name of the "North Middlesex Natural History Association." A Society of this description was much needed in the neighbourhood, and there is, therefore, every prospect of its doing useful work. The objects of the Association will be the formation of a natural history museum, and a library for reference and circulation among members: also the diffusion of natural history knowledge by means of lectures, papers, discussions, &c. It is also proposed to organise field excursions during the summer months. The meetings are held every Tuesday evening between the hours of eight and eleven o'clock p.m. The Secretary is Charles M. Allen, 26, Ingleby Road, Grove Road, Holloway, N.

THE President of the Royal College of Physicians has appointed Dr. George Johnson, F.R.S., to deliver the Harveian Oration.

THE balloon which was seen in the neighbourhood of Santander in Spain, and which was conjectured to be that in which Mr. Powell was carried off, was probably, according to M. W. de Fonvielle, a French meteorological balloon, sent up by the Paris aëronauts equipped to register the phenomena of the upper atmosphere, and with a polyglot request that it be forwarded by the finder to the address given.

TWO earthquake shocks were felt on the 18th inst. in Switzerland, at Bers, Vevey, Lausanne. A few days previously oscillations were observed in Neuchatel, the Valais, and other parts of Switzerland.

THE long-continued eruption of Mount Vesuvius has within the last few days assumed large proportions. Copious streams of lava have been flowing in an easterly direction. It is noteworthy that this increased activity was preceded by sensible seismic agitation of the soil in the neighbouring provinces.

THE new number of the *Proceedings* of the Bristol Naturalists' Society (vol. iii. part ii., Bristol, Fawn and Son) contains some useful papers. We may mention the following:—On the breathing of aquatic larvæ, by W. J. Fuller; On the preparation of a local flora, by J. Walter White; The boulders of the Bromsgrove district, by Oliver Giles; Catalogue of the Lepidoptera of the Bristol district, by A. E. Hudd; Fungi of the Bristol district, by Cedric Bucknall; A naturalist's rambles in Guernsey, by Adolph Leipner; Recent investigations on the cause of storms, by G. F. Burder; papers on Binaural Audition and the Phenautograph, by Prof. S. P. Thompson; and the flora of the Bristol coal-field, by J. Walter White, Part I. Thalamifloræ.

A REPORT from the German Fisheries Union states that during the season 1880–81 no less than 6,151,036 fish ova were artificially hatched, and with the young brood various German rivers were stocked. Amongst them were 1,792,000 salmon, all from the Rhine (with the exception of 18,000 from Pomerania), 295,000 Californian salmon (imported direct from America), 183,500 sea trout (*Trutta trutta*), 6000 *Trutta lacustris*, 46,000 *Trutta fario*, 270,000 *Salmo salvelinus*, 48,536 American trout, 152,000 *Thymallus vulgaris*, 657,000 *Gymnothorax muræna*, 1,810,000 *Coregonus Wartmanni*, 335,000 eels, 151,000 American eels, and 720,000 carp. The results of the Society's efforts become more and more apparent every day in the largely augmented receipts of German fisheries generally.

ON Wednesday, December 21, diplomas of the Royal Agricultural College, Cirencester, were granted to four candidates, and the sessional certificates and prizes distributed.

ON April 10, 1882, the second International Congress for Ethnographical Sciences will be opened at Geneva. The organisation of the Congress is in the hands of M. G. Becker at Lancy (Geneva), the delegate of the Swiss Ethnographical Institute. All who wish to participate in the Congress must send their names to him or to the delegates of the countries they may reside in. The Congress will be divided into seven sections:—(1) Origin and migrations of peoples; (2) Ethnology; (3) Descriptive ethnography; (4) Theoretical ethnography; (5) Manners and customs; (6) Political ethnography; (7) International law. Delegates have already been announced from the following countries:—France, Belgium, England, Luxemburg, Sweden and Norway, Russia, Germany, Roumania, Greece, Italy, Spain, Portugal, Switzerland, Turkey, Egypt, British India, Japan, Canada, the United States, Peru, Australia, and the Argentine Republic.

THE *Transactions* of the Epping Forest Field Club contain some unusually interesting papers. In parts 4 and 5, for example, vol. ii., we have, among others, the following papers: "Is *Vanessa polychloros* the prototype of *Vanessa urticæ*?" by W. White; "The Evolution of Fruit," by Prof. Boulger; "The Developmental Character of the *Larvæ* of the Noctuæ, as Determining the Position of that Group," by Raphael Meldola; "Infusoria, what are They?" by W. Saville Kent; "Report on the Excavation of the Earthwork known as Ambresbury Banks, Epping Forest, by Gen. Pitt-Rivers." Evidently this young Society is doing good work.

THE additions to the Zoological Society's Gardens during the past week include a Malbrouck Monkey ♀ (*Cercopithecus cynosurus*) from West Africa, presented by Mr. C. A. Rose; a Chilian Teal ♂ (*Querquedula creccoides*) from Chili, presented by M. J. M. Cornely; a Kite (*Milvus ictimus*), European, pre-

sented by Mr. G. H. Tod-Heatley; a Rhesus Monkey ♀ (*Macacus erythræus*) from India, a Greater Sulphur-crested Cockatoo (*Cacatua galerita*) from Australia, deposited; a White-browed Amazon (*Chrysotis albifrons*) from Honduras, a White-headed Parrot (*Pionus senilis*) from Mexico, a Javan Parrakeet (*Palæornis javanicus*) from Java, two Chestnut-breasted Ducks (*Anas castanea*, ♂ ♀) from Australia, a Germain's Peacock Pheasant ♂ *Polyplectron germaini*) from Cochin China, a Black-throated Diver (*Colymbus arcticus*), two Oyster-catchers (*Hæmatopus ostralegus*) British, a —— Deer ♂ (*Cervus* sp. inc.) from Patagonia, purchased; four Undulated Grass Parrakeets (*Melopsittacus undulatus*) bred in the Gardens.

OUR ASTRONOMICAL COLUMN

THE SATELLITES OF MARS.—The following Greenwich times of elongations of these satellites are taken from an ephemeris contributed by Prof. Pritchett to *Science* of November 26. At elongation *Deimos* is distant about 52″ from the planet's centre and *Phobos* about 21″; the angle of position, 246°. 5h. 13m. are added to the Washington mean time, for difference of longitude and aberration-time:—

Deimos.

h. m.	h. m.	h. m.
Dec. 30, 11 57 W.	Jan. 2, 15 36 E.	Jan. 4, 13 0 W.
Jan. 1, 9 20 E.	3, 6 44 W.	6, 10 24 E.

Phobos (W. elongations).

h. m.	h. m.	h. m.
Dec. 30, 8 16	Jan. 2, 12 46	Jan. 5, 9 38
31, 7 13	3, 11 44	6, 8 36
Jan. 1, 6 10	4, 10 41	7, 7 33

COMET 1881 *g* (SWIFT, NOVEMBER 16).—From observations between November 22 and December 12, Herr J, Palisa has calculated the following orbit of the comet: we express the elements in the form usual in the Catalogues:—

Perihelion passage 1881, November 19·9987 Greenwich M.T.

	°	″	′	
Longitude of perihelion	63	17	57	M. Eq. 1881·0.
,, ascending node	181	21	41	
Inclination	35	11	54	
Log. perihelion distance	0·284788			

Motion—retrograde.

There is still a certain resemblance to the orbit of the first comet of 1792, discovered by Miss Caroline Herschel, as last calculated by Mechain, but the differences in the elements would not be accounted for by perturbation in the interval, so that it is probable the comets are distinct. Maskelyne's observations in 1791-92 will be found in his third volume in a form that will admit of a new reduction.

THE COMETS OF SHORT PERIOD.—No one of the known comets of short period is due at perihelion in the year 1882. The next to return may probably be that discovered by Tempel in July 1873, at the end of the year 1883, and about the same time D'Arrest's comet will be round again. Brorsen's comet follows in the autumn of 1884.

VARIABLE STARS.—The following are Greenwich times of heliocentric minima of Algol, calculated upon similar data to those used for Prof. Winnecke's ephemeris for 1881:—

h. m.	h. m.	h. m.
January 3, 16 18·9	January 12, 6 45·5	January 29, 11 38·9
6, 13 7·7	23, 18 1·1	February 1, 8 27·8
9, 9 56·6	26, 14 50·0	

Minima of S Cancri occur on January 19, at 13h. 1m., and February 7, at 12h. 16m. A maximum of the "crimson star" R Leporis may be expected about January 19; the period from the last fifteen years' observations is close upon 436½ days.

We may once more draw attention to the star with which Encke's comet was compared by Rümker at Paramatta on June 19, 1822, and which is certainly variable to a considerable extent. Rümker estimated it between the fourth and fifth magnitude; Gould says 6·0 in the *Uranometria Argentina;* the star is 6·5m. in the *Durchmusterung*, but has been several times noted as low as the eighth magnitude: perhaps systematic observation may show that the period is not a long one. The position of this star for 1882·0 is in R.A. 7h. 23m. 21s., N.P.D. 91° 39′·8.

GEOGRAPHICAL NOTES

INFORMATION has been received from Tromsoe which augurs well for the success of Mr. Leigh Smith's present voyage. Capt. Isaaksen, of the Norwegian whaler *Proven*, saw the *Eira* on June 30 at Matushin Straits at the edge of the ice, a few miles from the coast. On July 2 he again saw the *Eira* steaming southward, and he concludes that Mr. Smith failed to force his way along the coast of Nova Zembla. It is supposed that he again failed to pass Kara Straits, as he was afterwards seen bearing north from Gooseland. Capt. Isaaksen says that the ice was in about its usual position in June and July, but on August 8 it had all gone, he did not know where or how. On the 16th of that month there was no ice twenty miles north of Nova Zembla, but a heavy sea was running from the north. This conclusively shows that the sea was open for a very considerable distance, probably as far as Franz Josef's Land, which Capt. Isaaksen feels certain Mr. Smith has reached, and in such circumstances he would not be astonished if tidings came of his having reached a point very much nearer the North Pole this year. As might have been expected, the Russian Government and Mr. Gordon Bennett are doing everything possible to succour the people of the crushed *Jeannette*; we hope they will soon be all safe in Western Europe.

DR. STECKER, the companion of Dr. G. Rohlfs, writes on June 21 to the editor of *Petermann's Mittheilungen*, from Debra Tabor, on the results of his last journey to Lake Tana. He has explored all the lake, visited the mountains on its shores, and prepared a detailed map of this basin, which covers a surface of 2980 square kilometres, the level of which is 1942 metres above the sea, and which is 30 to 72 metres deep. The map will be the more welcome as Dr. Stecker says that all former maps of the Gorgora Mountains, situated north of the lake, and of its southern shores, are quite wrong. Dr. Stecker is satisfied with the reception he received during his journey from the native rulers, and especially from the Negus, who promises to let him go to Kaffa. During his stay at Lake Tana Dr. Stecker made interesting collections of plants, insects, fishes, and molluscs, and he discovered in the Gorgora Mountains unmistakable proofs of volcanic activity: eruptive cones, a crater, and a mighty lava stream, all probably recent, as in the volcanic rocks, he has found inclosed remains of a mollusc which still inhabits the waters of Laka Tana. After the end of the rainy season he proposes to explore the negro tribes who live west of Lake Tana, and then to travel either to the mouth of the Juba River or to Zanzibar *viâ* Lake Samburu, Mounts Kenin and Kilimangaro.

THE expedition led by Lieut. Holm, and sent out early in the summer by the Copenhagen Commission for the geological and geographical investigation of Greenland, has just returned. The expedition proceeded to the southernmost part of Greenland; they succeeded in circumnavigating the large islands on the southern coast, and in determining the exact position of Cape Farewell. The land itself was investigated as far as line drawn from the Tasermint Fjord on the west coast, to the Lindenows Fjord on the east coast. It contains magnificent alpine scenery with enormous glaciers, particularly on the western side. The low-lying eastern part is covered with a layer of ice and snow, which forms hills and valleys, following the soil underneath; here and there mountain peaks rise above the immense winter landscape.

THE *Oesterreichische Monatsschrift für den Orient* for November contains a paper by von Hellwald on the Gilyaks of Eastern Siberia. They inhabit the districts of the Lower Amour, the coast of the Straits of Tartary, and the northern part of Saghalin. Estimates of their numbers vary from 8000 to 3000. Col. Wenjukow thinks they form a special branch of the yellow race, but not a subdivision of the Tungusic stock. Their language, he says, has no resemblance to the Tungusic, and their physiological structure betoken a more powerful and energetic race than the neighbouring Magunes, Samagry, &c. Ravenstein also distinguishes the Gilyak tongue, which is rich in monosyllables, from the Tungusic, and others distinguish it from the Aino, with which it has been sometimes connected. They are said to have oblique eyes, prominent cheek-bones, and scanty beards; the

hair is dark and thick, the nose flat, and the chin pointed. A skull which Barnard Davis succeeded in sending to England was found to have a capacity of 1638 cubic centimetres, with horizontal and vertical indices of 77·3 and 78·3 respectively. They have the reputation of being a bloodthirsty and inhospitable people, but they have now succeeded better than any of the neighbouring tribes in drawing closer to the Russians. They frequently change their paganism for the Russian Orthodox Church. The Japanese, with whom they traded in the southern part of Saghalin, have had no great influence over them. Sometimes they live in houses which are built on piles raised some distance above the ground, with a platform, or balcony around, on which they lay their sledges, nets, &c. From the roof are suspended hundreds of salmon, put there to be smoked and dried. The men pass most of the time away from their families, fishing or hunting. They are especially fond of the dolphin, but as they have but bad weapons of the chase, they rarely succeed in catching this fish. When they do, however, the occasion is kept as a festival. As with most of the aborigines of North-Eastern Asia, they reverence the bear as a divinity, but it is nevertheless almost invariably slaughtered. Their proceedings at the festival of the bear resemble those of the Ainos of Yezo, drunkenness being the order of the day. The religion of the Gilyaks is Shamanism with all its superstitions. They will allow no one to take a spark of fire, even in a tobacco-pipe, from their huts, believing that ill-luck and misfortune will follow. The bodies of the dead are burned, and a small house erected above the ashes, while a favourite hound is slaughtered on the grave. The Gilyaks in Saghalin differ in some respects from those on the mainland. Their mode of living differs little from that of the Ainos. Marriage is not permitted among members of the same family; wives are purchased, but also captured. The Japanese traveller, Mamia Rinso, who thoroughly examined the whole of Saghalin and the neighbouring coast about the beginning of this century, says that polyandry existed amongst them. They are the most superstitious of all the Tungusic tribes in the Amour region, as well as the most cruel in their customs.

THE United States war-steamer *Palos* has been engaged for some time past, by order of the American Government, in carrying out a series of observations in China and Japan with the object of ascertaining the correct latitude and longitude of certain important points. The position of Wladivostock was determined by Russian engineers some years ago, and the object of the present expedition is to settle those of the chief centres between that place and Madras, *e.g.* Nagasaki, Amoy, Shanghai, Hongkong, and Singapore. The positions of the first three have been determined, and it is said do not show any great discrepancy with those hitherto accepted.

THE December number of the Geographical Society's *Proceedings* opens with Mr. F. A. A. Simons' paper on the Sierra Nevada of Santa Marta and its watershed, accompanied by a good map of the region from his own survey. Mr. Delmar Morgan contributes a paper on steppe-routes from Karshi to the Amu-daria, being an annotated rendering of one by M. Maief in the Russian Geographical Society's *Isvestia*. In the Geographical Notes the new Russo-Chinese frontier is described, and there is an interesting note on the old map of Djungaria by the Swede Renat, recently discovered in the library of Linköping. M. Wiener's discovery of the Samiriá tributary of the Upper Marañon is also referred to, and it is stated that he has constructed a map of this almost unknown region. Perhaps the most interesting item in the whole number is the short letter from Capt. Gray, of Peterhead, on the recent advance of the Polar ice in the Greenland and Spitzbergen Sea, with its accompanying ice-chart. A long report on the Venice Congress and Exhibition is furnished by Capt. A. W. Baird, R.E., and is the only one, so far as we know, which has yet been published.

THE last *Bulletin* of the Commercial Geographical Society of Bordeaux contains some notes on M. Ch. Wiener's extensive explorations on the tributaries of the Upper Amazon by a Peruvian, Sr. M. Albornoz, and observations by M. Raeckelboom on the country, &c., between Susa and Kairwan.

DR. LENZ ON THE SAHARA

IN a paper which Dr. Oscar Lenz contributes to the *Zeitschrift* of the Berlin Geographical Society, he gives an authentic account of the results of his journey across the Sahara, from Tanger to Timbuktu, and thence to Senegambia. The real journey was begun at Marrakesh, at the northern foot of the Atlas Mountains, where Dr. Lenz laid in his stores of provisions and changed his name and dress, travelling further under the disguise of a Turkish military surgeon. He crossed the Atlas and the Anti-Atlas in a south-western direction. The Atlas consists, first, of a series of low hills belonging to the Tertiary and Cretaceous formations, then of a wide plateau of red sandstone, probably Triassic, and of the chief range which consists of clay-slates with extensive iron ores. The pass of Bibauan is 1250 metres above the sea-level, and it is surrounded with peaks about 4000 metres high, whilst the Wad Sus Valley at its foot is but 150 metres above the sea. The Anti-Atlas consists of Palæozoic strata. On May 5, 1880, Dr. Lenz reached Tenduf, a small town founded some thirty years ago, and promising to acquire great importance as a station for caravans. The northern part of the Sahara is a plateau 400 metres high, consisting of horizontal Devonian strata which contain numerous fossils. On May 15 Dr. Lenz crossed the moving sand-dunes of Igidi, a wide tract where he observed the interesting phenomenon of musical sand, a sound like that of a trumpet being produced by the friction of the small grains of quartz. But amidst these moving dunes it is not uncommon to find some grazing-places for camels, as well as flocks of gazelles and antelopes. At El Eglab Dr. Lenz found granite and porphyry, and was fortunate enough to have rain. Thence the character of the desert becomes more varied, the route crossing sometimes sandy and sometimes stony tracts or sand-dunes, with several dry river-beds running east and west between them. On May 29 he reached the salt works of Taudeni, and visited the ruins of a very ancient town, where numerous stone implements have been found. Here he crossed a depression of the desert only 145 to 170 metres high, while the remainder of the desert usually reaches as much as 250 to 300 metres above the sea-level; and he remarks that throughout his journey he did not meet with depressions below the sea-level. The schemes for flooding the Sahara are therefore hopeless and misleading. The landscape remained the same until the wide Alfa fields, which extend north of Arauan. This little town is situated amidst sand-dunes devoid of vegetation, owing to the hot southern winds. Four days later Dr. Lenz was in Timbuktu, whence he proceeded west to St. Louis. During his forty-three days' travel through the Sahara Dr. Lenz observed that the temperature was not excessive; it usually was from 34° to 36° Celsius, and only in the Igidi region it reached 45°. The wind blew mostly from north-west, and it was only south of Taudeni that the traveller experienced the hot south winds (*edrash*) of the desert. As to the theory of north-eastern trade-winds being the cause of the formation of the desert, Dr. Lenz remarks that he never observed such a wind, nor did his men; it must be stopped by the hilly tracts of the north. Another important remark of Dr. Lenz is what he makes with respect to the frequent description of the Sahara as a sea-bed. Of course it was under the sea, but during the Devonian, Cretaceous, and Tertiary periods; as to the sand which covers it now, it has nothing to do with the sea: it is the product of destruction of sandstones by atmospheric agencies. Northern Africa was not always a desert, and the causes of its being so now must be sought for, not in geological, but in meteorological influences.

SCIENTIFIC SERIALS

Journal of Anatomy and Physiology, vol. xvi., part 1, October, 1881, contains—Dr. D. J. Cunningham, on the relation of nerve-supply to muscle-homology.—Dr. Gibson, the action of duboisia on the circulation.—J. F. Knott, the cerebral sinuses and their variations.—Dr. G. Barling, primary growth from bone, resembling in some of its features scirrhus carcinoma of the breast.—Doctors George and F. Elizabeth Hoggan, the comparative anatomy of the uterine lymphatics (plates 1 and 2).—Dr. H. Ashby, transposition of the aorta and pulmonary artery in a child of seven months.—Dr. W. Stirling, some points in the histology of the newt, and on the nerves of the lungs of the newt (plates 3 and 4).—Dr. Garson, on pelvimetry (plate 5).—Prof. Turner, cranial characters of the Admiralty Islanders.—Report on physiology, and anatomical notes.

The American Naturalist for November, 1881, contains: W. K. Higley, on the general and microscopical characters of the peach tree affected with the "yellows."—W. H. Dall, on the so-called Chukchi and Namolló people of Eastern Siberia.—W. H. Edwards, the length of life in butterflies.—H. D. Minot notes on the migrations of birds.—V. Havard, on Sotol.—E,

D. Cope and A. S. Packard, jun., on the fauna of Nickajack Cave. Many miles were explored, and no end reached. The invertebrate fauna of the caves proved very considerable, and several new species are described and figured; one of the most interesting is the blind crayfish (*Orconectes hamulatus*, Cope).—Recent Literature, Scientific News, &c.

Rivista Scientifico-Industriale, No 18, October 15.—Malfatti's fossil Italian insects.—On the rectification of the cycloid, by Prof. Dainelli.

Verhandlungen der k.k. geologischen Reichsanstalt, No. 14, September 30.—Inclosures of foreign stones in crystalline limestone, by T. Fuchs.—Picrite-porphyry of Steierdorf, by E. Hussak.—On tentaculites, by O. Novak.—A note on the diluvium of Masenderan in Persia, by E. Tietze.—Travellers' reports.

Journal of the Asiatic Society of Bengal, vol. l. part 2, No. 3, 1881 (October 22).—Geoffrey Nevill, on new or little-known mollusca of the Indo-Malayan fauna (plates 5 to 7).—Dr. O. Feistmantel, a sketch of the history of the fossils of the Indian Gondwána system.—Prof. V. Ball, additional note on the identification of the ancient diamond mines visited by Tavernier.—J. Wood-Mason and Lionel de Nicéville, list of diurnal Lepidoptera inhabiting the Nicobar Islands.

Revue des Sciences Naturelles, tome 1, série 3e, No. 1, September, 1881, contains:—P. Gazalis de Fondouce, on Tertiary man in Portugal.—Prof. S. Berggren, on the prothallus and on the embryo of Azolla (plate 1).—G. M. Viguier, studies on the formation of tufas of the present epoch.—Dr. P. Amans, anatomical and physiological researches on the larva of *Æschna grandis* (plate 2).—Account of the Zoological Station at Cette.

Revue internationale des Sciences biologiques, October, 1881, contains:—M. Bochefontaine, on the effects of the obstruction of the coronary arteries on the heart's action.—Jules Soury, on the modern doctrine of hylozoism (the doctrine which considers matter as living).—Prof. Hanstein, protoplasm considered as the basis of animal and vegetable life.—Dr. W. Roberts, on the digestive ferments.

THE last number of the *Journal* of the Russian Chemical and Physical Society contains, besides the minutes of proceedings, papers by Prof. Menshutkin, on the etherification of polybasic acids; on the bromides of vinyle, and on cholic acid, by M. Kutcheroff; on the affinities of sulphur with metals, and on the means of discovering cadmium in presence of copper, by M. Orlovsky; and on the potential of hydrostatic pressures, by M. Latchinoff.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 8.—"On the Coefficients of Contraction and Expansion by Heat of the Iodide of Silver AgI; the Iodide of Copper Cu_2I_2; and of five Alloys of these Iodides," by G. F. Rodwell, F.R.A.S., F.C.S., Science Master in Marlborough College.

The experiments herein described are a continuation of those relating to the anomalous expansion by heat of certain iodides, published at intervals during the last five years in the *Proceedings* of the Royal Society. New determinations of the coefficients of iodide of silver are given. Certain physical and chemical properties of cuprous iodide are detailed, and its coefficient of expansion is determined. Five compounds or alloys were prepared, and their physical characteristics examined. They possessed the following composition, and percentage of iodide of silver:—

Composition.	Percentage of Iodide of Silver.
$Cu_2I_2.AgI$	38·2233
$Cu_2I_2.2AgI$	55·3066
$Cu_2I_2.3AgI$	64·9884
$Cu_2I_2.4AgI$	71·2225
$Cu_2I_2.12AgI$	88·1304

They are compared with the five chlorobromiodides of silver previously examined by the author (*Proc.* Roy. Soc. vol. xxv. p. 303), and with the lead-silver iodide alloy last described (*Proc.* Roy. Soc. vol. xxxii. p. 540).

The following are some of the results observed in connection with the new copper-silver iodide alloys:—

"1. The specific gravity varies but slightly, viz. from 5·7302 to 5·6950, and is a little above the mean specific gravity of the constituents."

"2. The melting points are in all cases much lower than that of either iodide of silver or iodide of copper, for while the former is 527° C., and the latter 601° C., the highest melting-point of any one of the alloys is 514° C., and the lowest 493° C.

"3. Some of the alloys possess three points of similar density, and some two, at different temperatures. They are resinous in fracture, and transparent in thin layers. When pulverised they furnish brilliantly yellow powders, unaffected by light.

"4. When heated in a current of carbonic anhydride they volatilise very slowly. Heated in dry oxygen iodine is freely evolved, and oxide of copper appears on the surface of the mass. When heated in dry hydrogen hydriodic acid is produced, and the metal is reduced.

"5. The coefficients of expansion of the alloys below the point at which contraction on heating commences, was found to decrease as the percentage of iodide of silver was augmented.

"6. While the iodide of silver commences its considerable contraction at 142° C., the five chlorobromiodides of silver, the percentage of iodide of silver in which varies from 26·1692 to 73·9285, and the lead-silver iodide alloy, the percentage of iodide of silver in which amounts to 33·794, all commenced their contraction at 124° C., that is 18° C. lower, although the coefficients of expansion of the associated bodies necessarily differ. Thus it would appear that 124° C. is the temperature at which iodide of silver commences its passage from the crystalline into the amorphous condition when freed from the attraction of its own molecules, provided no other attraction or influence supervenes; while the attraction exerted when it exists unalloyed with any other substance, and when its molecules are hence much nearer to each other, raises the point at which the change commences to 142° C.

"7. When the same result was looked for in the case of the copper-silver iodide alloys, it was not found. In fact the presence of the iodide of copper, instead of promoting the assimilation of molecular motion and lowering the point at which the change from the crystalline into the plastic condition commences was found to considerably raise it; although the coefficient of expansion of the iodide of copper is lower than that of either chloride or bromide of silver or of the iodide of lead which enter into the composition of the other alloys. Thus:

Percentage of iodide of silver in the copper-silver iodide alloys.	Temperature at which contraction on heating commences.
38·2232	284° C.
55·3066	233°
64·9886	214°
71·2225	199°
88·1304	153°

Hence while 66·206 per cent. of iodide of lead lowered the point of change 18° C., the presence of 61·7767 per cent. of iodide of copper raised it 142° C."

A general discussion of the results is given and the special properties of the alloys described.

Linnean Society, December 15.—G. Busk, F.R.S., in the chair.—Prof. T. S. Cobbold exhibited a large guinea-worm (*Dracunculus*) taken from a pony, and forwarded by Vet. Surg. Frederick Smith from Madras. Only one previous instance of the occurrence of this parasite in the horse has been mentioned, and its authenticity was doubted by Fedschenko and other helminthologists.—Mr. G. S. Boulger brought before the meeting a set of large papier-maché models of insectivorous plants made at Breslau by Herr Brendel under the superintendence of Prof. Cohn. Mr. Boulger explained their adaptation for teaching purposes, and made special referenre by a diagram to the various stages and physiological distinctions of these plants, viz. from simple viscidity of surface to the more complex apparatus in Dionæa and Aldrovanda.—Mr. T. Christy called attention to a volume of the Annual Report of the Commissioner of Agriculture, Washington, U.S. (1879), wherein was embodied much valuable information on the insects and parasites destructive to crops, &c.—Prof. Duncan thereafter gave the gist of a paper on the morphology of the test of the Temnopleuraidæ.—A paper by Dr. Maxwell Masters followed, dealing with a new species of cotton (*Gossypium Kirkii*) from East Tropical Africa. It has an interest historically from being probably the origin of very numerous cultivated varieties. It was obtained by Sir John Kirk growing wild at Dar Salam. Dr. Masters regards it as most nearly allied to *G. barbadense*, which is most

commonly cultivated in tropical Africa; though along the Nile valley *G. herbaceum* is that usually in cultivation. According to authorities, cotton was not cultivated in Egypt in ancient times, and the fact that the varieties now grown there are for the most part forms of *G. herbaceum*, suggests the idea that India is the source whence Egypt has derived the cotton—a notion confirmed by various other considerations. The wild form of *G. herbaceum*, Dr. Masters has previously shown, is probably *G. Stocksii*, Masters, a native of Scinde.—A note on *Abies Pattonii*, Jeffrey, MS. 1851, by Prof. W. R. McNab, was then read. The author mentions that the trees known as *A. Hookeriana* and *A. Pattonii* have been a source of confusion to botanists and horticulturists. Andrew Murray, in 1855, in describing a New North American pine, mixed up the leaf of *A. Pattonii*, Balf., from Mount Baker, with the cone of *A. Hookeriana* from Scots Mountain, Oregon, originally collected by Mr. John Jeffrey. Dr. McNab, in unravelling the error, proposes that as Jeffreys, No. 430, from the Cascade Mountains, named by Balfour *A. Pattonii*, in the Oregon Circular, was unpublished, it should now be referred to *Tsuga Hookeriana*, and the Mount Baker tree he regarded as *T. Pattoniana*.—There followed a paper by Dr. G. E. Dobson, on the digastric muscle, its modifications and functions; and thereafter the eleventh part of the Mollusca of the *Challenger* Expedition, by the Rev. R. Boog Watson, was read in abstract.—Messrs. W. H. Coffin, E. Milner, and S. H. Parkes were balloted for and elected Fellows of the Society.

Mineralogical Society, December 14.—W. H. Hudleston, F.G.S., President, in the chair.—Messrs. H. Baker, F.C.S., and R. Fleming, were elected Members.—The following paper was read:—On some minerals from the sodalite syenite of Julianshaal District, South Greenland, by Johann Lorengen; communicated by Prof. Johnstrup.—Mr. Baring Gould and Mr. Porter Rhodes, who were present as visitors, gave an account of the diamond mine of Kimberley, South Africa, illustrated by photographs of the workings and by numerous specimens, which gave rise to an interesting conversation.

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Academy of Sciences, December 19.—M. Wurtz in the chair.—The following papers were read:—Proofs of the recent formation of the Mediterranean, by M. Blanchard. In the nature and relations of plant species in places more or less apart he seeks evidence regarding changes that have occurred in the configuration of the land. Were the banks of the Mediterranean brought together one might pass from Europe into Africa or into Asia without any trait of nature making one aware of it. Now as very moderate obstacles prevent a dissemination of many plants and animals, the Mediterranean would be absolutely uncrossable by most living species. It is inferred that the sea has been formed in the present age of the earth, when the animals and plants on the coasts were under the same conditions as now. The recent study of the marine fauna, proving that there are few species in the depths, and those present are probably from the Atlantic, is thought confirmative. M. Milne Edwards considered the uniformity of natural productions explained rather by the recent existence of two isthmuses between the northern and southern banks of an older sea, one between Sicily and Tunis, the other between Spain and Morocco. The Mediterranean has probably not been in communication with the Indian Ocean since the Miocene epoch. M. Daubrée also declined, on geological grounds, to accept M. Blanchard's conclusion.—Observations on the decomposition of metallic formiates in presence of water, by M. Berthelot.—On the principle of surfaces of separation, by the same.—M. de Lesseps presented maps and plans of the project of a railway between the Niger and theSoudan, by the Fonta-Djallon. The Fonta-Djallon presents a central plateau 350 km. from the coast and 1000 m. in altitude; five parallel valleys run from it to the coast. The iman of Timbo (in that region) is friendly.—Researches on the fundamental laws of electrodynamics, by M. Le Cordier. This mathematical memoir was deposited as a sealed packet in September.—On a means of preventing the development of phylloxera by turfing the ground in the intervals of the vine-stocks, by M. Bidauld. This proposal is based on the facts that heating of the ground is very favourable to hatching of the apterous, and still more of the winged phylloxera, and that according to MM. Becquerel, bare ground requires in summer a much higher temperature than turfed ground.—Ephemerides of the planet (217) Eudore (continued), by M. Callandreau.—On the introduction of logarithms in criteriums, which determine an upper limit of the number of roots of an equation which are comprised between two given numbers, by M. Laguerre.—On a differential equation of the form $f\left(u\frac{du}{dz}\right)=0$, by M. Fuchs.—On functions irreducible according to a prime modulus, by M. Pellet.—Theorem of arithmetic, by M. Weil.—Amplitude of diurnal oscillation of the magnetic declination obtained at the Observatory of the Charles Albert Royal College, at Moncalieri, in the years 1879 and 1880, by M. Denza. In agreement with previous data (1871-78) the minimum occurs in the winter months, and the maximum in summer. The values for the summer months are very variable. The mean annual values for the two years are both superior to that for 1878, which, indeed, is the smallest in the period 1870-1881; the minimum seems to have been passed then, or rather between 1877 and 1878.—On the method of M. Lippmann for determination of the ohm, by M. Brillouin.—History of the process employed for direct coppering of cast iron, by M. Weil. He maintains his rights and priority in the invention. His patents date from 1863.—On the diffusion of solids in solids, by M. Colson. When, *e.g.* in a reducing atmosphere, an iron plate is heated in lampblack, not only does carbon pass into the iron, changing it successively into steel and cast iron, but notable quantities of iron are diffused in the carbon. This will occur at a temperature below red. At a low temperature the iron is more easily diffused in the carbon; at a high, the reverse is the case. Nothing of the kind occurs with platinum. For two solids to diffuse into each other, there must be affinity, or more generally, they must react on each other. M. Colson illustrates this, and he describes an experiment establishing the law of the diffusion.—On the temperature of combustion, and on the dissociation of carbonic acid and of aqueous vapour, by MM. Mallard and Le Chatelier.—On chromocyanide of potassium, by M. Moissan.—On the decomposition of metallic formiates in presence of water; production of some crystalline mineral species, by M. Riban.—On a new sub-class of Infusoria, by Mr. Geddes. This relates to curious, small, curved, pear-shaped cells found in the mesoderm of the Planarian *Convoluta;* they have a large central vacuole, and in the wall of this a row of fibrillæ, which, when the cell is in water, are in rapid rhythmic contraction, altering its shape. When in the animal's body, the cell shows but slight contraction. The author thinks these cells parasitic infusoria, and proposes for them the name *Pulsatella convolutæ;* a fourth sub-class, *Pulsatorians*, being here represented.—On a new type of Turbellaria, by M. Silliman. This was got at Roscoff; it is parasitic on a green parasitic nematoid. It is intermediate between Turbellaria and Trematoda, and the author proposes to call it *Syndesmis*. The genital organs are the most remarkable character.—On the live fishes, crabs, and molluscs ejected by the Artesian wells of the Oued Rir (Sahara of the province of Constantine), by M. Rolland. These animals are only for a time under ground in passing from one "bahr" or pond to another.—On the age of the carboniferous limestone of the Central Oural, by M. Grand Eury.—Two posthumous memoirs of M. Delesse were presented: one on the influence of soil on the composition of the ashes of plants, the other on the waters of Savoy.

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