Advancement of Science, held at Cleveland in August 1888. The volume, we need scarcely say, contains addresses, reports, and papers of great interest. The Presidential address, delivered by Prof. S. P. Langley, is on the history of our present views about radiant energy.

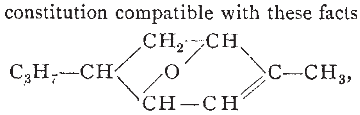
THE latest issue of the Proceedings of the Royal Society of Edinburgh (Session 1888–89) includes pp. 257–320 of vol. xvi. The following are the contents :—On the relation among the line, surface, and volume integrals, by Prof. Tait ; the development of diarthrodial joints in birds and mammals, by David Hepburn ; electrification of air by flame, by Sir Wm. Thomson ; on the placentation of the halicore dugong, by Prof. Sir William Turner ; on the geographical distribution of some tropical diseases, and their relation to physical phenomena, by R. W. Felkin (with 16 plates) ; quaternion note on a geometrical problem, by Prof. Tait ; the solubility of carbonate of lime in fresh and sea water, by W. S. Anderson.

THE thirteenth part of Cassell's excellent "New Popular Educator" has been issued. It includes a good coloured plate representing the Rosegg glacier.

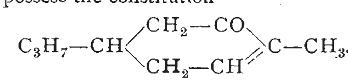
THE Glasgow and West of Scotland Technical College has issued its Calendar for the year 1889–90. We have received also the new Calendar of the University College of Wales, Aberystwith.

AN interesting paper on Japanese lacquer, read lately by Mr. R. Hitchcock before the Chemical Society of Washington, has been printed in the Proceedings of the United States National Museum. Japanese lacquer is the product of a tree, the *Rhus vernicifera*, D.C., which grows throughout the main island of Japan. It attains a large size, the trunks sometimes measuring a metre in diameter. It is said the tree will live for forty years, but only comparatively young trees are valued for the production of lacquer. Having yielded for several years they are cut down, the lacquer extracted from the branches, and young trees take their places. Having given an account of the chemical composition of lacquer, and described the uses to which it is applied, Mr. Hitchcock urges that it should receive more attention than has hitherto been devoted to it by manufacturers in America. "It gives a surface to wood," he says, "much harder than our best copal varnish, without brittleness. It takes a polish not to be excelled, which lasts for centuries, as we may see in the old treasures of Japan. It is proof against boiling water, alcohol, and, indeed, it seems to be insoluble in every agent known. It is the best possible application for laboratory tables. I have a set of photographer's developing trays that have been in use for more than a year, and I find them excellent and cheap. In Japan it is used for many household articles." Unfortunately, lacquer poisoning from the fresh material is a serious danger. According to Rein, the poison is a volatile acid, and Mr. Hitchcock suggests that it might be removed by a heat that would leave the lacquer uninjured.

AN isomer of camphor, $C_{10}H_{16}O$, has been prepared by Drs Wallach and Otto in the chemical laboratory of the University of Bonn (*Liebig's Annalen*). This new substance is a liquid, to which the name pinol is provisionally given, possessing a very strong camphor-like odour. It is obtained by the action of hydrochloric acid upon a well-cooled mixture of turpentine oil, glacial acetic acid, and ethyl nitrite. The hydrochloric acid is gradually added in the form of a concentrated solution, and its addition is followed by the separation of crystals of the nitroso-chloride of pinene, one of the terpenes, and the formation in the solution of pinol, the new camphor. The whole is allowed to stand for about twelve hours at a low temperature to complete the precipitation of the first-named body, after which the crystals are filtered off, and the filtrate is subsequently distilled in steam. A rapid evolution of gas occurs at the commencement of the distillation, after which the pinol is quietly conveyed over in the steam. The distillate separates into two distinct layers, and the aqueous layer is readily separated by means of a funnel. The dried distillate is then freed from acetic ether by fractional distillation, and the higher boiling portion again distilled in steam. This redistilled product is similarly separated from water, dried, and finally itself subjected to fractional distillation : when the principal fraction, consisting of pinol with a small quantity of impurity, passes over between 182° and 188° C. The liquid thus obtained is found to possess in a very marked degree the odour of camphor, and it can be freed from the last traces of impurity by taking advantage of the action of bromine upon it. Bromine yields with pinol a beautifully crystalline dibromide, $C_{10}H_{16}OBr_2$. On diluting the distillate, therefore, with twice its volume of glacial acetic acid, and running in a thin stream or drops of liquid bromine, the colour of the latter rapidly disappears, and, on evaporating, splendid rhombic crystals of this dibromide are obtained. In order to recover the pinol in a pure state from the recrystallized dibromide, about a hundred grams of the latter are boiled with excess of alcoholic potash for a whole day, and the product distilled in steam, separated from water, dried with solid potash, and repeatedly fractionally distilled. Finally, pure pinol is obtained, boiling constantly at 183–84°. Analyses of this product conclusively point to the formula $C_{10}H_{16}O$, the same as that of ordinary camphor. Its constitution is proved to differ, however, from the latter body by the nature of its oxidation products. Both potassium permanganate and dilute nitric acid oxidize it to carbonic anhydride, oxalic acid, and terebic acid, $C_7H_{10}O_4$. The only possible constitution compatible with these facts is



while ordinary camphor is generally assumed on Kekulé's authority to possess the constitution



An extremely interesting fact about pinol is that its nitroso-chloride readily reacts with β-naphthylamine to form a base of the formula $C_{20}H_{24}N_2O_2$, isomeric with quinine. This is the first base of this empirical formula which has yet been artificially prepared. Solutions of both the base and its salts present similar fluorescent phenomena to those of quinine and its salts.

THE additions to the Zoological Society's Gardens during the past week include a Gaur (*Bos gaurus* ♂) from Pehang, Malay Peninsula, presented by Sir Cecil C. Smith, K.C.M.G. ; three Blue-crowned Hanging Parrakeets (*Loriculus galgalus*) from Malacca, presented by Mr. A. Baker ; a Short-tailed Capromys (*Capromys brachyurus*) from Cuba ; two Reed Buntings (*Emberiza schœniclus*), British, purchased ; three Dingo Dogs (*Canis dingo* ♂ ♂ ♀), a White Goshawk (*Astur novæ-hollandiæ*), a Berigora Hawk (*Hieracidea berigora*), a Brush Turkey (*Talegalla lathami* ♀), an Australian Thicknee (*Œdicnemus grallarius*) from Australia, received in exchange.

OUR ASTRONOMICAL COLUMN.

THE NATAL OBSERVATORY.—The Report of this Observatory for 1888, which has recently come to hand, is a somewhat meagre one, and is chiefly occupied with the routine daily meteorological observations. The small record of astronomical work achieved may perhaps be explained by the circumstance that the Superintendent, Mr. Nevill, has recently been appointed Government Chemist and Official Assayer for Natal, that a laboratory was erected for him in the early part of the year, and that he has already commenced his official duties in his new capacity.

Of direct astronomical work the Report only records the routine work in connection with the maintenance of the system of colonial time signals; a number of observations of the zenith distances of northern stars and circumpolars both above and below the Pole, for the comparison of declinations as observed at Observatories on either side of the equator; and some progress as having been made in the observation of pairs of equi-zenith distance stars for the determination of the latitude of the Observatory. The various computations undertaken at the Observatory have been pushed forward much more zealously. These embrace the comparison of the Greenwich lunar observations for the decade 1878-87 with Hansen's lunar tables; the reduction of Mr. Campbell's observations of the lunar crater Murchison A, made at the Arkley Observatory in the years 1882-84; and the reduction of the third year's tidal observations at Durban.

THE SPECTRUM OF R ANDROMEDÆ.—Mr. Espin, who has recently discovered bright lines in the spectra of several long-period variables of Secchi's third type, has added another to the list; R Andromedæ, at the maximum just passed, showing a number of bright lines, F being very bright, so bright as to appear to project beyond the spectrum. The spectrum of the star had manifestly undergone a great change from the time when Dunér made the very thorough study of it which he has recorded in his work on "Les Étoiles à Spectres de la Troisième Classe." Five of the seven variables included in Mr. Lockyer's Species 10 of this type have now shown bright lines at maximum, whilst Gore's Nova Orionis, which should certainly be included in the same species, would make a sixth. The two stars in which bright lines have not yet been observed are R Leonis Minoris and α Herculis.

COMET 1889 *d* (BROOKS, JULY 6).—The following ephemeris is in continuation of that given in NATURE for October 3 (p. 550):—

Ephemeris for Berlin Midnight.

1889.	R.A. h. m. s.	Decl. ° ′	Log *r*.	Log Δ.	Brightness.
Nov. 1	23 41 40	2 32·2 S.	0·2977	0·0625	1·8
5	23 42 56	2 3·6	0·2988	0·0754	1·7
9	53 44 39	1 33·1	0·3001	0·0888	1·6
13	23 46 49	1 0·8	0·3015	0·1025	1·5
17	23 49 25	0 27·0 S.	0·3030	0·1163	1·4
21	23 52 25	0 8·4 N.	0·3046	0·1303	1·3
25	23 55 49	0 45·2	0·3063	0·1445	1·2
29	23 59 34	1 23·3 N.	0·3082	0·1587	1 1

The brightness at discovery is taken as unity.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 *NOVEMBER* 3-9.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on November 3

Sun rises, 7h. 0m.; souths, 11h. 43m. 40·4s.; daily increase of southing, 0·5s.; sets, 16h. 28m.: right asc. on meridian, 14h. 35·4m.; decl. 15° 13′ S. Sidereal Time at Sunset, 19h. 21m.

Moon (Full on November 7, 16h.) rises, 15h. 30m.; souths, 21h. 1m.; sets, 2h. 45m.*: right asc. on meridian, 23h. 54·5m.; decl. 6° 7′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	5 8	10 37	16 6	13 28·3	6 53 S.
Venus ...	4 29	10 9	15 49	13 0·0	4 37 S.
Mars ...	2 35	8 54	15 13	11 45·3	3 5 N.
Jupiter ...	11 38	15 31	19 24	18 23·6	23 27 S.
Saturn ...	0 22	7 28	14 34	10 19·5	11 53 N.
Uranus ...	5 16	10 36	15 56	13 28·0	8 37 S.
Neptune..	17 30*	1 18	9 6	4 8·4	19 15 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

Saturn, November 3.—Outer major axis of outer ring = 39″·3; outer minor axis of outer ring = 5″·8: southern surface visible.

Meteor-Showers.

	R.A.	Decl.	
Near γ Camelopardalis...	55°	71° N.	Swift.
,, the *Pleiades* ...	60	20 N.	The *Taurids*.
,, θ Ursæ Majoris	143	50 N.	Very swift.
From Lacerta...	346	52 N.	Rather slow.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.
U Cephei	0 52·5	81 17 N.	Nov. 4,	1 23 *m*
			,, 9,	1 3 *m*
R Canis Majoris	7 14·5	16 11 N.	,, 6,	17 5 *m*
			,, 7,	20 20 *m*
S Cancri	8 37·6	19 26 N.	,, 3,	21 22 *m*
U Ophiuchi	17 10·9	1 20 N.	,, 5,	18 29 *m*
R Scuti	18 41·6	5 50 S.	,, 8,	*m*
U Aquilæ	19 23·4	7 16 S.	,, 9,	21 0 *M*
χ Cygni	19 46·3	32 38 N.	,, 6,	*m*
T Vulpeculæ	20 46·8	27 50 N.	,, 9,	21 0 *m*
Y Cygni	20 47·6	34 14 N.	,, 4,	15 40 *m*
			,, 7,	15 35 *m*
δ Cephei	22 25·0	57 51 N.	,, 8,	23 0 *M*

M signifies maximum; *m* minimum.

SEISMOLOGICAL WORK IN JAPAN.[1]

THE seismological work which has been accomplished in Japan is to a great extent described in fourteen small volumes published by a Society which was organized in 1880 to study phenomena connected with earthquakes and volcanoes. This Society is called the Seismological Society of Japan. An epitome of a portion of this work is to be found in nine Reports on the volcanic phenomena of Japan issued by this Association. A glance at the first few volumes published by the Seismological Society shows that the attention of its members was directed towards seismometry. For several years attempts were made to record earthquakes by using the old types of earthquake instruments, such as columns balanced on end, bowls or tubes filled with liquid, pendulums with pencils or pointers writing on paper or smoked glass. The records obtained from instruments of this order were, however, gradually recognized as being too indefinite; the instruments indicated that shakings had taken place, but they failed to measure them. All investigators recognized that to measure the movement of the earth it was necessary, while the movement was going on, to obtain a steady point or platform relatively to which the motion might be measured. By the patient labours of investigators in Japan, which have extended over many years, this has been accomplished, and we now have pendulums and other forms of instruments which for small displacements are in neutral equilibrium, so that when the frames carrying these instruments are shaken back and forth or up and down there are certain portions of them which remain at rest. From these steady points pointers project which write the movements or magnified representations of these movements upon suitably prepared surfaces.

From the simple pendulum and style, tracing its movements in sand, and costing but a few pence, elaborate instruments, embracing many new mechanical contrivances, and writing their movements with delicate siphons on continuously running bands of paper, have gradually been evolved. With the assistance of these instruments many thousands of diagrams, each of which represents in absolute measures the back and forth motions of the ground during an earthquake, have been obtained, and we now know the true nature of earthquake movement. We have learnt that, in many earthquakes which are quite perceptible and sometimes even alarming, the amplitude of motion may not exceed a millimetre, while if it reached 25 millimetres, or an inch, we might expect cities to be ruined.

The results which have flowed from a study of these diagrams are numerous and interesting. We now know that the direction of movement in any given earthquake is continually varying. At one moment a point on the surface of the earth may be moving north and south, and the next moment it may be moving east and west, while at other times it may be following a path too intricate to be easily described.

More interesting observations relate to the period and amplitude of the earth's motion, from which may be calculated the destructive power, which depends partly on the maximum velocity and partly on the suddenness of movement. Some earthquakes commence with preliminary tremors, which have been recorded with a frequency of eight or ten waves per second.

The back and forth movements of considerable amplitude which constitute the shock or shocks in an earthquake usually have a period of one or two seconds, while the ordinary back

[1] A Paper, by Prof. John Milne, of the Imperial University of Japan, Tokio, read at the British Association.