

isolating pure salicylide. Salicylic acid is dissolved in an indifferent solvent, preferably toluene or xylene, before the addition of the phosphorus oxychloride. The product of the reaction is washed first with soda and afterwards with water. Owing to the property, discovered by Prof. Anschütz during the course of the work, which salicylide possesses of combining with chloroform, it may be extracted from the white solid product, after drying, by means of chloroform, the compound being deposited from the chloroform solution in large colourless transparent crystals belonging to the tetragonal system. The compound possesses the composition $C_6H_4.CO.O.2CHCl_3$. The chloroform readily escapes upon warming, in very much the same manner as the water of crystallization contained in many crystallized salts. The free salicylide remaining is a solid substance melting at 261° . As regards its molecular constitution it is shown, by the amount of lowering of the melting-point of phenol employed as a solvent, to contain four of the salicylic radicles $C_6H_4.CO.O$, and is probably a closed ring compound. In a precisely similar manner phosphorus oxychloride reacts with the three cresotinic acids, the acids next higher than salicylic, with formation among other substances of lactides, which may be isolated in the same way in the form of their chloroform compounds, $CH_3.C_6H_3.CO.O.2CHCl_3$. Ortho-cresotinic acid lends itself best to this reaction. The pure lactides are readily obtained from the chloroform compounds by warming to 100° , pure chloroform being gently evolved.

THE two substances above described, salicylide-chloroform and the corresponding compound derived from ortho-cresotinic acid, are admirably adapted for the preparation of pure chloroform, on account of their large content of the latter substance, salicylide-chloroform containing 33.24 per cent. and the cresotinic compound 30.8 per cent of its weight. Moreover, in closed vessels they may be preserved any length of time; when exposed to the open air salicylide-chloroform slowly loses its chloroform, but the cresotinic compound is well-nigh stable, even under these conditions. The same quantity of the free lactide may be used over and over again without decomposition, it being only necessary, in order to re-form the chloroform compound, to allow it to remain in contact with the chloroform to be purified for twenty-four hours at the ordinary temperature. None of the usual impurities in chloroform crystallize along with the compound, so that a perfect separation is effected. Again, it is well known that pure chloroform decomposes more or less on keeping; this loss may be avoided by storing it in the form of the lactide, and regenerating it when required by the application of a gentle heat, with the certainty of obtaining it perfectly pure.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus* ♀) from India, presented by Mr. W. Stutely; two Barbary Mice (*Mus barbarus*) from North Africa, presented by Lord Lilford; four Bearded Titmice (*Panurus biarmicus*), European; four Ani (*Crotophaga ani*) from South America; six Hog-nosed Snakes (*Heterodon platyrhinos*); a Striped Snake (*Tropidonotus sirtalis*); a Snake (*Pitnophis* —), from North America, purchased.

OUR ASTRONOMICAL COLUMN.

THE MOTION OF NOVA AURIGÆ.—Prof. W. W. Campbell, of the Lick Observatory, has communicated further results relating to Nova Aurigæ to the December number of *Astronomy and Astrophysics*. He is now perfectly convinced that the variation in the velocity previously suspected is real, and probably due to orbital motion. The values given below have been calculated on the assumption that the brightest line in the spectrum of the Nova, since the reappearance in August, is

really the chief nebula line. The bright lines were displaced towards the violet, indicating approach, whereas in February and March last they were displaced towards the red.

Date. 1892.	λ	Velocity of approach. Miles per sec.
Aug. 20	...	5003.6
21	...	3.7
22	...	3.7
23	...	3.1
30	...	2.4
Sep. 3	...	2.4
4	...	1.9
6	...	2.1
7	...	1.9
15	...	2.2
22	...	2.5
Oct. 12	...	3.6
19	...	3.8
Nov. 2	...	4.4
3	...	4.7

In the same journal Mr. Sidgreaves points out that the new lines cannot simply be revivals of those of February, and, further, that on account of the great difference of velocities and the reversed direction, they cannot be supposed to belong to the bright-line component of February. Neither is it likely that the dark-line component has become a planetary nebula, and the probability of three bodies rushing together being very small, Father Sidgreaves believes the new results to strengthen the view that the compound character of the spectrum was produced by local disturbances of a single star.

ASTRONOMICAL DISCOVERIES IN 1892.—In the *Observatory* for January Mr. Denning gives an excellent summary of the astronomical discoveries of 1892, a year which was very remarkable for the special attention given to the science by the press and the public. In chronological order the principal events were as follows:—

January 20.—Minor planet (324) discovered by photography by Max Wolf at Heidelberg. (Altogether 27 were discovered during the year by various observers.)

January 23–30.—Discovery of Nova Aurigæ by Dr. Anderson.

February 11.—The great sun-spot, extending over 150,000 miles of longitude, reached the sun's central meridian. This was followed by remarkable magnetic disturbances and displays of aurora.

March 6.—Comet discovered by Lewis Swift.

March 18.—Comet discovered by Denning at Bristol. On this day also, Dr. Spitaler, of Vienna, re-detected the periodical comet of Pons (1819) and Winnecke (1858).

August 6.—Opposition of Mars. Mr. Denning writes: "Practically our knowledge stands where it stood before. The results are not sufficiently discordant to settle disputed points."

August 27.—A new comet discovered by Brooks, of Geneva, N. Y.

September 9.—Prof. Barnard's memorable discovery of the fifth satellite of Jupiter.

October 12.—Comet discovered by photography by Prof. Barnard.

November 6.—Bright comet discovered in Andromeda by Mr. Edwin Holmes, London.

November 20.—A faint comet discovered by Brooks.

November 23.—Brilliant shower of shooting stars observed in Canada and the United States. The shower was evidently that of the Andromedes connected with Biela's comet.

COMET HOLMES.—Mr. Lewis Boss finds for this comet a period of 6.914 years, and concludes that no very close approach to Jupiter can have taken place in recent years; the eccentricity, however, is so small that important perturbations by Jupiter may have occurred. He further states that "the recent remarkable decrease in brightness of the comet seems to do away with the necessity of supposing that it has been recently made a member of the solar system. This decrease also renders it reasonably certain that the comet must have been subjected to some extraordinary disturbance of its internal economy, by the application of forces from without or within, with the result of giving to it that which was really an unaccustomed and temporary size and brightness" (*Astronomical Journal*, No. 283). According to Mr. Lockyer's views, such increase of brightness would be produced by the comet colliding with another meteor

swarm lying in its track, and it is quite possible that the brightening of the comet at the time of the discovery was very sudden, thus explaining why the comet was not detected earlier.

The Rev. E. M. Searle (*Astronomical Journal*, No. 283) has deduced a period fifteen days shorter than that of Mr. Boss.

M. Schulhof, of Paris, finds a period of 6'909 years. He also points out that among the known periodic comets that of De Vico shows the greatest orbital similarity to Holmes's comet, and he considers that they may possibly have a common origin.

Mr. Roberts, of the Nautical Almanac Office, accepting as real the supposed impression of the comet obtained by Mr. Schorling in a photograph of the region taken on October 18, found a period of fifteen years, but the general agreement of the latest computations seems to indicate that the image in question could not be that of the comet.

The comet is now so dim that it is not considered necessary to continue the ephemeris.

EPHEMERIS OF COMET BROOKS (November 20, 1892).—The following ephemeris of Comet Brooks (Berlin, midnight) is given in *Ast. Nach.*, No. 3140, by Kreutz:—

Date.	R. A. h. m. s.	Decl. (app.)	Log r .	Log Δ .
Jan. 12 ...	21 40 18 ...	+ 59 41 ...	0.0786 ...	9.8915
13 ...	56 4 ...	58 8.1 ...	0.0791 ...	9.9012
14 ...	22 9 53 ...	56 33.6 ...	0.0797 ...	9.9114
15 ...	22 3 ...	54 59.1 ...	0.0803 ...	9.9220
16 ...	32 47 ...	53 25.7 ...	0.0810 ...	9.9330
17 ...	42 18 ...	51 54.2 ...	0.0818 ...	9.9442
18 ...	50 47 ...	50 25.2 ...	0.0826 ...	9.9556
19 ...	22 58 23 ...	48 59.3 ...	0.0835 ...	9.9670

THE METEOR SHOWER OF NOVEMBER 23, 1892.—Further observations of this fine display of shooting stars are recorded in *Astronomical Journal*, No. 283. Prof. J. K. Rees counted 165 meteors in half an hour, and noted some as bright as Mars; all of them were very swift. The Rev. J. G. Hagen estimated that one observer, with a clear view to the west would have seen 250 meteors in half an hour, and notes that some were as bright as Jupiter. Mr. Sawyer estimated the maximum frequency as about 300 per hour, and, strangely enough, describes them as "slow-moving, generally quite bright, although none were observed as bright as the planets Mars and Jupiter." Both Prof. Rees and Mr. Sawyer note that the meteors appeared in clusters, four or five falling almost at the same instant, while for a few minutes none were seen. The radiant was near γ Andromedæ, and there is little doubt that the shower was that due to Biela's comet.

GEOGRAPHICAL NOTES.

In M. Dybowski's journey from the Mobangi to the Shari, as described at a recent meeting of the Paris Geographical Society, he encountered one of the most systematically cannibal tribes which has yet been described. This tribe, known as the Bonjos, have only one object of purchase—slaves to be eaten. They refuse to sell food or any other products of their country for anything else, and the surrounding tribes capture and export canoe-loads of slaves for this purpose. The French expedition experienced great difficulty in obtaining food amongst a people who had no desire for ordinary articles of trade.

THE boundaries of the republics of South and Central America are certainly the least definite lines on the political map of the world so far as civilized lands are concerned. The question of delimitation is never at rest. Dr. H. Polakowsky gives in the last number of *Petermann's Mitteilungen* a brief account of the negotiations and surveys relating to the frontier of Costa Rica and Nicaragua from 1858 to 1890. The difficulty in this case lies in the fact that the mouth of the San Juan river, a certain point of which was fixed on in 1858 as the coast frontier, is continually changing, and a breakwater belonging to the harbour and canal entrance of Greytown, in Nicaragua, now stands in what was formerly the territory of Costa Rica. On the Pacific coast years of diplomacy were required to fix the centre of Salinas Bay, but it is satisfactory to know that permanent boundary stones have now been erected at both ends of the line.

MR. COLES delivered his second lecture to young people under the auspices of the Royal Geographical Society, on

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Friday evening, when a large audience of both young and old enjoyed his spirited descriptions of Iceland and British Columbia, illuminated by many anecdotes of personal adventure.

THE defective condition of the charts, even of the coast of Europe, was strikingly brought out by the recent court-martial on the stranding of H.M.S. *Howe* in Ferrol Channel. The chart used on board was drawn from soundings made about a hundred years ago, with a few subsequent corrections, which failed altogether to indicate the rock on which the *Howe* struck. The Spanish authorities are reported to have refused permission for the new chart surveyed by the officers of the Channel Squadron to be published, and meanwhile the Hydrographic Office has cancelled the old chart.

A NEW SEISMOGRAPH.

BEFORE speaking of this memoir, let me enter a protest against the method of publishing these "Annali" in such a way as to convey the impression that the papers composing it were written three years before their actual date. All readers are warned that when the volume is bound up, and the paper covers are removed, they must post-date the papers by three years.

The seismograph described in the present paper is intended for stations of the second class. The objects in view in its construction were amplification of the record in a pendulum seismograph, and improvement of the warning apparatus in the form of a style seismoscope of the Milne type which the author finds frequently fails.

The amplifying lever is composed of fine placfont tubes arranged girder-like in the form of a short hollow triangular prism, surmounted by an acute triangular pyramid, which points downwards, and carries at its apex the writing style. The pendulum bob is a flattened cylinder, supported by a placfont wire 1.50 m. long. The amplifying lever at the junction of the three pyramidal and the prismatic tubes supports three radial arms meeting in the centre, as it were, of the pyramid base, and support a ball-and-socket joint of agate, the cup part of which is at the end of an arm projecting from the supporting wall. Immediately above this centre, and occupying the prism space of the lever, is the cylindrical box, the wire supporting which passes through a small hole in the centre of the base of the prism. We thus have a simple lever of the first order of light girder work. It is prevented from rotating in azimuth by including some steel wire permanently magnetized.

The style has been modified by lightening it and making it more rigid and non-oxidizable, which is done by using a capillary glass tube.

The registering apparatus is a smoked glass plate, supported over a clock, started at the moment of the earthquake by a seismoscope. To prevent the complex figures of the ordinary registration in a pendulum seismograph, the author has arranged so that the plate shall rotate through a segment of a circle every three seconds, so as to bring a fresh surface of smoked glass beneath the style.

Some modifications are then described. The principal one is making the bob annular, carrying a suitable aperture, in which is engaged the short end of a lever. This lever is composed of three very thin brass tubes, graduating away smaller from the fulcrum, which is a gimbal joint such as suggested by the reviewer some years since in NATURE. This lever carries at its lower and longer end the style which records on the glass plate as in the original one described in this memoir.

Another modification is a combination of the triple and single suspension of the pendulum bob, that is, the bob ring is first suspended by triple wires to a button which in its turn hangs at the end of a single wire.

The details of these seismographs are fairly well worked out, but the employment of aluminium in many of the parts has been neglected. Likewise, no arrangement has been made for the oblique play of the engaged pinion in the newer lever. The only new point about this seismograph is the interrupted rotation of the recording plate. This has a decided advantage in giving a dissected record, but is part counterbalanced by the fact that important movements that may be taking place at the moment

¹ G. Agamemnone, "Sopra un Nuovo Pendolo Sismografico." *Annali dell' Ufficio Centrale Meteor. e Geodinamico*, ser. sec., pt. 3, vol. xi., 1889. (Roma, 1892.)