

value must almost invariably be quantitative. It is little less than a disgrace to the medical profession that a subject of such vital importance as chemistry should be so neglected.

If, however, we are to make any change in our method of teaching science, if we are to teach science usefully throughout the country, two things are necessary: teachers of science must take counsel together, and the examining boards must seriously consider their position. There can be little doubt that in too many cases the examinations are suited to professional instead of to educational requirements; and that the professional examinations are often of too general a character, and do not sufficiently take into account special requirements.

APPENDIX

PROBLEM: TO DETERMINE THE COMPOSITION OF AIR

N.B.—Immediately after performing each experiment indicated in this and subsequent papers, write down a careful description of the manner in which the experiment has been done, of your observations and the result or results obtained, and of the bearing of your observations and the result or results obtained on the problem which you are engaged in solving. Be especially on your guard against drawing conclusions which are not justified by the result of the experiment; but, on the other hand, endeavour to extract as much information as possible from the experiment.

1. Burn a piece of *dry* phosphorus in a confined volume of air, *i.e.* in a stout Florence flask closed by a caoutchouc stopper. Afterwards withdraw the stopper under water, again insert it when water ceases to enter and measure the amount of water sucked in. Afterwards determine the capacity of the flask by filling it with water and measuring this water.

N.B.—The first part of the experiment requires care and must be done under direction.

2. Allow a stick of phosphorus lashed to a piece of stout wire to remain for some hours in contact with a known volume of air confined over water in a graduated cylinder. After noting the volume of the residual gas, introduce a burning taper or wooden splinter into it.

N.B.—The residual gas is called *nitrogen*.

3. Burn a piece of dry phosphorus in a current of air in a tube loosely packed with asbestos. Weigh the tube, &c., before and after the experiment.

4. Repeat Experiment 2 with iron borings moistened with ammonium chloride solution. Preserve the residual gas.

5. Suspend a magnet from one arm of a balance; having dipped it into finely divided iron, place weights in the opposite pan, and when the balance is in equilibrium, set fire to the iron.

6. Pass a current of dry air through a moderately heated tube containing copper. Weigh the tube before and after the experiment; also note the alteration in the appearance of the copper.

7. Strongly heat in a *dry* test tube the red substance obtained by heating mercury in contact with air. At intervals plunge a glowing splinter of wood into the tube. Afterwards note the appearance of the sides of the tube. (Before performing this experiment ask for directions.)

N.B.—The gas obtained in this experiment is named *oxygen*.

8. Heat a mixture of manganese dioxide and potassium chlorate in a dry test tube, and at intervals plunge a glowing splinter into the tube. This experiment is to acquaint you with an easy method of preparing oxygen in quantity.

9. Prepare oxygen as in Experiment 8, and add it to the nitrogen from Experiment 4 in sufficient quantity to make up the bulk to that of the air taken for the latter experiment. Test the mixture with a burning taper or splinter.

10. Dissolve copper in nitric acid and collect the escaping gas (nitric oxide); add some of it to oxygen and some of it to air.

11. Fill a large flask provided with a well-fitting caoutchouc stopper and delivery tube with ordinary tap water and gradually heat the water to the boiling-point; collect the gas which is given off in a small cylinder and add nitric oxide to it. Also collect a sufficient quantity in a narrow graduated cylinder and treat it as in Experiment 2.

COMPARATIVE STUDY OF SILVER AND LEAD

SILVER.—*Symbol*, AG. (*Argentum*). *Atomic weight*, 107.67. *Specific heat*, .05701.

LEAD.—*Symbol*, PB. (*Plumbum*). *Atomic weight*, 206.47. *Specific heat*, .03140.

1. Determine the relative density of lead and silver at a known temperature by weighing in air and in water.

2. Separately heat known weights of lead and silver for some time in the air, allow to cool, and weigh.

3. Separately convert known weights of lead and silver into nitrates, and weigh the latter. From the data thus obtained calculate the *equivalents* of lead and silver.

4. Convert the known weights of nitrates thus obtained into chlorides, and weigh the latter.

5. Compare the action on lead and silver of chlorhydric acid; of dilute and concentrated sulphuric acid, using the acid both cold and hot; and of cold and hot nitric acid.

6. Using solutions of the nitrates, compare their behaviour with chlorhydric and sulphuric acids, hydrogen sulphide, potassium iodide, and potassium chromate. Ascertain the behaviour of the precipitate formed by chlorhydric acid when boiled with water, and when treated with ammonia solution.

7. Compare the behaviour of lead and silver compounds on charcoal before the blowpipe.

8. Tabulate the results of your experiments with lead and silver in parallel columns.

9. Ascertain whether the substances given you contain lead or silver.

10. Determine silver in an alloy of lead and silver by cupellation.

11. Study the method of determining silver volumetrically by means of a *standard solution* of ammonium thiocyanate. Determine the percentage of silver in English silver coinage.

12. Determine silver as chloride by precipitation.

13. Dissolve a known weight of lead in nitric acid, precipitate it as sulphate, collect and weigh the latter.

14. What are the chief ores of lead and silver? How are lead and silver extracted from their ores? How is silver separated from lead? How is it separated from burnt Spanish pyrites? What are the chief properties and uses of lead and of silver? State the composition of the chief alloys of lead and silver.

TRANSACTIONS OF THE NEW ZEALAND INSTITUTE

VOLUME XVI. of the *Transactions and Proceedings of the New Zealand Institute* contains the more important memoirs laid before its eight incorporated Societies during the year 1883 and the first weeks of 1884. It forms a bulky volume of about 650 pages, and is illustrated by 44 plates. It speaks a great deal for the energy of the able editor, Dr. James Hector, F.R.S., that he has in so short a time reduced such a mass of material into order, and that the volume should be issued in May of this year. While we think the illustrations still leave something to be desired as to their general style and execution, this volume is extremely creditable to the colony, and the amount of accurate research recorded will, if continued, soon make New Zealand one of the most completely investigated regions of the world. Of the 57 articles selected from the papers read before the local Societies, 25 relate to zoology, 22 to botany, 5 to geology, 1 to chemistry, and 4 to miscellaneous subjects. While of the titles of these papers we append a classified list, some few of them merit a more particular reference.

Mr. E. Meyrick contributes a third series of his descriptions of New Zealand Microlepidoptera, treating this time of the *Ecophoridae*. This is the principal family of the *Tineina* in New Zealand, as is also the case in Australia. Some 67 species are recorded, of which 55 are particularly described, but the total number of species it is thought will be much more considerable. In New Zealand the family constitutes about a sixth of the entire Microlepidoptera, in Australia it forms more than a fourth, whilst in Europe it is about a thirtieth. It seems strange that, while this family occupies so prominent a position in both New Zealand and Australia, no species as far as is yet known is common to both. Fourteen genera are found in New Zealand; of these ten are endemic, three occur also in Australia, and one is cosmopolitan. Of the three genera shared with Australia, two (*Eulechria* and *Phleopola*) are large and typically Australian genera, represented in New Zealand by three species, obviously mere stragglers; the third (*Trachypepla*) is a typical New Zealand genus, probably of considerable extent, and is represented in Australia by two species only, evidently also stray wanderers. Of the ten endemic genera, none are very closely related to Australian forms. It would therefore appear that, while it is not improbable that a slight interchange of species has taken place at some not exceedingly remote period, it seems nearly certain that the group is of

much more ancient origin, and was derived from another and quite distinct region. Incidentally Mr. Meyrick suggests an affinity with South America, but in a collection made by the Rev. T. Blackburn in the Hawaiian Islands, the Cecophoridae appeared to be altogether absent, their place being taken by a peculiar group of Gelechiidae.

Mr. Meyrick also contributes a monograph of the New Zealand Geometrina. He does this with some diffidence, owing to the difficulties he has laboured under of consulting type specimens and of the absence of works of reference. A large number of published names are reduced to the rank of synonyms; some 30 species are added to the list, which now stands at 89. In addition to the description of both genera and species, analytical tables of these are given throughout, and the monograph appears to be such as will enable the student to easily identify his captures and will still induce him to the further study of this group, and especially to the transformations of the species contained in it.

Capt. F. W. Hutton gives a very important revised list of the land Mollusca of New Zealand. From the ample collections that have passed under his examination, he has been enabled to determine satisfactorily all but a very few of the described species, as well as to indicate fairly their distribution in the islands. The list contains 116 species, of which 13 remain unknown to the author. Seven have been introduced from England. The definition of 60 and the internal anatomy of 26 species have been described by Capt. Hutton in vols. xiv. and xv. of the *Transactions*. So far as at present known, one-half of the species are confined to the North Island, one-quarter to the South Island, and one-quarter are common to both. The closest connection of the land molluscan fauna would appear to be with North Australia, but there is a considerable generic affinity with the faunas of New Caledonia, Polynesia, and South America.

An interesting paper on the habits of earthworms in New Zealand is contributed by Mr. A. T. Urquhart. The species are not named, but with such wonderful opportunities as Mr. Urquhart possesses for making a collection of these, may we hope that, in addition to his following out his painstaking observations as to their habits, he will also advance science by making a careful collection of the forms and placing them in the hands of some of the able naturalists of the Auckland Institute for description? It will be remembered that Darwin assumes that in old pastures there may be 26,886 worms per acre, and that Henson gives 53,767 worms per acre for garden ground and about half that number in corn-fields. Mr. Urquhart gives, as the result of his investigations of an acre of pasture-land near Auckland, the large number of 348,480 worms as found therein. It being suggested to him that in his selection of the spots for examination he may have unconsciously selected the richest, the experiment was again tried in a field seventeen years in grass. A piece was laid out into squares of 120 feet, and a square foot of soil was taken out at each corner; worms hanging to the side walls of the holes were not counted, and in one hole, where the return of worms was a blank, the walls were crowded with worms. As a result there was an average of 18 worms per square foot, or 784,080 per acre. Although this average is very striking when compared with that of Henson, it is worthy of note that the difference between the actual weight of the worms is not so marked. According to Henson, his average of 53,767 worms would weigh 356 pounds, while Mr. Urquhart finds that the average weight of the number found by him came to 612 pounds 9 ounces.

Apropos of a description of the head in *Palinurus lalandii*, by Prof. T. Jeffery Parker, founded on specimens which happened to be brought on board at the Cape of Good Hope during his voyage to New Zealand, we have a very natural classification of the species of this genus offered to us. The genus *Palinurus*, Fabr., would contain three subgenera. For the species in which the stridulating organ is absent and the procephalic processes are present Prof. Parker proposes the very appropriate generic name of *Jasus*; while for those forms in which the stridulating organ is present and the procephalic processes are absent he would reserve the name *Palinurus*, Fabr., retaining Gray's subgenus *Panulirus* for the longicorn species. He notes that, omitting *P. longimanus* and *P. frontalis*, of which he could obtain no definite information, all the species of *Jasus* are confined to the Southern Hemisphere (Ethiopian and Australian Regions); and those of *Palinurus* are restricted to the Northern Hemisphere; while those of *Panulirus* occur in both Hemispheres.

Dr. Walter Buller furnishes a series of notes on some rare

species of New Zealand birds. *Sceloglaux albifacies*, the laughing owl, has been found by Mr. W. W. Smith in deep fissures of the limestone rocks at Albury, near Timaru. After many futile efforts Mr. Smith bethought himself of smoking them out; after a few whiffs the owls began sniffing, and then in a few moments quietly walked out; four were captured. They soon became quite tame. On waking up at nightfall, their call was "precisely the same as two men cooing to each other from a distance." The male is the larger and stronger bird, with a harsher cry. The female performs most of the duty of hatching. They showed a decided preference for young rats, but would eat beetles, lizards, mice, or mutton. The crannies of the rocks in which they make their nests and live during the day are dry, very narrow at their entrance, and often five or six yards in depth. While casting their feathers they become almost naked, and two of Mr. Smith's birds while in this state were stung to death by a swarm of bees which passed through the wire netting of their cage.

Mr. R. H. Govett gives some startling facts as to the bird-killing powers of *Pisonia brunoniana* or *P. sinclairii*. A sticky gum is secreted by the carpels when they attain their full size, but is nearly as plentiful in their unripe as in their ripe condition. Possibly attracted by the flies which embalm themselves in these sticky seed-vessels, birds alight on the branches, and on one occasion two Silver-eyes (*Zosterops*) and an English sparrow were found with their wings so glued that they were unable to flutter. Mr. Govett's sister, thinking to do a merciful act, collected all the fruit-bearing branches that were within reach, and threw them on a dust-heap. Next day about a dozen silver-eyes were found glued to them, four or five of the pods to each bird. She writes:—"Looking at the tree one sees tufts of feathers and legs where the birds have died, and I don't think the birds could possibly get away without help. The black cat just lives under the tree, a good many of the birds falling to her share, but a good many pods get into her fur, and she has to come and get them dragged out." In a note Mr. T. Kirk says that *Pisonia umbellifera*, Seeman, = *P. sinclairii*, Hook. f., is found in several localities north of Whangarei, both on the east and west coasts, also on the Taranga Islands, Arid Island, Little Barrier Island, and on the East Cape, possibly in the last locality planted by the Maoris. The fruiting pericarp is remarkable for its viscidness, which is usually retained for a considerable period after the fruit is fully matured. It can be readily imagined that small birds tempted to feed on the seeds might easily become glued to a cluster of fruits.

Among new species of plants collected on Stewart Island by Mr. Kirk, he describes a beautiful new *Olearia* (*O. trillii*), called after his old and valued friend C. Traill, who has done so much for the natural history of Stewart Island. It forms a large shrub from five to twelve feet high. The terminal panicles are from four to nine inches long. The disk florets are purple. It is one of the most striking plants in the New Zealand flora, and one we hope we may soon see in cultivation. Mr. Kirk also, among other important contributions, publishes notes on *Carmichaelia* with descriptions of new species, one of which, *C. uniflora*, seems to be the same as a new species, with the same specific name, described in a paper read the same night before the Wellington Philosophical Society by Mr. J. Buchanan.

Mr. J. Buchanan gives an interesting account of Campbell Island and its flora. The island, thirty miles in circumference, is three good days' steaming from Wellington. Peat boulders, and the soil is extremely damp in the low-lying regions. The highest altitude is 1500 feet. Only a day and two half-days were available for botanical research, but five species were added to the flora, of which three were new. Many of the species had large and showy flowers, such as *Celmisia vernicosa*, Hook. f., and the various species of *Pleurophyllum*. These and the like were confined within an altitudinal range of 500 feet above sea-level, but the shrubby forms, such as species of *Coprosma*, *Drachophyllum*, *Veronica*, and *Myrsine*, ranged from sea-level, where they were most abundant, to the highest altitude. An Alpine flora may also be recognised, as a few plants were only found at the highest altitude, such as *Gentiana concinna*, Hook. f., and *Trineuron spatulata*, Hook. f.

Mr. T. F. Cheeseman contributes a very valuable revision of the New Zealand species of *Carex*, admitting 40 species, of which 25 are peculiar to the country; of the other fifteen found elsewhere, eleven are recorded from Tasmania and Australia, nine of these are found in Europe, North and West Asia, and North America, seven in Southern or Eastern Asia, six

in temperate North and South Africa, and four or five come from extra-tropical South America.

We can only direct general attention to Mr. Justice Gillies' important paper giving the result of his experiments in 1882-83 on the production of sugar from Sorghum, which seem to have been most successful, and to give promise of a good future for sugar-making in the colony; and to Mr. W. Arthur's report on the brown trout introduced into Otago.

Zoology.—E. Meyrick, New Zealand Microlepidoptera and Geometrina; R. W. Fereday, new species of Cidaria; T. H. Potts, on a species of Mantis; W. M. Maskell, on new Coccidæ; Geo. M. Thomson, new Crustacea and Pycnogonida; C. Chilton, New Zealand sessile-eyed Crustacea; T. Jeffery Parker, on Palinurus; A. T. Urquhart, habits of earthworms; Capt. F. W. Hutton, revision of land Mollusca, of recent Rhachiglossate Mollusca, new species of Mollusca; H. B. Kirk, Anatomy of *Septoteuthis bilineata*; Dr. J. von Haast, occurrence of the Red Phalarope in New Zealand; Dr. W. Buller, notes on rare birds; Prof. T. J. Parker, on the occurrence of some rare fishes; Dr. Hector, notes on New Zealand ichthyology.

Botany.—W. Colenso, further contributions to New Zealand botany; J. D. Enys and T. Kirk, *Botrychium lunaria* in New Zealand; T. Kirk, botanical notes, descriptions of new species of plants; J. Adams, the botany of the Thames gold-fields; A. T. Urquhart, the spread of the Eucalyptus; J. Buchanan, notes of new and rare plants, Campbell Island and its flora; Charles Knight, Lichenographia of New Zealand; T. F. Cheeseman, additions to New Zealand flora, revision of the genus *Carex* (New Zealand species).

Chemistry.—J. A. Pond, the pottery clays of Auckland district.

Geology.—R. M. Laing, thermal springs at Lyttelton; H. Cox, new minerals; Captain F. W. Hutton, the lower gorge of the Waimakariri; D. Sutherland, discoveries near Milford Sound.

Miscellaneous.—W. Arthur, brown trout introduced into Otago; Mr. Justice Gillies, Sorghum experiments, 1882-83; Coleman Phillips, the law of gavelkind, a reply to Messrs. George and Wallace.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, October 27.—M. Rolland, President, in the chair.—Remarks on the first volume of the late M. Dumas' "Discours et Éloges Académiques," presented to the Academy by M. J. Bertrand.—Note on contaminated waters in connection with the spread of cholera, by M. Marey. A careful study of this epidemic since its first appearance in Europe, together with some personal observations in Paris and other parts of France, have convinced the author that the disorder is propagated chiefly through the medium of water. All other influences are of secondary importance, so that to secure the purity of drinking-water in every affected locality should be the first care of the sanitary authorities.—On the formation of saltpetre in plants, by MM. Berthelot and André.—On the oxidation of copper, by MM. Debray and Joannis.—On the laws determining the penetration of the rolled plates of ironclads by projectiles, by M. Martin de Brettes.—On the employment of the aqueous solution of the sulphuret of carbon for the destruction of Phylloxera, by M. A. Rommier.—Account of an easy process for rapidly preparing solutions containing sulphuret of carbon in large quantities, by M. Ach. Livache.—Observations of the lunar eclipse of October 4, made at the Observatory of Lyons (Brunner 6-inch equatorial), by M. Gonnèsiat.—Observations of the comets of Barnard and of Wolf made at the Observatory of Lyons (Brunner 6-inch equatorial), by M. Gonnèsiat.—On a representation of the exponential function by an infinite product, by M. R. Lipschitz.—On the equilibrium of a homogeneous segment of a revolving paraboloid floating on a fluid, by M. Em. Barbier.—Measure of the horizontal component of terrestrial magnetism by the method of amortissement, by M. J. B. Baillie.—Note on the relation between temperatures and pressures of the protoxide of liquid carbon, by M. V. Olszewski.—On some reactions of chlorochromic acid, by M. Quantin. The oxide of carbon acting alone on chlorochromic acid changes it to a green sesquioxide of chromium and to a violet sesquichloride. The simultaneous action of the oxide of carbon and of an excess of chlorine changes integrally the oxychloride of chromium to a sesquichloride.—Chemical analysis of the apatite (phos-

phate of calcium) occurring at Logrozan in Spain, by M. A. Vivier.—On a graphic granite with large crystals of chlorophyllite from the banks of the Vizézy near Montbrison (Loire), by M. F. Gonnard.—Heat of combination of the compounds of hydrogen and oxygen, by M. A. Boillot.—On the phenomena accompanying the solar corona at present visible in the Alps, by M. Duclaux. These phenomena are regarded as purely atmospheric, the sun being merely the luminous source. The solar corona itself is attributed to normal although rare causes, and is considered as analogous to the halo so often observed round the moon, when the atmosphere is charged with moisture.—Observation of the solar coronas during the aërostatic ascents of October 23 and 24, by MM. A. and G. Tissandier.—Note on solar energy and the oscillations of the magnetic needle, by M. Duponchel. From the observations made from the middle of the sixteenth century down to the present time the author infers that the secular variations of the needle are due to the action of a new ultra-Neptunian planet which he names the *Ocean*, and which may have a revolution of about 467 years. This planet must have passed through the longitudes 80° and 260° about the years 1580 and 1813, and should now be in the longitude of 314° in the constellation of Capricorn.—Note on the employment of hydrosulphuric acid for discharging colours, by M. A. Gérardin. This acid, discovered by M. Schützenberger, and now extensively employed, produces remarkable effects, acting by reduction, contrary to chlorine and oxygen, which act by oxidation. This property seems capable of important industrial application.—Note on distilled water used for drinking-purposes, by M. A. Hureau de Villeneuve. The author argues that the price of distilled water might be greatly reduced by obtaining it from steam-engines at work in mills; that it is neither unpalatable nor difficult to digest; that it generally contains a sufficient quantity of air, and that the absence of calcareous salts is rather an advantage than a drawback.

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