them in abundance earlier in the year. From an examination of the American species it would seem that the greater number possess two or more distinct or confluent glands situated where the blade and petiole join, and in these few species where none were discovered, it is quite possible that a closer examination in the spring time may show that they exist. Thus on *P. tremula*, the weeping variety, a careful examination in early May failed to show a single gland; but a week or two later, after several days' rain, the young branches grew very rapidly for a short time, unfolding many new leaves, and the first three or four of these on each branch bore large and active glands. The nectar is greedily gathered by insects, chiefly Hymenoptera and Diptera. The most numerous were the ants, who, as is usual in such cases, would fight rather than give up a good position near a nectar-secreting gland. The author regards these glands as protective. (The *Botanical Gazette*, Crawfordsville. November, 1881.)

FAUNA AND FLORA OF THE WHITE SEA.—At a meeting of the Natural History Society of St. Petersburg (April 23, 1881) Dr. Chr. Gobi gave a sketch of Prof. Cienkowski's report on his expedition to the White Sea, which appears in the *Proceedings* of the Society, in the Russian tongue, and is illustrated with three coloured plates. The bathymetrical distribution of the algæ seems to show a connection between the marine flora of the Solowezk Islands and that of the Scandinavian and Arctic coasts. In the White Sea there is a distinct though fully developed littoral zone, chiefly marked by the presence of Fucoids, with a few Chlorophyceæ and Florideæ. As new to the White Sea flora may be mentioned *Bulbocaulon piliferum*, Pringsh., and *Gloeothamnin palmelloides*, Cnk. The sea was by no means rich in microscopical organisms, but still a few new and interesting forms were found, and are described and figured, such as *Wagneria mereschkowskii*, a new genus and species of Protista, somewhat between Haeckeliana and Clathrulina; several new Flagellata, *Multicilia marina*, new genus and species having a protoplasmic body of protean form without nucleus or contractile vesicle, but having several cilia; *Exuviaella marina* also new, with an ovum-like body, flattened horizontally at the top, with two cilia and one or two round marks (*Schildchen*); *Daphnidium boreale* n.g. and sp., with a spherical body, prolonged into a curved beak, giving origin to one long cilium. In the dead cells of Pylaicella and other Phæospores there was found a colourless form of a Labyrinthula which had previously been found thriving in the cells of a Lemna; Finally, a new Moner, *Gobiella borealis*, which shows a great resemblance to Vampyrella, but the green contents seem never to extend into the pseudopodia (*Botanische Zeitung*, January 13, 1882.)

THE GROWTH OF PALMS.—In a paper (Russian) recently read before the Botanical Section of the St. Petersburg Natural History Society, Mr. K. Friderich describes in detail the anatomical structures to be met with in the ærial roots of *Acanthorhiza aculeata*, these roots presenting a remarkable example of roots being metamorphosed into spines. Supplementing this, E. Regel made the following remarks:—Palm trees, grown from seed, thicken their stems for a succession of years, like bulbs, only at the base. Many palms continue this primary growth (*i.e.* the growth they first started with) for fifty to sixty years before they form their trunk. During this time new roots are always being developed at the base of the stem, in whorls, and these always above the old roots. This even takes place in old specimens, especially in those planted in the open ground which have already formed a trunk. In such cases the cortex layer, where the roots break through, is sprung off. In conservatories, under the influence of the damp air, this root-formation, on which indeed the further normal growth of the palm depends, takes place without any special assistance. When the palm is grown in a sitting-room, one must surround the base of the trunk with moss, which is to be kept damp, in order to favour the development of the roots. When the base of the palm-trunk has almost reached its normal thickness, then begins the upward development of the trunk which takes place more slowly in those species whose leaves grow close together than in those whose leaves are further apart. In specimens of many species of Cocos and Syagrus, whose leaves are particularly far apart, the stems grow so quickly when planted in the open ground that they increase by five to six feet in height per annum. The stem of those palms which develop a terminal inflorescence have ended their apical growth by doing so, and wither gradually. In addition to this (withering) in the case *e.g.* of *Arenga saccharifera*, new inflorescences are developed from the original axils (*Blattachseln*) from above downwards, so that one sees at last the already leafless trunk still developing inflorescences in the direction towards the base of the trunk. Almost all palms with this latter kind of growth develop off-shoots in their youth at the base of their trunks which shoot up again into trunks after the death of the primary trunk, if they are not taken off before. As to the structure of the palm-trunks out of unconnected wood-bundles, the assertion has been made that the palm-stem does not grow thicker in the course of time, and that this is the explanation of the columnar almost evenly thick trunk. But careful measurements that were made for years have led Regel to the conclusion that a thickening of the trunk actually takes place, which probably amounts to an increase of about a third over the original circumference of the trunk.

ACTION OF GASES AND LIQUIDS ON THE VITALITY OF SEEDS

MY experiments extend over a period of nearly three years. They were made principally with the seeds of *Medicago sativa*, these seeds resisting in a remarkable manner the action of chemical agents. The observations were very numerous and frequent; but in the present abstract those results alone are given in which the action of the gases and liquids lasted longest.

I. *Action of Gases*. The chief difficulty in these experiments is an easy method of keeping many samples of seeds in the several gases the action of which is to be tested. I devised the following simple plan:—A thick glass tubing was heated in the middle and blown into a bulb of sufficient size to contain a certain quantity of seeds and a relatively large volume of gas; after introducing the seeds into the bulb, the two extremities of the tube were heated, and drawn out, so as to form, on each side of the bulb, a nearly capillary neck; one end was left free, while the other was connected, by means of an india-rubber tube, with the generator of the gas that was to fill the bulb. The air was completely displaced in the latter by allowing the gas to pass for some time through the apparatus; after which, without previously interrupting the passage of the gas, the bulb was sealed by fusing at the blowpipe the two capillary necks.

I prepared a large number of bulbs with seeds and with different gases; the greater number of bulbs contained air-dry seeds, while some contained seeds that had been moistened and swollen with water. On opening the bulbs the seeds were sown, and their vitality measured by the percentage of those that germinated on moist quartz sand.

Experiments with air-dry seeds of *Medicago sativa* in dry gases:—

Gas.	Number of days in which the seeds remained in the gas.	Percentage of seeds that retained the germinating power.
Air (not in bulbs)	More than two years	83
Air (not in bulbs—another sample)	More than three years	50
Nitrogen	789	93
Oxygen	758	59
Hydrogen	1005	63
Carbon monoxide	803	93
Carbon dioxide	1035	24
,, ,,	408	73
Marsh-gas	550	58
Nitrogen protoxide	214	70
,, dioxide	776	48
Ammonia	832	0·5
,,	398	1·2
Sulphur dioxide	838	4·5
,, ,,	405	10·6
Sulphuretted hydrogen.	976	58
Arseniuretted ,,	802	87

Chlorine and hydrochloric acid gas rapidly disorganise the seeds, and destroy their vitality. It is remarkable how air-dry seeds can resist for so long a time the action of nitric oxide, of sulphuretted hydrogen, and of sulphur dioxide, and how some can even survive the action of dry ammonia-gas. The percentages that represent the vitality of the seeds that have been under the action of the different gases cannot be compared, for the experiments were not all begun at the same time, nor extended over the same period, nor was the same sample of seeds used in all the experiments.

Whenever seeds moistened with water are kept in the above-named gases, their germinating power is very rapidly destroyed.

It is also a well-ascertained fact that moist heat acts much more powerfully on seeds than dry heat. We may safely conclude therefore that when the physical and chemical conditions of the medium in which a seed is placed are unfavourable to its germination, water is the most powerful agent in rapidly destroying its vitality. My experiments on the action of liquids on seeds confirm this conclusion.

Moist seeds kept in oxygen and in nitrogen protoxide do not germinate. In some few cases I observed the commencement of sprouting in seeds kept in oxygen. My observations confirm those of Cossa, and are contrary to those of Borscow and Rischawi, who asserted that nitrogen-protoxide can cause moistened seeds to germinate.

II. *Action of Liquids.*—The air-dry seeds were kept in the different liquids in well-stoppered bottles. In some liquids several kinds of seeds were put. The following are some of the results of experiments with the seeds of Lucerne or *Medicago sativa* :—

Liquids used.	Number of days in which the seeds remained in the liquid.	Percentage of seeds that retained the germinating power.
Methyl alcohol...	841	19
Ethyl ,, (absolute)	834	78
Amyl ,,	841	19
Ethyl ether	484	29
,, ,,	908	1·3
Chloroform	484	29·6
,,	841	6
,,	924	0
Carbon tetrachloride	350	57·4
,, disulphide	405	63·2
,, ,,	802	58·4
Ethyl iodide	350	65·4
,, ,,	792	52·5
Glycerine	157	24·2
,,	484	5·2
Benzol ...	397	20
,,	841	8·6
Nitrobenzol	397	17·4
,,	841	6·0
Aniline ...	397	20·1
,,	841	4·2
,, and alcohol (93°)	709	37

In the experiments with methyl alcohol and with glycerine the presence of small quantities of water must have contributed not a little in augmenting the action of the liquid on the vitality of the seeds.

Experiments were made to see the action of ethyl-alcohol when at different degrees of dilution. It was observed that, when the solution contained less than 50 per cent. of alcohol, the seeds easily got swollen, and were rapidly killed. The following are the results of experiments where Lucerne seeds, from the same sample, were kept for 834 days in different mixtures of alcohol and water :—

Degree of the alcoholic solution, Gay-Lussac's scale, per cent. in volume.	Percentage of seeds that retained the germinating power.
60°	0
70	0
80	23
90	62
100	63
100 *bis*	78

Absolute or nearly absolute, alcohol rapidly destroys the germinating power of some kinds of seeds, such as wheat, flax, &c.

In some cases seeds resist the action even of boiling liquids, when the temperature of the boiling point is not too high. Thus, of Lucerne seeds that had been for 160 hours in boiling ether (boiling point 36°) 31 per cent. were still capable of germinating. Seeds of the same plant were kept for 81 hours in boiling carbon disulphide (boiling point 43°): 75 per cent. of the seeds sprouted when sown in moist sand. After five hours boiling in absolute alcohol (boiling point 78°) only 9½ per cent. of the Lucerne seeds did germinate.

In all the experiments where seeds, previously swollen in water, were brought in contact with other liquids, such as absolute alcohol, ether, carbon disulphide, the germinative power was quickly destroyed.

The last series of experiments was made with solutions of solids and gases in liquids different from water. Great care had to be taken in washing the seeds, the germinative power of which had to be tested on the moist sand well with alcohol, and then with water; the presence, even of traces, of the solution in which the seeds had been immersed was sufficient, in some cases, to entirely prevent germination. The following are experiments made with Lucerne seeds :—

Solutions used.			Number of days in which the seeds remained in the solution.	Percentage of seeds that retained the germinating power.
Alcoholic	solution	of iodine	382	1·5
,,	,,	potassium bromide	757	68·4
,,	,,	zinc chloride	757	34·6
,,	,,	,, ,,	376	83·6
,,	,,	mercuric chloride.	756	68·4
Glycerine	,,	copper sulphate ...	757	23·1
,,	,,	,, ,,	375	67·1
,,	,,	arsenic trioxide ...	758	1·3
,,	,,	,, ,,	322	70·2
Alcoholic	,,	potassium sulphide	223	8·2
,,	,,	ammonium ,,	223	0
Glycerine	,,	potassium cyanide	757	80
,,	,,	,, ,,	376	95·3
Alcoholic	,,	camphor ...	757	70·4
,,	,,	phenol ...	757	65
Ether	,,	,, ...	598	69·4

All these solutions easily destroyed the germinating power of wheat.

The following results show the action of saturated alcoholic solutions of gases on Lucerne seeds :—

Solution (alcohol at 97° Gay-Lussac).			Number of days in which the seeds remained in the solution.	Percentage of seeds that retained the germinating power.
Alcoholic	solution	of sulphuretted hydrogen ...	587	27
,,	,,	sulphur dioxide	587	3
,,	,,	nitric oxide ...	587	20

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UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—Dr. Acland, Dr. Burdon Sanderson, and Mr. W. W. Fisher, having been appointed examiners for the Radcliffe Travelling Fellowship, give notice that an examination will be held for the purpose of electing a Travelling Fellow on Tuesday, February 14. Candidates are to send their names to Mr. Fisher before February 8.

There will be an examination at Christ Church on February 22 for at least one Junior Studentship in Natural Science; papers will be set in Chemistry, Biology, and Physics; but no candidate will be allowed to offer himself for examination in more than two of these subjects.

Candidates for the Natural Science Studentships who make Physics their principal subject are recommended to offer themselves for examination in Mathematics, at least in Algebra, Plane Trigonometry, and Pure Geometry, as great weight will be attached in their case to a knowledge of these subjects.

Candidates for the Natural Science Studentships will also have to show that they possess such a knowledge of Classics as will enable them to pass Responsions.

On February 7 Convocation will be asked to pass a decree authorising the Curators of the University Chest to pay to the Delegates of the Museum a sum not exceeding 250*l.*, for the purpose of providing the Linacre Professor of Physiology with additional microscopes, diagrams, and drawings for the use of students in the Physiological Laboratory, as well as with additional cupboards for containing diagrams and drawings.

CAMBRIDGE.—The following elementary lectures on chemistry are being given :—Prof. Liveing's and Mr. Main's (St. John's College) General Courses; Mr. Pattison Muir (Caius), Non-Metallic Elements; Mr. Lewis (Downing), Catechetical Lectures; Mr. Walker (Sidney), Organic Chemistry; Mr. Garnett is lecturing on Heat at St. John's; Mr. Glazebrook (Trinity),