

THE fourth number of the circulars of the U.S. Bureau of Education for 1873 contains a list of publications by the members of certain college faculties and institutions of learning in the United States from 1867 to 1873, and constitutes quite a valuable record of scientific activity during that time. We hope the Bureau will continue such a publication yearly, and we only wish there was any prospect of a similar undertaking in our own country.

WE would draw attention to the efforts being made by the Directors of the London Polytechnic Institution to give a scientific character to part of the entertainment which they provide for the public. Mr. E. V. Gardner is at present delivering the seventh and eighth of a series of lectures descriptive of "Inventions and Appliances Useful or Necessary to Everyday Life," the subjects being "Sugar: from the Cane to the Teacup," and "The Silber Light and Lightning." We wish the Directors of the Polytechnic success in this attempt to make their institution administer to instruction as well as amusement.

MR. J. D. PAINTER of Macclesfield sends us some very interesting ornithological notes relative to East Cheshire. A short time ago, a bird which had been hovering round the Grammar School for six weeks, was brought him; it had evidently been killed by a violent blow with either a stick or a stone. Upon examination it proved to be the Crested Lark (*Alauda cristata*), which is a common bird throughout the Continent of Europe, but not a native of Britain. Indeed, it is a very rare visitor, since only two or three instances are on record of its having been met with in this country. Occasionally, the neighbourhood of Macclesfield is resorted to by other strangers of the feathered tribe. Some few weeks since the Black-headed Gull (*Larus ridibundus*) was shot in Swithamley Park, and previous to that, on the same estate, the Common Buzzard (*Buteo vulgaris*) had been shot upon the Roaches. A few years further back the Roller (*Coracias garrula*), and a Hobby were killed two or three miles south of the town. In tempestuous weather the Stormy Petrel or Mother Carey's Chicken has been frequently picked up either dead or in an exhausted condition near Macclesfield: and Terns are occasionally shot. The Siskin is a winter visitor, some become victims to the bird-catchers, and the Brambling, also a winter visitor, is now and then shot or snared. Twenty-five years ago, that delightful songster the Woodlark bred about Gawsorth, but in like manner it became completely extinguished. The Grey or Wild Goose (*Anser ferus*) and the Curlew (*Numenius arquata*) came almost every year to breed on Danes Moss, but when the North Staffordshire Railway was carried across it these birds deserted it. Last year, however, the Curlew returned and nested, but some boys took the eggs when just upon the point of being hatched; and this year the birds have not been seen in the neighbourhood. A few Woodlarks have likewise returned lately, and they will most probably share the same fate as their predecessors, unless the forthcoming amended Birds' Act be extended to them and also to the Skylark, which have been most unaccountably omitted in the Act now in force. A few years ago Mr. Painter gave a lecture at the Town Hall upon the Geology, Archæology, Botany, Ornithology, and Zoology of Danes Moss and its borders, when he mentioned some rare and beautiful bog plants. &c. that grew upon it. In the course of a year or two nearly the whole of them were rooted up and carried away, chiefly by strangers.

THE additions to the Zoological Society's Gardens during the last week include a Zebu (*Bos indicus*) born in the Menagerie; a Greater White crested Cockatoo (*Cacatua cristata*) from Moluccas, presented by Mr. T. Towndrow; a Squirrel Monkey (*Saimaris sciurea*) from Guiana, presented by Mrs. Paget; a Parrot Crossbill (*Loxia pityopsittacus*) and two common Crossbills (*L. curvirostra*), European, purchased.

EFFECTS OF ALCOHOL ON WARM-BLOODED ANIMALS*

AFTER referring to what had already been done in reference to this subject, Prof. Binz gave an account of his and his pupils' researches during the last years. They concerned especially two points (1) the influence of alcohol on the temperature of the blood, and (2) the causes of this influence.

As in every powerful attack on our organism, so also in the case of alcohol, the questions arise—In what quantities it worked? and whether the organism to be experimented on was previously accustomed to its influence or not? Taking into exact consideration these two points, so often disregarded, the answer is as follows:—The pretended heat of the organism does not exist. The subjective impression is, at least partially, the consequence of an irritation of the nerves of the stomach and of the enlargement of the vessels arising in the skin. When given in small doses the thermometer shows no extraordinary increase or decrease of the temperature of the blood. Moderate doses, which lead by no means to drunkenness, show a distinct decrease of about half-an-hour duration or more; and inebriating quantities evince a still more decided lowering of 3 to 5 F., which lasts several hours. The decrease in the temperature after moderate doses takes place most successfully in warm-blooded animals, which have had for some time previously no alcohol administered. When inured to it, the organism does not answer on such doses by any measurable cooling or by the reverse.

Good results are yielded more easily by a feverish than by a healthy animal. For these experiments strong guinea-pigs, rabbits, or dogs of the same origin and of the same quality have been used. Under their skin some cubic-centimeter of ichor or putrifying blood was injected. After thus proceeding, the temperature of the animal rises several degrees, and all the symptoms appear which are to be observed in human beings suffering from putrid fever. If the quality of the poisonous substance be right, the animal expires in a few days. Not so, however, if, simultaneously with the ichor, alcohol diluted with water is administered. The temperature then remains lower from the beginning, and the one animal may be seen to die, whilst the other runs about. The analysis of these experiments shows a threefold action of alcohol in putrid fever—(1) the diminution of the heat; (2) reduction of the putrid processes; and (3) rising of the action of the nerves and of the heart.

Prof. Binz then remarked on the causes of such antipyretic action of alcohol. He pointed out several possibilities which here may concur, and has proved by a series of experiments that two of them really take place. It is the action of the heart, together with the enlargement of the vessels of the skin, which allow a stronger evolving of the blood at the surface of the body, and then the moderating influence of alcohol on the chemical metamorphosis of tissues. All these results seem to be suggestive for the use and abuse of alcohol in social life as well as in illness, and they explain a great many empiric observations in both departments. The paper of Prof. Binz will be published at length in one of the next numbers of *Humphrey's Journal of Anatomy and Physiology*.

Dr. Brunton remarked that the performance of the vital functions depended on oxidation of the tissues, and Professor Binz's observation that this was lessened by alcohol was the key to an explanation of its physiological effects. These may be nearly all explained on the supposition that the power of the nervous system is diminished, different parts of it becoming successively paralysed. First, the vasomotor nerves become affected and the blood-nerves consequently dilated. After a glass or two of wine, the hands may be noticed to be of a very red colour and plump, showing that arterial blood is flowing freely through the capillaries, and at the same time the veins are dilated and full. All the vessels of the body, however, are not dilated at the same time. In some persons those of the stomach or intestines become dilated, and the blood being thus abstracted from the head the brain becomes anæmic, and the individual dull and sleepy. In others the arteries of the head become dilated first, and in consequence the brain receives a full supply of blood, and the intellect becomes more vigorous. If this stage is not passed the functions return to their normal condition, and no harm ensues, but if more alcohol is taken the paralysis extends to other parts of the nervous system. Sometimes the cerebral lobes, which are the organs of the mental faculties, are first affected, and some-

* Abstract of paper read at the British Association, Bradford, by Prof. Binz, of Bonn, with Dr. Brunton's remarks.

times the centre, for co-ordinated movements usually supposed to be the cerebellum, or, as it is often expressed, "one man gets drunk in his head, another in his legs." When the head is affected judgment becomes impaired, though memory and imagination may still be more active than usual. These faculties next fail, and the emotions become hilarious, pugnacious, or lachrymose. The spinal cord is generally unaffected even when the cerebellum is paralysed, and a man who is utterly unable to walk can still ride, the mere pressure of the saddle upon his thighs being sufficient to cause reflex contraction of his adductor muscles and fix him firmly on his seat, although the upper part of his body may be swaying about like a sack of wheat. The cord itself next becomes paralysed, and lastly the medulla oblongata, which regulates the respiratory movements.

After relating an anecdote illustrating the effects of alcohol in hastening death during exposure to cold, Dr. Brunton remarked that, notwithstanding all these apparently injurious actions, alcohol was of great service when properly used. Many men came home from their offices completely exhausted, and the stomach, sharing the general exhaustion, is unable to digest the food which lies heavily in it, and incommoding instead of strengthening the individual.

A glass of sherry taken with the food will stimulate the stomach to increased action, and by the time the effect of the stimulus has passed away the food has digested and absorbed, and sustains the effect which the alcohol temporarily produced. When taken in considerable quantities for a long time, alcohol is apt to produce deposit of fat and fatty degeneration of organs, rendering a person not only less capable of work, but liable to succumb to disease.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Dec. 11.—"Researches in Spectrum-Analysis in connection with the Spectrum of the Sun."—Part III., by J. Norman Lockyer, F.R.S.

The paper commences with an introduction, in which the general line of work since the last paper is indicated. Roughly speaking, this has been to ascertain the capabilities of the new method in a quantitative direction. It is stated that while qualitative spectrum-analysis depends upon the *positions* of the lines, quantitative spectrum-analysis on the other hand depends not on position but on the *length*, *brightness* and *thickness* of the lines.

The necessity of maps carefully executed and showing the individuality of each line is shown; and it is stated that the execution of these maps required the use of the electric arc to render the vapours of the metals incandescent. A battery of 30 Grove's cells of one pint capacity was accordingly employed in the researches about to be described.

The difficulties of eye-observations of the characters of the lines compelled the application of photography, another reason for the use of which existed in the facility it afforded for confronting spectra with each other, and so eliminating coincident lines, since the lines, if due to impurities, would be longest and thickest in the spectrum to which they really belonged.

The portion of the spectrum at present worked upon is that from H to F.

Another branch of the research has been the construction of a Table of all the named Fraunhofer lines, showing the lengths and thicknesses of the metallic lines to the absorption of which they were due; this Table enabled the author to allocate upwards of 50 lines in the solar spectrum, presumably overlooked by Angström and Thalén. The table was intended as a preliminary to a new photographic map of the spectrum from H to F, on a larger scale than Angström's, which was intended to clear away all the difficulties touching coincidences, and to have below it complete maps of all the solar elements with their long and short lines. This map is incomplete at present, but is making rapid progress.

A preliminary search for elements supposed not to be in the sun has also been commenced.

Of the above-named researches the subsequent parts of the paper refer to:—

I. The experiments made on a possible quantitative spectrum-analysis.

II. The method of photographing spectra adopted.

III. The coincidences of spectrum lines.

IV. The preliminary inquiry into the existence in the sun of elements not previously traced.

I. The Experiments made on a possible quantitative Spectrum-Analysis

After the two former papers were sent in to the Royal Society, an investigation of the general changes undergone by spectra given by alloys was commenced.

A micrometer eye-piece was mounted on the observing-telescope of the spectroscope. With this the following phenomena were observed:—

I. The lines which remained varied their length as the percentage of the elements to which they were due varied.

II. Some of the lines appreciably varied their thickness or brightness, or both in the same way.

III. In cases where the brightness of a line was estimated through a considerable range of percentage composition by comparison with an air-line, the air-line was observed to grow faint and then disappear as the lightness of the metallic lines increased.

IV. In cases where the brightness or thickness of the line of one element was estimated by comparison with the line adjacent of the other constituent of the alloy, the point of equal brightness was observed to ascend or descend; this method was used to avoid the uncertainty of micrometric measurements of the tips of the lines in consequence of their variation in length due to the unequal action of the spark.

V. In some cases where the percentage of a constituent was so small that none of its lines were visible, there yet seemed to be an effect produced on the vapour of the opposite pole.

As these conclusions were derived from coarse alloys, and it was desirable to observe the effect of very fine gradation, Mr. C. Freemantle, the Deputy Master of the Mint, was begged to allow observations to be made on the gold-copper and silver-copper coinage alloys, and he immediately responded most cordially to the request.

Examples of the behaviour of some coarse alloys of silver and lead are given; they were irregular in their action, but it was observed that silver lines remained in the alloy as long as from .05 to .02 per cent. of silver was present. The alloys, however, were very unequal. Experiments on cadmium and tin alloys are described, the cadmium forming 10, 5, 1.0, 0.15 per cent. In the last but one cadmium line was permanent; in the first at least five were seen. In an alloy of 0.099 per cent. of cadmium with a mixture of lead, tin, and zinc constituting the rest of the alloy, the behaviour of the cadmium lines was sensibly the same as in a mixture of 0.1 per cent. of cadmium and 99.9 of tin.

In the Mint-specimens the same phenomena were observed *en petit*, as the coarser alloys showed *en grand*. In a gold-copper alloy $\frac{1}{1000}$ increase in the gold made the lines shorter, and a similar increase in the copper made them longer.

In the silver-copper alloy an increase of $\frac{1}{1000}$ in the silver lengthened the lines, a similar increase in the copper shortened them.

These phenomena can be explained by assuming such alloys to be different physical things, and that the spark acts upon the alloy as a whole as well as upon each vapour separately.

Thus in these Mint alloys, copper is common to both, and their melting-points are:—

| | |
|--------------|---|
| Gold . . . | 1200° (Pouillet). |
| Copper . . . | 1200° to 1000°, the precise point not determined. |
| Silver . . . | 1000° (Pouillet). |

The intermediate position of copper explains the different action on its lines of gold and silver.

II. The Method of photographing Spectra adopted

A camera carrying a 5 × 5-inch plate and a 3-inch lens of 23 in. focus, replaced the observing-telescope of the spectroscope. The lens focused from 3900 to 4500 very fairly upon the plate. The beam passing through collimator and prisms was, as in Mr. Rutherford's researches, very small. As the electric arc in its usual vertical position gave all the lines from pole to pole, the lamp was placed on its side, and the arc used in a horizontal position, the slit being vertical. The dense core of the arc then gave all the short lines in the centre of the field, the longer ones extending beyond them on either side. In order to obtain a scale, it was resolved to photograph the solar spectrum immediately adjacent to the metallic spectrum under examination.

To effect this a portion of the slit was covered up while the solar spectrum passed through the free part, and then the part used for the solar spectrum was covered, while the formerly covered part was opened for the metallic spectrum. This was