

## THE DISCOVERIES OF 1863.

These items of the "Discoveries of 1863," are further extracts from "Wells' Annual of Scientific Discovery:"—

## THE MOST RECENT SPECTRUM DISCOVERIES.

The following is an abstract of a lecture on the above subject, recently delivered before the Royal Institution, London, by Professor Miller, F. R. S. :—

"Among the rays, emitted by the sun, there were three kinds, interesting as endowed with special action—those which conveyed heat, light, and chemical action. With heat, he should have but little to do, on this occasion; about light he had something to say; but he was now principally concerned with the rays which manifested themselves by producing chemical action. It was well known that transparent substances did not transmit all these rays with equal facility. Glass was only imperfectly transparent to the chemically active rays, which were found in the most refrangible rays of the spectrum, heat-rays being in the least refrangible portion, and light occupying the middle place. It had been found that rock-crystal was one of the few substances which perfectly transmitted those highly refrangible rays which glass absorbed.

"The professor then showed that some kinds of light were without chemical action, the light from a mixed air-gas flame possessing scarcely any, while that from an ordinary gas flame did possess a little. The oxy-hydrogen flame, while attended with intense heat, was endowed with very little chemical action. A prepared collodion plate exposed to this light for twenty seconds gave a very faint picture. But when the flame was thrown on a lime, although the temperature was lower, the light had sufficient chemical activity to produce a strong picture on a similarly prepared plate, exposed for the same time. In the case of the chemically-acting ray, the intensity, number, and position of the lines on the spectrum had been found to vary with the source of light. The most remarkable illustration of this was the different spectra produced by the electric spark of an induction coil between poles of different metals, and projected upon a photographic plate.

"The spectrum produced by the spark from silver poles, for example, was found to be three times the length of the whole of the solar spectrum transmitted by quartz. In order to obtain views of this invisible spectrum, it was necessary to transmit the rays through a medium more transparent to chemical rays than glass, which, it had been said, was opaque to the higher rays of this kind, and various experiments had been made to ascertain what substance allowed them to pass most freely."

## PRACTICAL APPLICATION OF THE SPECTRUM ANALYSIS.

A beautiful practical application of the principles of the spectrum analysis has recently been made in England in the casting of steel. In a newly-adopted process of melting the metal, it is important to know the exact moment at which to shut down the cover of the furnace; time must be allowed for the escape of the gaseous products which are injurious to the steel, but if that time be prolonged, an injurious effect of another kind is produced. To meet this contingency, it has been proposed to test the gases as they fly off, by means of the spectroscope; and as soon as the particular color is observed, peculiar to the gas, which begins to escape at the moment the molten metal is in proper condition, the manufacturer will then have an infallible sign of the proper moment for closing the furnace.

## Joule's New Sensitive Thermometer.

At a recent meeting of the Manchester Philosophical Society, Dr. Joule exhibited an exquisitely sensitive air thermometer, capable of being affected by the  $\frac{1}{1000}$  of a centigrade degree of heat. The construction is thus described: A glass vessel in the shape of a tube, two feet long by four inches in diameter, is divided longitudinally by a blackened pasteboard diaphragm, leaving spaces at the top and bottom, each a little over an inch. In the top space, a piece of magnetized sewing needle, furnished with a glass index, is suspended by a single filament of silk. It is evident that the arrangement is similar to that of a bratticoid coal-pit shaft, and that the slightest excess of temperature on one side over that on the other must occasion a circulation of air, which will ascend on the heated side, and, after passing across the fine

glass index, descend on the other side. It is also evident that the sensibility of the instrument may be increased to any required extent, by diminishing the directive force of the magnetic needle. I purpose to make several improvements in my present instrument; but in its present condition, the heat radiated by a small pan, containing a pint of water heated 30°, is quite perceptible at a distance of three yards. A further proof of the extreme sensibility of the instrument is obtained from the fact that it is able to detect the heat radiated by the moon. A beam of moonlight was admitted through a slit in the shutter. As the moon (nearly full) traveled from left to right, the beam passed gradually across the instrument, causing the index to be deflected several degrees, first to the left and then to the right. The effect showed, according to a very rough estimate, that the air in the instrument must have been heated by the moon's rays a few ten-thousandths of a degree, or by a quantity, no doubt the equivalent of the light absorbed by the blackened surface, on which the rays fell.

## ADDITIONAL FACTS RESPECTING THALLIUM.

This new metal, which was first publicly shown at the London International Exhibition, 1863, has since that time been produced in comparatively large quantities. At the meeting of the British Association, 1863, Mr. Crookes, its discoverer, exhibited a mass weighing upward of a quarter of a hundred-weight, and demonstrated its more obvious properties. It is the softest of the new alkaline metals, being easily scratched by a point of lead. When obtained in larger quantity, thallium will doubtless be employed to furnish a magnificent green flame. Eight parts of chlorite of thallium, two of calomel, and one of resin, yields a splendid light on being ignited, and a very little reduction in price would enable it to be used for ship-signals; its extraordinary intensity and monochromatic character enabling it to penetrate through a hazy atmosphere, which alters altogether the color of the ordinary green lights produced by the salts of baryta.

## PASTEUR'S RESEARCHES ON FERMENTATION AND PUTREFACTION.

For some years past, M. Pasteur, a distinguished French chemist, has been engaged in investigating the phenomena of fermentation and putrefaction, and the results attained to by him constitute some of the most important contributions made to chemical science during the past few years. In the report of researches heretofore published, M. Pasteur claims to have proved that the effects hitherto attributed to the atmosphere of oxidizing and thus consuming dead organic matter are really dependent on the growth of infusorial animalculæ. In a recent paper submitted to the French academy, M. Pasteur says:—"We must banish from science those preconceived views which consisted in the supposition that a whole class of organic substances—the nitrogenous—could acquire, by the hypothetical influence of direct oxidation, an occult force characterized by an internal movement, ready to communicate itself to organic substances pretended to be slightly stable." And further, "the slow combustion of organic matter after death, though real, is scarcely perceptible if the air is deprived of the germs of the lower organisms. It becomes rapid if the organic matter is permitted to cover itself with molds, mildews, bacteriums, and monads. . . . The intermediate principles of organized beings would be, in some sort, indestructible, if we were able to suppress altogether those beings which God has made so extremely small, so useless in appearance, and life would become impossible, because the return to the atmosphere and to the mineral kingdom of that which had ceased to live, would be entirely suspended."

## SUGAR AS FOOD.

Mr. Bridges Adams, the English physiologist, in a recent paper on the "Uses of sugar in assisting assimilation of food," says: "I know by experience the difference in nutritious effect produced by the flesh of tired cattle on a march, and those slain in a condition arising from abundant food and healthy exercise. In a former case any amount might be eaten without the satisfaction of hunger, whilst in the latter a smaller amount removed hunger. But I discovered that certain other food of a different quality, such as grape-sugar and fruit, would help the tired meat to assimilate, and thus to remove hunger." Puddings and fruit-tarts are not, therefore, simply flatteries of the

palate, but digestive agents; provided, always, they are not themselves made of rebelliously indigestible materials. The reviewer alludes to the fondness of artisans for confectionery, and of patients just discharged from the hospital asking for "sweets" in preference to "good substantial food," as examples of a correct instinct. There is no doubt that in children, in whom the requirements of growth call for a rapid and efficient transformation of food into tissue, the demand for sweets is very imperious; and parents should understand that the jam-pot will diminish the butcher's bill, and increase the amount of nutrition extracted from beef and mutton.

## GLACIAL MUMMIES.

In the year 1844, a man of the commune of Passy situated between Chamounix and Sallenches, went on a pilgrimage of devotion to the celebrated hospice of St. Bernard. He accomplished his journey, paid his devotions to the perilous shrine, and returned by the mountain road to Martigny, where he purchased at the fair then holding there a large roll of cloth, which he intended to smuggle into Savoy, then belonging to Sardinia, while Martigny was, as now, in the canton of Valais, in Switzerland. But the pilgrim of St. Bernard never reached his home in Passy. His wife mourned his absence, the villagers wondered for a few days, and gradually as years glided along, he was comparatively forgotten, and his memory began to be lost in obscurity.

During the last week of August, 1863, however, a hunter crossing the *glacier de Buet*, while leaping a crevasse, had his attention attracted by a dark object below, and peering down into the chasm, he saw beneath a transparent sheet of pale blue ice, a human form laid as in an icy sarcophagus! The features were ruddy and natural, though in horrid contrast to this were the eyeless sockets, whence the eyes had fallen away. The astonished hunter hastened to inform the village authorities of Chamounix of his discovery; and on extricating the body it was readily recognized as that of the long-lost merchant of Passy, and more certainly identified by the roll of cloth bought nineteen years before at the Martigny fair, and which was lying near the glacier-preserved corpse. It was evident that the smuggling mountaineer, in trying to avoid the frontier authorities and regain his home by circuitous Alpine passes, had fallen into some crevasse, and the slow motion of the great glacier had gradually brought the lifeless, frozen body down the slope of Mt. Blanc, to the point where it was discovered.

## MECHANISM OF LOCOMOTION.

Prof. Marshall, in a recent lecture on the above subject, before the Royal Institution, London, gave the following as the possible rates of animal locomotion per hour; shark and salmon, sixteen and seventeen miles; flies, four to six miles; eider-duck, ninety miles; hawk, one hundred and fifty miles; worms, thirty feet; race-horse, forty to sixty miles; man walking, four to five miles, running, twelve to fifteen miles. Especial attention was also directed to the advantage of the atmospheric pressure on the joints, amounting in the knee, where so much flexibility is required, to sixty pounds, and in the hip-joint to twenty-six pounds.

## VOCAL FISHES.

Dr. Dufosse has communicated to the French Academy an account of certain researches into the vocal powers of certain fish, most of his observations being made upon species of *Trigla* and *Zeus* (gurnards and dories). He states the sounds to be produced by the vibration of the muscles belonging to the air-bladder, and that large gurnards may be heard at a distance of six or seven yards. Out of five or six hundred individuals, of the species mentioned, their voices were comprised between  $si_2$  and  $re_3$  inclusive. The sounds were instantaneous, or prolonged for several minutes, sometimes as long as seven or eight minutes. The pitch often varies during a single "sonorous emission." The finest vocal performers appear to belong to the species *Morruide*, who surpass all their congeners in producing a great number of completely distinct sounds. "They sustain the simple sounds better, and modulate better the compound sounds; they render more distinctly long successions of sounds different in tone and pitch; in fine, there is less dissonance in the sonorous vibrations they produce. Other species, however, beat them in intensity."