

manufacture of artificial visualisations; and the hat feat just narrated falls within the same category.

In working the rich mine which Mr. Galton's genius has discovered, I hope he will explore the vein of chess without the chess-board. As efforts of memory, such performances are as surprising as the numerical feats of Colburn and Bidder. And they notably differ from them in that the highest development is reached, not by young boys, but by men of mature years, who, as players over the board, have reached the front rank. The writer (in last year's *Chess Player's Chronicle*) attempted to give a rough estimate of the number of moves and positions possible at chess. They are of course practically illimitable; and with this fact in mind it is easy to form an idea of the difficulty of playing *twelve* games blindfold against very strong antagonists. This task, however, is often performed by Messrs. Zukertort and Blackburne, beyond question in England, and probably in the world, the greatest adepts in this branch of chess-play. It would be highly instructive to learn by what process, in so far as it is a conscious and describable one, these feats are achieved. If Mr. Galton takes the matter up, no doubt he will, with his usual skill, throw a flood of light upon the subject.

EDWYN ANTHONY

Riggs's Hotel, Washington, March 29

Meteor

A LARGE and brilliant meteor was seen here at 8.25 p.m. on the 7th inst. It appeared a little below Zeta Tauri, and travelled very slowly southwards in a line nearly parallel to the horizon, traversing a space of about 50°.

The meteor rapidly increased in brilliancy, and is described as many times brighter than Venus, until near the end of its course, when it diminished in size. No trail was seen, although the meteor appeared to smoke.

SYD. EVERSHERD

Wonersh, Guildford, April 12

Carnivorous Wasps

A SUMMER or two ago I observed a number of dead flies, blue-bottles, humble-bees, and hive-bees on a certain part of one path in my garden; though the dead insects were removed every day, yet a fresh collection was seen every morning, the cause of death remaining unknown for several days. One morning I was earlier than usual in the garden, and I saw a number of wasps attacking flies and bees in their flight, biting and twisting their wings, and ultimately killing their victims on the ground.

The garden was at the time full of flowers, and the wasps appeared to be waiting in ambush for the flies and bees as they came over a low wall into the garden. Sometimes the wasps would bite the wings entirely off their victims, and they soon after appeared to be sucking the juices of the flies from the joint between the head and thorax.

WORTHINGTON G. SMITH

"Who are the Irish?"

WILL you permit a few words of reply to your notice of "Who are the Irish?"

Grateful to your critic for pointing out some hastily-written sentences, I am surprised he failed to see the real object of the little book. This was to show in a popular rather than a scientific way the folly of that *race hatred*, arising from the assumption that Irish are Celts and English are Saxons.

It was not necessary to cite French authorities on the Celtic question there, though they appear in the forthcoming pamphlet on "Who are the Scotch?" As for my supposed absurd remarks about Basques and Dark Irish, I only quoted the opinions of the learned Prof. Huxley. My simple and honest desire was to promote peace and goodwill between two peoples, more closely related than the factious and contentious care to believe.

JAMES BONWICK, AUTHOR OF

"WHO ARE THE IRISH"

Acton, E., March 24

A LEAF FROM THE HISTORY OF SWEDISH NATURAL SCIENCE¹

III.

IN a yet higher degree than fluor spar, phosphorus attracted attention through its property of being self-luminous in darkness in consequence of a slow combus-

¹ Translated from a paper by Prof. A. E. Nordenskjöld of Stockholm. Continued from p. 547.

tion. This substance was accidentally discovered, as I have already mentioned, at the close of the sixteenth century, at Hamburg in the course of experiments made by the ruined alchemist, Brand, with a view to produce the philosopher's stone by the dry distillation of urine which had been evaporated to dryness. The raw material was not abundant, the process of manufacture uncertain, and phosphorus, which is now sold at about 7s. 6d. per kilogram, was worth many times its weight in gold. Soon after the physician Bernard Albinus discovered that the same substance could also be produced from the ashes of certain plants, but its general occurrence in nature (in the bones of animals and in the mineral kingdom) was first pointed out by Scheele and Gahn, who, during Scheele's stay in Stockholm (1768-70), are believed to have simultaneously made this important discovery.¹ It forms the proper starting point of our knowledge of this substance, of such extraordinary importance in the economy of nature, so indispensable in scientific agriculture, in medicine, and in numberless branches of modern industry.

In attempting to discover the cause of cold-shortness in iron, Bergman and the German Meyer believed that they had discovered almost simultaneously that it was caused by the iron being alloyed with a brittle and easily fusible metal, for which Meyer proposed the name *hydrosiderum*. Soon after, however, Meyer himself and Klaproth showed that a metal completely similar was produced by fusing together iron and phosphoric acid—the latter distinguished chemist expressly declaring that the *analytical* proof of this was difficult to carry out. The year after, however, Scheele succeeded in producing phosphorus in a very ingenious way from cold-short iron. We are thus under a great obligation to him for a very important contribution to scientific metallurgy.

As I have already stated, Brandt proved, about 1730, that the regulus of arsenic ought to be considered as a peculiar semi-metal, whose proper "kalk" was arsenious acid. If we except Macquer's discovery of arseniate of potash, our knowledge of this important and dangerous substance made little progress during the following decades, until Scheele in 1775 published in the *Transactions* of the Swedish Academy of Sciences his remarkable, and in this field epoch-making work "On Arsenic and its Acid." Scheele introduced to our knowledge arsenic acid and a number of its salts, and besides discovered that it gave with zinc a gas previously unknown, which contained "combustible air" and arsenic. This gas (arseniuretted hydrogen) is exceedingly poisonous, and experiments with it forty years after its discovery cost the German chemist Gehlen his life. It appears to be this gas which is given off in rooms where the paper-hangings contain arsenic. This work of Scheele's came to be of great theoretic importance by his sharp glance immediately noting that the white arsenic and the new arsenic acid were different degrees of oxidation, or as it was then expressed, different "stadia of dephlogistication" of the same metal. Long before Davy's discovery of potassium and sodium, Berzelius' of calcium and silicium, and Wöhler's of aluminium, Scheele appear to have had a clear insight into the relationship of the earths to metallic oxides.²

¹ The first account of this discovery is found in a note of two lines in Scheele's paper on fluor spar to this effect: "That the earth in bone and horn is lime saturated with *acidum phosphori* is newly discovered." (*Trans. Acad. Sc.* 1771). The discovery was ascribed by Bergman in his edition of Scheffer's Chemistry, at one place to Scheele, and at another to Gahn. The facts of the case are cleared up in Wilcke's biography of Scheele. He had in the spring of 1770 mentioned to Gahn that he had found in burned hartshorn lime combined with a substance unknown to him, on which Gahn examined the "animal earth by means of the blow-pipe, and found it be composed of lime combined with phosphoric acid." Scheele at first doubted Gahn's statement, until in the summer of the same year at Upsala he for the first time made phosphorus from burned bones.

² All metallic "kalks," indeed all earths are distinct acids, whose difference depends on different proportions of phlogiston. In a letter to Hjelmscheele says:—"The discovery of ferric acid is reserved for chemists, not earlier than the coming century, when we labour in the Elysian fields." Ferric acid was discovered in 1840 by Fremy.