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THE AUSTRALIAN ANTARCTIC EXPEDITION.

In the SCIENTIFIC AMERICAN SUPPLEMENT of September 21, 1895, we gave an account of the recent voyage of Mr. C. E. Borchgrevink to the Antarctic regions, which he undertook in the interest of science. In his paper, read before the International Geographical Congress, he advocated the sending of an expedition to Victoria Land for exploring purposes, and offered his personal services for such a voyage. A response to his suggestion has come from Australia, where the Premier of New South Wales has sent out an invitation to the other colonies to co-operate in fitting out an Antarctic exploring expedition. The proposition has been favorably received, the latest response coming from Queensland. South Australia has the matter under advisement, and will reply on receipt of the full details of the scheme. Tasmania has voluntarily offered her assistance.

The first efforts of the expedition will be directed to the exact location of the south magnetic pole. If the plan proposed by Mr. Borchgrevink be followed, a landing will be made at Cape Adare and a supply depot formed there. From this point the expedition will attempt to reach the magnetic pole by an overland route. If the calculations prove to be correct, it will be found to lie 160 miles to the southwest from Cape Adare.

EXHAUSTIVE STEAM BOILER EXPERIMENTS.

The issue of Engineering for September 20 contains an account, by Mr. Bryan Donkin, M.I.C.E., of twenty-one steam boiler experiments which have been carried out by Professor Kennedy and himself during the past five years. The paper is accompanied by tables and diagrams showing the results, and it is in every way a valuable contribution to this branch of mechanical engineering.

We note that in the column headed "Pounds of coal burned per square foot of grate per hour," the highest results are credited to a locomotive in active service that was fitted with a copper fire box. This amount, $35\frac{50}{100}$ pounds, is fully double the average results obtained on the grates of the other types that were tested. With the exception of a steam fire engine boiler, which burned $34\frac{30}{100}$ pounds, the other boilers average about 15 pounds per square foot per hour.

This comparison shows to what hard work a locomotive boiler is put. Under the head of "Equivalent water evaporated per pound of coal from and at 212° Fahr.," the Great Eastern locomotive again heads the list with the very fine record of 12·51 pounds.

Mr. Donkin is of the opinion, however, that priming took place on this trial of the locomotive, from the fact that the heat accounted for was 4 to 5 per cent in excess of the heat received. In such a case a certain amount of the 12·51 pounds of water was carried off in the solid form, and cannot justly be credited to the evaporative capacity of the boiler. This would place the Lancashire boiler in the first place with a record of 12·46 pounds.

It is remarkable that the fire engine boiler, with its high consumption of fuel per square foot of grate, shows the relatively small evaporation of $7\frac{95}{100}$ pounds of water; though this is in part accounted for by the fact of the small size of the boiler, and the fact that it was pushed very hard in the trial.

In the table of relative "thermal efficiency" the best result is shown by three Cornish boilers, in which the good average of $11\frac{40}{100}$ pounds of water evaporated per pound of coal was obtained with a consumption of $6\frac{86}{100}$ pounds of coal per square foot of grate. It is surprising to find that the two water tube boilers stand near the bottom of the list, being from fifteen to twenty per cent lower in efficiency than the Cornish and Lancashire boilers, and—if we include them in the comparison with a five per cent reduction—the Great Eastern Railway locomotive boilers. In the Cornish boilers the direction of the gases was through the one center tube, back along each side, and returning underneath the boiler to the chimney. The center tube was furnished with large cross tubes. The whole paper is extremely valuable, and it is of the kind that the mechanical engineer will carefully file away in his scrap-book for future reference.

CHROMATOPHORES, OR THE COLOR-BESTOWING CELLS OF ANIMALS.

The endless variety of coloring which is to be found in the animal kingdom, and which is a distinguishing characteristic of its lower forms, has been made the subject of elaborate and careful investigation. We are told that the published literature bearing on the subject of pigment cells, or chromatophores, is "enormous." Much of this literature is controversial, and the exact means by which nature presents such a rich variety of coloring in the animal world, the origin and functions of the cells to which are assigned the color-giving properties, are, even to-day, to some degree a matter of opinion among the specialists who have devoted themselves to this difficult, but very fascinating, study.

The October number of Science Progress contains an exhaustive article upon the above subject by Walter Garstang, M.A.

According to the writer, although the chromatophore is a cell whose essential function is one of color-giving, it appears that all color-giving cells are not chromatophores. Thus the cells of the sensory, respiratory or excretory tissues are pigmented; but their pigmentation is accidental, or, more strictly speaking, not essential. The cells that give the reddish hue to the tissue of the lips or the nostrils are not chromatophores. Their primary function is not one of coloration, but that of the chromatophore is.

"Chromatophores are pigmented cells specialized for the discharge of the chromatic function."

The only true pigment cells, as explained above, are those of vertebrata, of cephalopod and certain pteropod mollusca, and of crustacea.

The commonly accepted therory regarding the nature and origin of chromatophores is that they consist of connective tissue elements. Mr. Garstang, on the other hand, is of the opinion that they have arisen by the modification of "pre-existing pigmented cells;" and since their very existence involves the idea of visibility, there is here strong presumptive evidence that they originated in the outside layer of the body, or what is known as the ectoderm. This view is borne out by Joubin's description of the development of the chromatophore in the embryo of argonauta. He shows that the pigmented cell is "originally one of the constituent cells of the embryonic ectodermal epithelium. At an early stage it becomes slightly larger than its neighbors, and then sinks beneath the surface of the epithelium at the apex of a pit-like invagination of the ectoderm. It then enlarges greatly, detaches itself from the epithelial pit, and becomes surrounded by mecodermal cells, which transform themselves into the radial muscle cells. The ectodermal invagination closes up."

Very nearly akin to the above process is that of the development of the purple glands of Aplysia, described by Blochmann: "Each of the purple gland cells is at first a part of the ectodermal epithelium; it enlarges and sinks beneath the epithelium, retaining a narrow, neck-like prolongation to the surface; the whole of the cell then sinks deeper within the mesoderm. Each gland cell becomes surrounded by connective tissue cells and muscle cells, by the contraction of which the pigmented secretion of the gland is forced to the exterior."

The chromatophore has an elaborate system of nerve fibers which spring from the nerve system of the skin. In shape it might be described as a disk, sandwiched between two outlying "nerve plates." Referring to the pigment cells of mammals already mentioned, such as those of the respiratory organs, it is probable that they are "degenerate representatives" of the chromatophores of the lower orders of vertebrata. In the process of evolution, as the covering of hair began to develop and the chromatophoric effect was covered up, these cells would become useless and degenerate.

The coating of feathers in birds would presumably beget the same degeneracy of the chromatophores—and it has done so.

Entire degenerate pigment cells are to be found in the epidermis of anthropoid apes. There are no entire pigment cells in the epidermis of the negro, "only processes from sub-epidermal cells."

In the white races of man pigment cells are almost entirely absent.

The above considerations furnish a strong presumption that in the mammals at least the function of the pigment cells is not one of nutrition, as some naturalists have suggested, but merely one of coloration.

As his final conclusion the writer states that there is not "a single indubitable proof of the mecodermal origin of true chromatic cells;" he has been "led to the opinion that chromatophores" "are universally of ectodermal origin." That is to say, that they originated on the outside, and not beneath the skin of the body.

This conclusion is agreeable to the function of the chromatophore, to the exercise of which light is an absolute necessity.

To Reward Conductors and Motormen.

According to the Street Railway Journal, the Brooklyn Heights Company proposes to reduce expenses and obviate damage suits by offering handsome premiums for the faithful discharge of duty. For this purpose the board of directors has authorized the setting aside of the sum of $10.000 to be divided pro rata among all conductors and motormen who, until May 1, 1896, shall have had no accident causing either injury or damage to either persons or property, or to the company's property, and who have not been suspended for violation of the company's rules.

The management hopes by the payment of this amount to secure more efficient and conscientious service on the part of both conductors and motormen and thus improve the service of the company's lines.