## *THE DISCOVERY OF ANOTHER CONNECTING LINK BETWEEN FLOWERING AND FLOWERLESS PLANTS.*

NEWS has recently reached Europe, from Japan, of a botanical discovery of unusual interest and importance. Two investigators, Prof. Ikeno (*Botan. Centrabl.*, 1897, 1) and Dr. Hirase (*ibid.*, 2 and 3), working independently, have observed the formation of antherozoids—bodies which have hitherto been regarded as exclusively confined to flowerless plants—in two groups of gymnosperms.

It is well known that in a large number of cryptogams, including all the higher forms, the process of fertilisation is intimately connected with the presence of water. The spores (or, at any rate, certain of them) give rise on germinating, sooner or later to cells from which free-swimming antherozoids are liberated. Each of the latter consists of a loosely coiled nucleus ensheathed in protoplasm, which is especially abundant at the anterior end of the body, and from it arise the cilia which enable the antherozoid to move through water.

In the flowering plants, on the other hand, with their special adaptations to a terrestrial mode of existence, it is of obvious disadvantage to depend on the precarious presence of water as the means of enabling the male sexual cell to find the female, and we find that the motile antherozoids are replaced by quiescent male cells, which are conducted to the female organs along a tube—the pollen-tube—which is a direct outgrowth of the spore or pollen-grain.

Now the gymnosperms, whilst they share with the rest of the flowering plants many characters in common, including the possession of a pollen-tube, yet differ from them in other important respects and approximate more nearly to the higher cryptogams. It is to the brilliant work of Hofmeister, more than forty years ago, that the recognition of this fact is primarily due, and it is, perhaps, a matter for surprise that a group occupying such an admittedly important position should not have been long ago subjected to a more searching scrutiny than it has received. It is true that Strasburger has added much to our knowledge; but, perhaps, the first really illuminating discovery since Hofmeister's time was that made by Belajeff in 1891, which was confirmed and extended by Strasburger in the following year. It was there shown that, whereas the similarity between the female prothallium and its products with the corresponding structures in cryptogams had already been recognised, a closer investigation into the process of germination of the pollen-grain also yielded quite unlooked-for resemblances to the homologous stages in the lower plants, clearly confirming the near kinship of the two groups.

But the presence of a pollen-tube, which would seem to render the formation of antherozoids superfluous, if not indeed directly disadvantageous, still appeared as one of the sharply-drawn distinctions between the zoidogamous cryptogam and the siphonogamous phanerogam. It is in the successful bridging over of this gulf that the great importance of the new discovery lies.

The two gymnosperms, *Cycas revoluta* and *Gingko biloba*, in which antherozoids have just been found, are both ancient types, and closely resemble each other in the mode of the formation of their male sexual cells. At first the pollen germinates much as in the other higher plants, forming a pollen-tube which penetrates the ovule, and containing a group of cells from one of which the antherozoids are ultimately derived. But unlike other forms which have been thoroughly investigated, the pollen-tube remains short, and although it may branch, it does not reach the archegonia in which the female cells are contained. The archegonia themselves lie round the base of a depression situated at the apex of the prothallium, and the space above them is stated to contain a watery fluid. The two generative cells, which have travelled to the end of the rudimentary pollen-tube, now become differentiated into antherozoids. The nucleus, which is large and egg-shaped, lies enclosed in protoplasm, and the latter alone supplies the material for the formation of the coiled anterior portion of the body. Cilia are formed on the coil in great numbers, and are able to impart a progressive, rotatory motion to the antherozoid. Dr. Hirase, who studied their behaviour in *Gingko* while alive, was able to watch them actually moving, and probably the same is true of Cycas, although, owing to the material having been killed, this, of course, could not be tested in the case of the latter plant. They are large bodies, measuring about $82\,\mu \times 49\,\mu$, and escape from the end of the pollen-tube, reaching the necks of the archegonia by swimming through the intervening water.

In reading the short account, as yet published, there is a point of especial interest which strikes one, namely, that the plant must have already begun to eliminate the element of risk which a dependence on a mere chance supply of water entails, by itself secreting the liquid necessary to enable the antherozoid to accomplish its mission. As soon as this habit has been developed it becomes intelligible how, in these more primitive examples, the spore might proceed to swell and finally put out a protuberance on the side nearest the water-supply. And the more effectively this was carried through, the less would be the chance of missing fertilisation. Thus it becomes comparatively easy to reconstruct, at any rate theoretically, the transitional stages between zoidogamy and siphonogamy.

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## *HUMAN INCUBATORS.*

IN a recent number of *L'Illustration* an account is given of an incubator used for rearing delicate children. The apparatus designed by Dr. Tarnier, Professor of the Faculté de Paris, was first used, in the year 1880, at the Paris Maternity Hospital: it is constructed on the same principles as the incubator used for hatching the eggs of poultry.

The apparatus, as first designed, consists of a large cubical box of thick wood, standing on a pedestal. This box is divided into two compartments, of which the lower contains a reservoir of hot water, and the upper the bed of the infant. A movable glass shutter forms the top of the apparatus, through which it is possible to observe the changes occurring inside, and take the readings of the thermometer placed near the infant. One side of the compartment is so hinged as to open like a door. The whole of the upper part is warmed by means of the hot water underneath, the warm air rising through holes at each end of the bed, and escaping through orifices situated at the top. The temperature of the water is so regulated that the temperature of the apparatus never exceeds 30° to 37° Centigrade. The weaker the infant is, the greater the temperature required.

Dr. Tarnier, with the help of his house surgeon, M. Auvard, lost no time in improving this apparatus. His latest design does not differ very much from the one described above; it has, however, the advantage of being more simple in character, and also lighter in construction. (Fig. 1.) The external dimensions measure 65 × 30 × 50 centimetres, the thickness of sides being about 25 millimetres. The upper part of the case is divided into two sections, one being a wooden fixture, L, about 13 centimetres wide, and having a circular opening 4 centimetres in diameter at its middle part, to which may be attached a small helix, H. The rotation of this helix indicates the existence of a draught of air through the case. The other section is a glass shutter, V, which also serves as door.

The interior of the case is divided into a lower and