The seed and calcium chloride were placed in the tube as usual and allowed to dry thoroughly. The tube containing the seed was then connected to the manometer. The entire apparatus was evacuated to .001 mm pressure and hydrogen allowed to flow in from a reservoir at atmospheric pressure. In the meantime the water in the flask was heated to boiling. The stricture marked "D" was sealed, thereby confining the gas in the apparatus. The stopcock on the capillary tube was opened and a mercury pellet above it allowed to fall into capillary tube "G."

At the end of thirty hours of continuous heating the mercury pellet advanced the entire length of the tube, indicating the absorption of hydrogen by the oils. The room temperature was held constant within two degrees, as a change of four or five degrees affected the position of the pellet.

Nitrogen was likewise studied in the same way as hydrogen and with one exception a germination of less than 50 per cent. was obtained. The seed which germinated were not as vigorous as untreated seeds planted under the same conditions. After extracting the fats in the treated seed, the iodine numbers were found to correspond closely to those of the original seeds, varying from 105 to 109.

A manometer of the same type as that used with hydrogen was used with nitrogen. Following the first three or four hours of heating the mercury pellet was blown entirely out of the opening marked "H." It was evident that there was a decomposition of the proteins or other vital constituents resulting in a lower percentage of germination. The enzyme action appeared to be normal.

Carbon dioxide was tried upon cotton seed, under the same conditions as previously stated. A decomposition was noticed when the manometer was used, but it was much slower than with nitrogen. At the end of thirteen hours of heating in an atmosphere of carbon dioxide no germination was obtained.

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COLLECTING AMPHIOXUS

DURING the month of March, 1926, I made a collection of some five thousand Amphioxus along the west or gulf coast of Florida. The specimens taken were found in situations varying between a mixture of mud and sand with some vegetation and a mixture of shell and sand. In all cases, sand was the predominant feature of the ocean bottom in which the animals burrowed.

Search for specimens was usually made at low tide. Collecting at other times was mechanically difficult. At low water the bars are more or less exposed and Amphioxus was found in many such bars. The specimens were not scattered but were usually found concentrated along the landward edge of the bar. As the waves roll in over the sandy sea bottom, the bars are built for the most part with a long slope to seaward. On the landward side they frequently show an abrupt drop of a foot or two. The incline of this drop may be as steep as 45 degrees. At the water's edge, along this short but abrupt incline, the Amphioxus were found congregated, at low tide.

When the Amphioxus are abundant their presence is indicated at low tide, by the presence of small holes in the sand. These holes are made by the burrowing animals and are usually at right angles, or nearly so, to the horizontal plane of the water. The animals lie in the burrows near the subterranean water line but whether with the head up or down is not easy to say. Sometimes when the shovel is pushed into the sand an individual Amphioxus will shoot its full length or more out of the sand as though pricked from behind. It seems fairly certain that these specimens come out of their holes head first.

Collecting was carried on as follows. A sieve made of reinforced copper wire tacked on to a square frame was used to sift the Amphioxus from the sand. Three to six or eight Amphioxus was the usual catch for one shovel full of sand. Along with the Amphioxus, there was usually a considerable amount of broken shell. Other animals, such as sand stars, Annelid worms, an occasional Lingula, many empty Dentalium shells with perhaps a few living Dentalium were also present. Now and then a Balanoglossus was noted; on one bar, sand dollars, varying in size from an eighth of an inch up, were found among the broken shell.

The material containing the Amphioxus was dumped on to a square of black oilcloth where the animals flopped about like miniature eels or burrowed beneath the shell and other débris. If by chance they found themselves on the sand of the bar, they disappeared like a flash, head first, into the sand, providing the bar had but recently emerged from the water. If the bar had settled, the animals were frequently unable to bore into it and in dry sand they were helpless. The movements used in boring into the wet sand are nothing more than the lateral oscillations of the body used in swimming. In short, if the sand contains sufficient water, the animals swim down into it.

The depth to which Amphioxus burrow at low tide was not fully determined; in general they seem to keep near the subterranean water level. On bars that yielded an abundance of specimens at ordinary low tide few specimens were to be found at spring tides, at which time these bars are left high and dry. At such low tides, however, plenty of specimens were secured farther out, that is, near the water's edge. It is hardly possible that the specimens on the bars followed the retreating water since this would, in some instances, have required a migration of several hundred yards. It is more probable that they burrowed deeper and thus kept near to or in the subterranean water.

The collections made in March showed at least two and possibly three generations of Amphioxus to be present in the sand. The oldest specimens were sexually mature, the large females being heavy with eggs. Besides the mature males and females two groups of smaller sized individuals were found. The smallest specimens were less than an inch in length. It would seem, then, that it requires two and possibly three years for this species of Amphioxus to mature.

No observations were made to confirm the statement made by some that the animals leave their burrows and swim freely at night. Collections were made both at daylight and at dark, but no night collecting was attempted. It seems open to doubt, however, that animals which swim as weakly as do Amphioxus could trust themselves to the ebb and flow of the waves on exposed shores and still be able to congregate within the small area in which they are found on the bars between tides.

The species of Amphioxus collected has not been definitely determined. The specimens are now being identified. In general appearance they are much like the common lancelot *Branchiostoma lanceolatum*.

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SPECIAL ARTICLES

CHONDRIOSOMES AND GOLGI APPARATUS IN PLANT CELLS

IN a recent contribution to these columns I outlined the more important results of some studies on the cytoplasmic structures of plant cells as exhibited in the meristem of growing root-tips. The outcome of these studies, like that of similar investigations by plant cytologists, was quite inconclusive as regards the point of most outstanding importance just at present, *viz.*, what cytoplasmic elements in plant and animal cells are homologous. Until we can get at the functional equivalence of the various formed bodies in plant and animal cytoplasm, the enigma of morphological homology would appear to be insoluble. At the present time so little is known of the physiology of chondriosomes and Golgi apparatus that comparisons between plant and animal are in general impossible. But it has occurred to me that the problem of functional equivalence might be approached from a different angle. Thus, we now know with great certainty and elaborate detail the behavior of chondriosomes and Golgi apparatus during the differentiation of the animal sperm. So regular and constant are the essential features of this process that their equivalence can be easily traced throughout the whole range of animal forms. If plants produced sperms comparable to those of animals, it would be at least conceivable that the processes of their differentiation might be capable of direct comparison. Thence conclusions could be drawn with a very high degree of certainty as to the homologies existing between cytoplasmic structures in plant and animal cells.

It so happens that the bryophytes possess sperms remarkably similar, superficially at least, to those of some Platyhelminthes, though unfortunately the structure of the latter has not as yet been very satisfactorily described. This similarity suggests, nevertheless, the possibility that the bryophyte sperm may likewise exhibit the usual characteristics of animal sperm formation. I am now engaged in the task of examining into this possibility, with results which, while still incomplete, seem to give a decisive answer to the long-standing riddles of cytoplasmic homologies. These results are here briefly outlined pending the preparation of a detailed paper.

I have examined the antheridia of Polytrichum juniperinum and P. piliferum, employing the usual osmic acid impregnation methods for the Golgi apparatus, and Fe-hematoxylin methods as often used for study of sperm formation in animals. The early androcytes, which are morphologically equivalent to the animal spermatid, present an appearance so nearly identical to that of an insect spermatid that it is doubtful whether even an expert in animal spermatogenesis could detect any important differences. These early androcytes of Polytrichum contain a spherical nucleus, in close juxtaposition to which is a spherical cytoplasmic structure and scattered bodies which are ring-like in plane view, rods in profile. These cytoplasmic structures exactly correspond to the chondriosome body or nebenkern, and the scattered Golgi bodies, respectively, of practically all insect spermatids. In the differentiation of the moss sperm, the nebenkern presents (though indistinctly on account of its small size) appearances of the differentiation into chromophilic and chromophobic materials so characteristic of insect spermatids. The nebenkern eventually elongates and is applied, together with the blepharoplast filament, along one side of the sperm nucleus, thus vaguely recalling the situation in an animal sperm like that of Lepisma, etc. The scattered bodies gradually merge together to form a mass (first called by M. Wilson the limosphere), which in