mycelium at the growing-points of the flower shoots, and in such sections the mycelium, at first intercellular, could readily be found becoming intracellular and of much greater diameter. Branches became very numerous, and in the hyphae and branches spores were formed. Towards the central parts spore-clusters were too dense for examination, but nearer the epidermis the branching and arrangement of the sporogenous hyphae could more easily be made out; and the teasing of the lateral flowers of each notch of the rachis was often more successful than if the central—and *only* flower of the ordinary ear—were taken. Sections were mounted in water, and some in 1 per cent. KOH, and it is but fair to say that such treatment has failed to show any septation of the hyphae as a preliminary to spore-formation. Material for microtome-sections was prepared as follows:—The leaves of a barley-shoot were stripped down so as to expose the apparently highest node, and the part an inch or two above this was cut off; then by a series of successively lower horizontal cuts the youngest leaves were removed until in the space they enclosed the tips of the awns or ear were seen; then a cut was made through the node, and the removed ear was placed in Flemming's or Rath's solution for fixing, the ear thus being, for a very few seconds only, between plant and reagent.

If a smutted ear be removed and kept floating on water, its spores continue to develop, and in several cases they matured first in the awn. It was by no means uncommon, on teasing out young fruits from such an ear, to find that the spores had germinated.

I have not yet made similar observations for *Tilletia* as my bunted wheat was less forward than my smutted barley, but I am satisfied that by this method of working class material for illustrating Bunt and Smut may easily be obtained.

W. G. P. ELLIS, Cambridge.

STRUCTURE OF THE YEAST-CELL.—A study of the cells of *Saccharomyces Cerevisiae* has led me to the following conclusions, part of which merely confirm former researches: (1) A relatively large nuclear body exists in each adult cell. (2) Young cells contain no such body; a little later the old nuclear body divides, and one of its two daughters wanders through the narrow connecting-channel into the young cell. (3) After the division is complete, the two cells are still kept together by a mucilaginous neck-shaped pedicel, which

appears not to have been noticed hitherto. It may persist or not, thus explaining the occurrence of cell-chains or of isolated cells in different races of Yeast. (4) Carbohydrates are stored up in Yeast in the form of glycogen, which accumulates or disappears from the vacuoles very rapidly, according to conditions of nutrition and growth. The colour given by a known quantity of iodine-solution to a known amount of Yeast-culture shows these variations most sharply. The change of tint by heat after iodine-action, and the destruction of the intracellular glycogen by saliva, also give very clear results.

L. ERRERA, Brussels.

OSMOTIC OPTIMUM AND MEASUREMENTS.—Recent researches made by Dr. F. Van Rysselberghe in the Botanical Institute of Brussels have shown that vegetable cells generally answer an *osmotic stimulus* by an appropriate *osmotic reaction*, and that the relation between stimulus and reaction follows, within wide limits, the 'law of Weber.' Hence results the possibility of predicting the existence and value of an *osmotic optimum*.

Let n be the normal osmotic pressure in a given cell ;

x the osmotic pressure of an external solution applied as stimulus ;

R the reaction, i. e. the change in the osmotic pressure of the cell in response to this stimulus. Then one has, according to Weber's law :

$$R = c \log \frac{x}{s} \text{ (} c \text{ and } s \text{ being constants).}$$

The total value of the osmotic pressure in the cell is of course $R+n$, and its excess over the pressure of the surrounding solution is,

$$y = R + n - x,$$

$$\text{or } y = c \log \frac{x}{s} + n - x.$$

It is easy to find by differentiation that this excess has a maximum value when $x = c \log e$ (e being the basis of the Napierian logarithms $= 2,7182818 \dots$).

Experiments made with *Tradescantia*, *Symphoricarpos*, *Allium*, *Elodea*, *Spirogyra*, agree most satisfactorily with these theoretical results.

Additional interest arises from the fact that these values of x really

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