What the outcome of this innovation will be, or where it will end, is at present impossible to say. The field is so broad and the inclination to experiment so great that, in all probability, some little time will elapse before the returns will all be in. Whether these extracts exert any specific action, or whether the results thus obtained have been through "suggestion" and auto-suggestion, is likewise hard to explain, the writer is inclined to the latter view, that "suggestion" has been the "specific" agent.

NOTES ON ARSENIC.

BY JAS. LEWIS HOWE, POLYTECHNIC SOCIETY, LOUISVILLE, KY.

NOTWITHSTANDING the well recognized danger of arsenical greens as coloring materials, their use is still far too common, especially in green enameled papers for covering boxes and for more reprehensible purposes. I cite two cases in point.

1. Some time since my attention was called to some so-called "Kiss Candies" for sale in a little variety shop, largely patronized by the children of a neighboring public school. These candies were squares of caramel, etc., each wrapped up with a verse of poetry (?) in a piece of colored paper, together with other candies not wrapped. Some of these papers were colored with anilin dyes, but a very considerable number were green enameled papers. An examination of several of these latter revealed the following: —

Paper I. Bright-green surface, 50 square centimetres, arsenic found (estimated as arsenious oxid), 0.0285 of a gram.

Paper II. Light-green surface, 50 square centimetres, arsenic found, 0.0062 of a gram.

Paper III. Dark-green surface, 50 square centimetres, arsenic found, 0 0093 of a gram.

Paper IV. Bluish-green surface, 47 square centimetres, arsenic found, 0.0209 of a gram.

In the latter cases the enameled surfaces appeared much abraded, doubtless by contact with the other candies.

It is needless to say that here was not only a grave danger of the surfaces of the candies containing considerable arsenic, but the well-known habit of young children of putting everything bright colored in the mouth, might have easily resulted in taking a toxic dose.

2. Very recently there has appeared in the market a natural leaf twist chewing tobacco, wrapped around with a strip of green enameled paper three-fourths of an inch wide and about six inches long, fastened to the tobacco by a tack. The surface of this paper is an arsenic green. An examination was made of the twist by cutting off the exterior and using Reinsche's test. Distinct traces of arsenic were found. The quantity from a single twist was far too small to be dangerous, but it is needless to say that the practice of using arsenic paper under such circumstances should be condemned, and the manufacturers of the twist were cautioned on the point. The arsenic found in the tobacco doubtless came, by abrasion, from the paper wrapped around it, but there is another possibility. It is more or less widely known that Paris-green is used by tobacco-growers against the tobacco worm. While in general, when properly used, probably no danger is to be apprehended, it has occurred in my knowledge that tobacco has been sprayed very shortly before gathering. This would seem to be dangerous, and investigations upon this point are being now carried out.

As regards the detection of arsenic in medico-legal cases, attention has been called by Dr. Bernard Dyer in the Proceedings of the Chemical Society[1] to the fact that in certain cases, at least, a large proportion of the arsenic is precipitated upon the zinc in Marsh's test. The following is an observation in point. Arsenic was recovered in a certain case by Reinsche's test on six pieces of copper foil, each 20 square centimetres surface. Three of the pieces were divided, and from each the arsenic was sublimed in well-defined crystals, which could be identified without difficulty. From the other three pieces all the arsenic was sublimed, dissolved, and submitted to Marsh's test. Only the very slightest trace of a mirror was found, not enough to identify it as arsenic in a doubtful case. In this case, as in that of Dr. Dyer, cast zinc was used.

[1] Proc. Chem. Soc., 1893, p. 120.

Another recent case illustrates the necessity of the physicians who perform the autopsy preserving other organs than the stomach. G. had given her husband coffee from a pot in which she had emptied probably a whole box of Rough on Rats. He drank two cups, containing probably in the neighborhood of 7 grams. The coffee left, which I afterwards examined, was practically a saturated solution of arsenious oxid. Death ensued in four hours. The stomach was brought me, and was found to be empty, and much inflamed. Using the whole stomach, but a very small quantity of arsenic was found, evidently only what the walls of the stomach as a tissue could absorb, and far from enough to have produced death. The corroborative testimony was, however, sufficient to secure the woman's conviction.

Brodie's statement that when arsenic is taken in solution no trace of it will be found in the stomach is too broad, but it is imperative that in such cases other organs, notably the liver (as well as spleen and kidneys), should be preserved for analysis.

In my own experience, Reinsche's test, when carefully carried out, is far more satisfactory and no less certain in testing for the presence of arsenic than Marsh's. It can be readily learned by medical students and used practically by the physician, which is not true of Marsh's test. In order to secure well-defined arsenic crystals in Reinsche's test with a minimum of arsenic, I have found it desirable to use electrolytic foil, to roll the strip very closely, and to sublime in a tube of the smallest possible diameter.

A NEW IDEA IN MICROSCOPE CONSTRUCTION.

BY C. W. WOODWORTH, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

EVERYONE who has worked with the microscope, especially in studying rather large objects with medium and low powers, has felt the need of a better means of orientation than those at present available.

Stage forceps admit of complete rotation in one direction and some degree of motion at right-angles to this by raising or lowering the object and readjusting the focus. Ordinarily, any change in the direction of the object requires this readjustment of the focus, and generally the part to be studied is out of the field and must be found as well.

The ideal condition would be to rotate the object at the exact focal point of the microscope, and one can readily see that this could be attained if the object was supported by an apparatus revolving upon two axes at right-angles to each other, which intersect at the focal point, provided neither of these remains fixidly coincident with the optical axis.

There are many ways by which this condition might be attained, but perhaps as simple a modification of an existing stand as could be made with this object in view is a stand I have recently had the Bausch & Lomb Optical Company make for the Entomological Department of the University of California.

The instrument is a "Model" stand with an ordinary revolving mechanical stage. This is supported on a rotating bar, resembling the usual sub stage bar, and provided with a rack and pinion adjustment.

The stage is centred in the usual way, which brings the axis of revolution coincident with the optical axis. The stage bar swings upon a core which is adjustable laterally, so it becomes possible to make the axis of its rotation intersect the optical axis.

These adjustments being made, the instrument fulfils the conditions specified above whenever the focal point is brought to the axis of rotation of the stage bar. Consequently, in using the instrument the tube is brought to a certain position and the focusing of the object accomplished by means of the rack and pinion of the stage bar. The correct position of the tube is determined by trial for each objective, and marks made on the tube to indicate this position.

Different objectives, as those who have used revolving stages must have noticed, have somewhat different optical axes, and there is enough variation with the medium powers to make a centreing nose-piece essential.

While it is mechanically impossible to make all these adjustments perfectly correct, still I find that even with medium powers the object remains in the field during orientation, and that the fine adjustment is generally sufficient to keep it constantly in focus, and I have no doubt that it might be adjusted well enough to use satisfactorily as high a power as a long-focussed quarter-inch objective.

Indeed, the instrument has proven to be all that could have been expected of it as an orienting microscope, and, at the same time, its value for ordinary work is is no way decreased, unless the slightly less rigidity of the stage is an objection.

Plans have already been completed for a dissecting microscope for use in my laboratory embodying the same principal but involving greater changes from instruments now in use. The new stand will consist of a stage which remains horizontal, so that insects may be dissected on it under water. The arm is jointed and the lower section bent so that the axes of the two hinges are at right-angles to each other. There will be the necessary arrangements for so adjustlng these axes as to make them intersect, and the tube will be fitted with a nose-piece adjustment.

The base will be clamped to the desk for sake of rigidity. The focussing will be all done at the stage, though the tube will move to accommodate the varying focal-lengths of the objectives.

It is expected to use the objective under water, providing it with a hard-rubber shield having a cover-glass on the end. This kind of instrument should be also very useful for the study of aquatic forms.

SUMMER WORK IN MARINE ZOÖLOGY AT NEWPORT.

BY W. E. CASTLE.

Out on the extreme southwestern point of the Island of Rhode Island, in Narragansett Bay, is Castle Hill, the comfortable residence of Mr. Alexander Agassiz. Against this point the waves of the Atlantic break with full force as they sweep round the east end of Long Island past Point Judith. This is the one rough spot in the trip from New York to Boston by boat.

As the tide comes in at Castle Hill and passes the narrow entrance of the bay, it makes a bend and carries its rich pelagic life into a little cove on the north side of the point. On this cove is Mr. Agassiz's laboratory.

It is a modest-looking little structure, modelled after a Swiss cottage, but within it is a very paradise for the marine zoölogist.

Aquaria, tanks, and glassware it contains in abundance, while fresh and salt water are carried in pipes to all parts of the laboratory. Fresh, salt water, and air to aërate the aquaria are pumped in by a wind-mill.

Mr. Agassiz carries on his own investigations in the smaller room at the west end of the building. The larger room of the ground floor each summer he generously puts at the disposal of a certain number of students from the Museum of Comparative Zoölogy at Cambridge, Mass.

Any day through the summer you may see half a dozen men here industriously bending over their microscopes, studying animals in their living form or preserving material for future study. On account of the extreme moisture of the atmosphere, little balsam mounting or clearing can be done at the sea-shore, so that work of this kind is usually postponed to be done at Cambridge during the fall and winter months.

Each morning at nine o'clock a hack from the boarding-house in town puts the men down at the laboratory door. It calls for them again at five, after their day's work is ended.

About ten o'clock each evening "Thomas," Mr. Agassiz's faithful man-of-all-work, rows slowly up and down the cove skimming the surface of the water with a tow-net. From time to time he lifts the net of fine cheese-cloth carefully from the water, turns it inside out and dips it repeatedly in a bucket of water.

The soup thus obtained is carried into the laboratory, diluted, and poured out into half a dozen glass dishes placed on black tiles.

Around these dishes the men gather upon their arrival in the morning, each furnished with pipettes and watch-glasses of various sizes. Every nook and corner of the dish is carefully scanned with naked eye and with the aid of lens, and in different lights, that no egg or larva, however minute, may escape notice.

After a man has acquired a general knowledge of the pelagic fauna, he usually confines his attentions to some particular group of animals, and the tow is sorted out and divided accordingly.

One man studies the mollusks, another the echinoderms, another the jelly-fishes, and so forth.

The tow is the chief source of material for study. It is supplemented, however, by dredging from the steam-launch, and shore collections at low tide.

The laboratory contains a good library of general works of reference, while literature on special topics is supplied from Mr. Agassiz's private library and from the museum library at Cambridge.

Not least among the advantages afforded to the training investigator are the helpful suggestions of Mr. Agassiz himself, whose long experience in marine work makes him an invaluable adviser.

With such excellent opportunities for advanced work in zoölogy, it is not surprising that in this little laboratory material has been gathered for many scientific papers of a high order, and that here many of the best zoölogists Harvard College has produced have received an important part of their professional training.

BACTERIOLOGY IN THE DAIRY.

BY C. C. GEORGESON, MANHATTAN, KANSAS.

The bacteria which affect the quality of our dairy products may, for practical purposes, be classed under two heads, namely, those which are beneficial, and those which are injurious, and it is as essential to encourage the one as it is to wage a constant war upon the other. It has been established beyond a peradventure that the pleasant flavor and aroma of good butter are developed by certain species of bacteria present in the cream and instrumental in producing the changes which take place during the process of fermentation usually termed "souring." And it is equally well established that there are certain other species which, if permitted to get the mastery, will, as it were, overpower and neutralize the influences of the former class and give a disagreeable taste and smell to the butter. Both classes are present in all dairies, and the skill and success of the butter-maker depend in large degree on the recognition of this fact and his ability to foster the growth of the beneficial bacteria and to keep the injurious kinds in subjection. His chief weapon against the latter is cleanliness. Filth of every description is their best breeding-ground. But it also happens that the conditions are such, in surrroundings over which the butter-maker has no control, that, in spite of the strictest cleanliness on his part, the injurious organisms propagate too fast and deteriorate his products. Again, it may lie in the health, feed, or other conditions affecting the cows from which the milk is drawn. Under such conditions, what is he to do? It is the solving of this problem which has brought bacteriology into intimate connection with the dairy business; and the honor of solving it and thereby ensuring the production of "gilt-edge" butter under naturally adverse conditions belongs to the Danes.

In practical dairying there are two forms of physical means by which the growth of bacteria may be controlled, namely, cold and heat, relatively speaking. At a temperature at or near the freezing-point the active growth of the bacteria ceases, and hence the reason for keeping the milk cool by the use of ice. The cold produced by the ice does not kill the organisms or purify the milk, it simply retards their multiplication, and thus affords time for the dairy operations to take place before they work injurious changes. Heat, on the other hand, kills the bacteria. At the boiling-point nearly all those forms ordinarily found in milk are destroyed. But, as this high temperature affects the taste of the milk or cream by imparting the characteristic "boiled taste," in practice the temperature is raised to but 75° or 80° C., at which point the taste is not materially affected, and still the greater portion of the bacteria are killed.

This much known, the Danes have gone a step farther. They have isolated and perpetuated "pure cultures" of those forms which they have found to be beneficial to the production of first-class butter, and by impregnating the cream, under proper conditions, with these artificially grown bacteria they give their butter the desired flavor and aroma. It is now between two and three