better to import a number of the Indian water-buffalo that do so well in the jungle regions of the lower Amazon, and get the inhabitants to breed the animals themselves.

However, any such step would have to be accompanied by education in the desirability of fresh meat against dried. It is noticeable that on the ranches of the great fertile cattle plains of Brazilian Guiana, where over 200,000 head of cattle are grazing to-day, fresh meat is almost unobtainable, and the problem of malnutrition is every bit as serious as on the jungle rivers. Vegetables seem never to be planted. Meat is very seldom eaten fresh. The reasons for the latter are threefold. In the first place, the ranchers are used to dried meat and possibly prefer it to fresh. Their diet is extremely limited in scope. This would probably make it all the more difficult to induce them to change and enlarge it—Stefansson has very forcibly pointed out that men as well as dogs who are used to a limited diet find it much more difficult to take to any change than those who are already used to a great variety. In the second place, the absence of ice makes it impossible to preserve meat in a fresh state after a steer has been killed, and would result in a large amount of wastage unless the meat were dried. In the third place, the population in these regions is so scattered that any "community" solution of the problem would be impossible. Every ranch is a small and self-contained community in itself, and the butcher-shops that are found in the town of Boa Vista can not exist in the cattle plains.

The river turtles and fish that give the inhabitants of the river settlements a certain amount of fresh food in units small enough to prevent wastage are, of course, lacking on the cattle plains. Whether or not chickens are cultivated in the cattle lands to any extent is something I am not able to say. On the two ranches that I visited, they were not to be found.

One other matter, that may be of interest in connection with the problem of diet and dental caries, might well be mentioned here. In Manaos I met Mr. Desmond Holdridge, of the Brooklyn Museum, who had with him a Makuxi Indian boy called Moi-i. This boy had lived for some fifteen years with his tribe, living the usual native tribal life. Here he had never known or seen any signs of dental decay. He had found it necessary, however, at the age of fifteen, to leave his tribe and to establish himself as a hired hand on the Brazilian National Ranch in the cattle plains. After a year and a half there, he came to Manaos with Holdridge, where the latter found it necessary to take him to the dentist to repair the ravages of a bad case of caries. This was told to me by Moi-i, and confirmed by Holdridge, who had known the boy well when he first left his tribe.

Inquring about the changes of diet, etc., that had accompanied this change in dental health, I found the following to have taken place. While living with his own people, Moi-i had eaten a great many fresh vegetables of various kinds, a good deal of hard cassava bread, little meat and almost no salt. On the ranch, living with white men, he had eaten a great deal of meat, mainly dried and salted, also milk, cheese, etc., almost no vegetables and a great deal of salt. The point about salt is interesting in view of the fact that the Indians of Southern Venezuela seem to believe that the white men have bad teeth because they eat so much salt. Moreover, while living with his own people, Moi-i had had the habit of constantly cleaning his teeth with charcoal, a habit that he had dropped when he went to live with the white man.

The matter throws an interesting light on the widespread modern idea that our teeth are bad because our soft foods do not give them enough exercise. While with his own people, Moi-i had found plenty of exercise for his teeth, in chewing the hard cassava bread. Here they stayed healthy. But later, when he lived with the white man, he had to chew still harder in order to get down the quantities of dried meat. If exercise is the determining factor, his teeth should have improved instead of deteriorating.

EARL HANSON

WASHINGTON, D. C.

# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## SAVINGS IN LABORATORY EXPENDITURES WITHOUT LOSS OF EFFICIENCY

WITH the present decreases in budgetary appropriations it has become a necessity for investigators to secure results with cheaper equipment. Notable savings can be accomplished by simple adaptations of common marketable supplies which are used for domestic purposes.

Operating tables for animal work can be readily adapted from kitchenware departments at a cost which is one tenth of the fancy professional models. Operating lamps, 110 volt, (particularly of the large Zeiss or Leitz types) can be equipped with 100 watt Mazda, instead of the costly filament types, without great loss of efficiency. Six volt lighting equipment can readily be modified to take automobile lamps, sometimes at an increased efficiency and generally at one tenth of the cost.

Sterilization can be secured just as readily with a

pressure cooker costing $15.00 as with the larger standard autoclave. Hot air sterilization can be efficiently and effectively completed in an ordinary baking oven with ordinary bunsen burners as the heat source. Fractional sterilization equal to the Arnold can be secured in a large-sized double boiler, by perforating the bottom of the enclosed utensil. Many of our fancy electrical set-ups can be efficiently made from radio equipment. Rheostats, potentiometers and meters are available at small cost. They must be calibrated, but then so should the more costly material from the supply houses.

The care of small animals is generally a very costly and inefficient process. In many cases the larger the animal the more the wastage. Small rodent colonies are useful for many types of work, but frequently are too costly to maintain on an adequate scale for continuous work. The cost of an attendant where the colony is of large size is no small item. If a part-time assistant can be used for this work, a larger saving can be effected. If a full-time assistant is available, part of his time can be used for other things demanding time without interruption.

As a standard stock feed for rats and mice, the dog and fox chow marketed by the Purina Company has many advantages over the ones usually used. It can be purchased in reasonable quantities, is easily stored in galvanized iron cans, keeps until used. The animals do not tire of it and it seems to be a complete diet under our laboratory conditions. This food is cheaper than any special baking brand which we have so far secured. It is supplemented with lettuce (3 times per week) and with stale bread, both of which can be obtained cheaply. Many complex drinking bottles are available, most of them costly. We use a 16 ounce Whitall-Tatum bottle with an L tube which leads to the cage interior. The L tube is fitted to the bottle with one inch of pressure tubing used instead of the usual perforated rubber stopper. The bottle is fastened to the top or side of the cage with a brass spring, preventing dislodgement and breakage. Cleanliness of an animal room is one of the most completely neglected of the arts. If all metal cages are used and supported 18 inches above the catch pans, which are covered with sawdust, the cages keep much cleaner than is the case where they are directly on the sawdust base. We use single plane sheets of aluminum for the catch pan. This can be scraped and washed in a few minutes. Our routine calls for complete cleaning operations three times each week. This is a minimum for a reliable rodent colony.

The wastage usually is more excessive in the operating room than in the animal colony. Ether for anesthesia is wasteful of this reagent as well as of animals under the methods generally employed. Narcosis is seldom satisfactory, and often the work must be hurried because of the animal's condition. Sodium amytal (Lilly) is an efficient, reliable and cheap method of settling the expense of narcosis. Antiseptic solutions often serve as irritants or astringents as used in animal work. Sterile 5 per cent. borax solution or chlorozene is just as effective as the more costly proprietary solutions. Clips so necessary for the suturing of skin incisions are usually the baby-skin clips used in human surgery. A metal stapling plier, H-54, distributed by the Hotchkiss Sales Company (Stamford) can readily be adapted as a skin suturing device by sawing 5 mm from the fixed jaw on the lower side and removing the lower part of the cover of the upper jaw.

The above are just a few of the economies which can be used to reduce the costs on most colonies from 40 to 60 per cent., without impairment of efficiency.

J. S. NICHOLAS

OSBORN ZOOLOGICAL LABORATORY
YALE UNIVERSITY

# SPECIAL ARTICLES

## THE STORAGE SAC FOR CAPSULE REINFORCEMENT IN NERITIDAE

ONE hundred years ago, when Qouy and Gaimard included in their multitudinous findings of the voyage of the *Astrolabe* (1830–1933) the discovery that the snail, Nerita, is not hermaphrodite, they figured and described two problematical organs of the female—the one a sac accessory to the uterus, containing white limey objects thought to be eggs; and the other a pyriform organ containing elongated filaments. Speaking of their illustrations, they recommended those who desire to understand the usage of organs to give special pains to the verification of what is represented of the reproductive organs.

In 1857, a student of Johannes Mueller, Eduard Claparede, having made a detailed study of the anatomy and development of the fresh-water snail *Neritina fluviatilis* near Berlin, was not able to clear up either of the above two problematic organs, but upon dissecting specimens of *Nerita peleronta* L., *N. atrata* Chemnitz, and *N. albicilla* L., found in the females that the above uterus accessory sac contained, not eggs, but lime concretions of 100 μ to 500 μ diameter, white and spheroid in the first two species, but red brown and discoid in the last, from the Red Sea.

While he described in detail the eggs of *N. fluviatilis* as laid in capsules often covered over with shells of diatoms, he surmised that in Nerita limey capsules