a taxonomist as I have been, but on much broader lines, including in my studies generic, specific and varietal differences in physiological characters, in responses of all kinds to the environment. The proverbial man in the street, if he knew me and my program, might hesitate to supply the funds, fearing or knowing that I should not have my eye on his bread and butter. The motive force would not be economic, but scientific, no easier to explain than enthusiasm in playing a game. Only on that basis would the rewards come abundantly to the worker, and the pleasure and zeal be maintained. Seek ye first the Kingdom of Heaven, and all else shall be added unto you, may be adopted as the statement of a psychological principle, fully applicable to-day.

It is at this point that we sense the weakest aspect of modern American entomology. There are in Washington and in the experiment stations and universities many capable workers. But as a general thing they are intellectually dissipated by a multiplicity of duties. They may be well paid and not overworked, but they can not concentrate on comprehensive research. Many, no doubt, have long lost any ability they have had for such labors. There has been no adequate policy for the development of comprehensive scientific research in entomology and little training directed toward that end. We have been sorely deficient in imagination, and have supposed that science could be governed by laws of supply and demand.

The book is well and accurately printed, and I find few errors of any kind. Only one suggests comment. Having visited New Caledonia and followed the footsteps of the famous pioneer naturalist of that island, Pére Montrouzier, I regret to see the now important beetle which was named after him printed (in many places) *Cryptolaemus montrousieri*. I have seen this substitution of s for z elsewhere and hope by this comment to stop the too easy propagation of an error in spelling. A criticism of a quite different kind may be added. We regret that there is, among the pictures of the leading economic entomologists of America, none of the dean of them all, Dr. L. O. Howard.

It seems a long time since the eighties of the last century, when, a lone bachelor in a cabin in Wet Mountain Valley, I first entered into correspondence with the entomologists of the Department of Agriculture, and received from Washington a whole sack full of books and bulletins. The letters used to be signed by Riley, but I understand that most of them were written by Howard. The pleasure and instruction derived from them greatly stimulated my zeal and I think it must be said that in that sense the person responsible for much of what I have accomplished since, whether he approves of it or not, is my old friend Dr. L. O. Howard.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW SPRING BALANCE FOR MEASURING WATER CONTENT OF SNOW[1]

THE water content of snow is determined by weighing a known volume of snow. For example, if a cylindrical prism of snow 1.485 inches in diameter weighs 1 ounce, it contains 1 inch depth of water. To determine the water content of a snow cover a core of snow the full depth of the cover is cut out with a snow tube. This core is weighed, and from its weight the water content is determined.

The problem of weighing the cores in the field under the trying circumstances of cold and storm has presented many difficulties. The fact that measurements of the snow cover must be made on high and almost inaccessible mountains where all travel is on snowshoes or skiis requires a light, portable and convenient instrument for weighing the cores and at the same time one which will give the desired degree of accuracy. Where large numbers of measurements are made, a balance that can be read directly to 0.5 inch of water and can be interpolated to 0.1 inch of water is of sufficient accuracy.

The snow scales developed by the U. S. Weather Bureau, Church of Nevada, as well as commercial scales that have been used in snow surveying, are all spring scales and subject to the inaccuracies inherent in a spring scale. In addition, they are all dial scales, the purpose of the dial being to give a greater readable accuracy and a wider range. These scales have dials which vary from 5 to 10 inches in diameter. They are heavy, awkward to carry, and are subject to binding when the wind swings the tube which is being weighed.

To overcome some of the disadvantages of the scales now in use for measuring the water content of snow, a tubular spring balance has been developed which is believed to be more sensitive and just as accurate and further has the advantage of being lighter and more compact.

[1] Contribution from department of irrigation and drainage engineering, Utah Agricultural Experiment Station.

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This balance is constructed of drawn seamless brass tubing of such diameter that the spiral spring just fits inside the inner tube and the inner tube fits inside the outer tube with clearance to prevent friction. Over the outer tube is placed a slotted tubular slip joint for setting off zero with the empty tube on the scales. The spring is made of 22- or 24-gauge music wire annealed and tempered. The calibration is placed on the inner tube. To calibrate the balance for a particular diameter of core, the equivalent weight of 1 inch of water in a tube of the same diameter as the core is placed on the spring and the unit stretch determined. The gradations are placed on the barrel of the inner tube by rotating the tube against a sharp tool in a lathe which is adjustable to 0.001 inch.

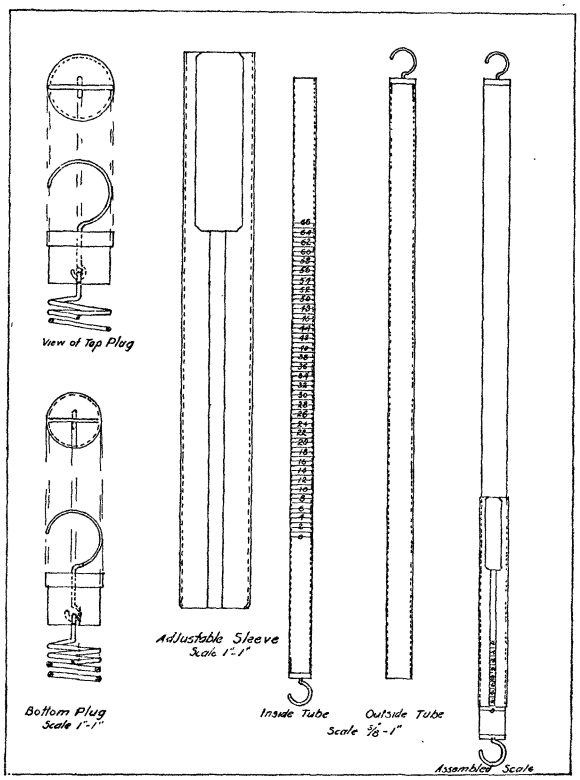

FIG. 1. Parts and assembly of tubular spring balance for measuring water content of snow.

Fig. 1 shows each part of the balance as well as the assembled balance. The hooks are made from 32-gauge piano wire. The plugs are turned out of a bronze rod and the spring is made from 22- or 24-gauge music wire. The drawn seamless brass tubing fits with ample clearance so that there is little friction. The slip sleeve fits the outer tube with spring tightness so that the zero with the empty tube on the scales can be set off. The gauge of wire and diameter of the spiral of the spring will govern the capacity of the balance. A scale having a capacity of 72 inches of water has a distance between each gradation of 0.15 inch. The over-all length of this scale with no load on it is 23 inches; when fully extended it is 41 inches long. This scale weighs 19 ounces. A scale having a capacity of 24 inches has a distance between gradations of 0.21 inch. This scale, weighing only 11 ounces, is 13 inches over all when telescoped and 20 inches long fully extended.

GEORGE D. CLYDE

SPECIAL ARTICLES

COMPARISON BETWEEN IRRADIATION OF DIET AND SUPPLEMENTAL IRRADIATION OF ANIMALS IN VITAMIN A AND D DEFICIENCY[1]

IN an experiment in which eight young rats, about one month old and averaging about 35 g in weight, were placed on a diet that was A-free and low in Vitamin D, on October 14, 1929, and had become well depleted on January 17, 1930, it was found that the addition of 1/100 mgm of irradiated ergosterol daily stimulated their growth for three weeks, but after that time they rapidly succumbed.

In a second experiment (see graph), four lots, consisting of forty-one rats, one month old and averaging 37 gm in weight, were placed on the Sherman No. 380 diet, known to be low in Vitamin D and deficient in Vitamin A, and allowed to become depleted from January 24, 1930. After a period of over eight weeks two of the lots were given irradiated ergosterol, each individual receiving 1/100 mgm daily, mixed with a small quantity of the A-free diet. The other two lots served as positive and negative controls.

RESULTS

The stimulating effects of the Vitamin D thus supplied became quite apparent and lasted for 10 days, then began to subside. The animals in Lot 2 were allowed to exist on the Sherman No. 380 diet, with supplemental Vitamin D, in the form of irradiated ergosterol, but in Lot 1 the animals were also irradiated daily except Sundays, for 30 seconds, at a distance of 18 inches from a Macbeth carbon arc lamp.

Beginning April 28, the additional irradiation was found to markedly stimulate growth for a short time,

[1] Investigations supported by a grant from the National Research Council.