with a rear surface, silvered, of 27 inches radius. The spectrum, slit and prism lie on an arc of a circle of 28 inches diameter. The spectrum can be thrown on a screen or photographed (*DC*, Fig. 1). The dispersion increases with decreasing wave-length, and from the red to 2,000 Å gives about a 10-cm spectrum. Eastman portrait film cut 3 cm wide and held against a curved wooden support (Fig. 3) was used satisfactorily for the photographic work, with a metal slide to prevent fogging. The prism is loosely held in a simple frame. Rough adjustments of aligning and focussing can be made quite quickly as the prism is the only movable part.

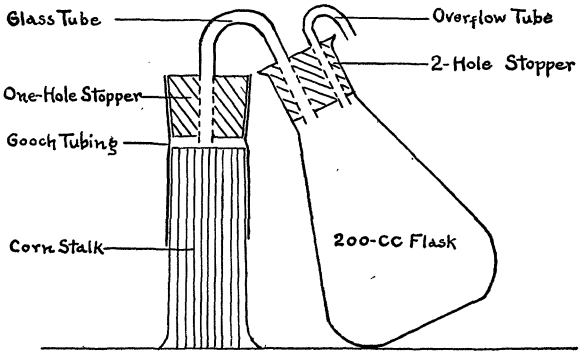
The apparatus was designed and practically completed by Dr. John F. Mohler in the physics laboratory of Dickinson College, in an attempt to find an inexpensive piece of apparatus for student work in the ultra-violet. There is no record of the exact cost, but it was certainly less than fifty dollars.

NORA M. MOHLER

SMITH COLLEGE

SAP FOR ANALYSIS BY BLEEDING CORN PLANTS

DURING the past three summers at Athens, Georgia, clear sap has been secured by bleeding corn plants on various fertilizer plats. The bleeding has been done by cutting the stalk just below one of the nodes near the surface of the soil and attaching a flask to the stump. A single plant about the silking stage and under favorable conditions will bleed more than 500 cc in a three-day period. This sap contains much less organic and inorganic material than expressed sap which is being studied in connection with soil fertility experiments at several experiment stations. The analyses made of the bled sap to date indicate that it is much nearer the composition of the displaced soil solution than is expressed sap. The ease of securing sap by bleeding, its similarity to the displaced soil solution, and its favorable condition for analysis with a minimum of corrective treatments are distinct advantages in a method for studying plant-soil relations by sap analysis. Doubtless the method can be used with many agricultural plants.



A beginning was made in the use of this method of securing sap for analysis by bleeding plants in 1864.[1] Ulrich bled potato plants for five consecutive days and analyzed each day's run for dry weight, ash and combustible material.

It has been found necessary to remove tillers and green leaves of the corn plant below the point where the stalk is cut if a good flow of sap is to be secured. Removal of these several days before cutting is preferable. There should be a perfect fit between the stalk and the rubber tube to prevent leaking. A few drops of formalin have been used in each flask to prevent fermentation of the sap. Where extended bleeding has been carried on, it has been necessary to make fresh cuts on the stalk every three or four days to renew the bleeding face. Under very favorable conditions, stalks have been bled for fifteen consecutive days and in this time the most vigorous have yielded slightly more than 1,700 cc of sap each.

M. W. LOWRY
PAUL TABOR

GEORGIA STATE COLLEGE OF AGRICULTURE,
ATHENS, GEORGIA

SPECIAL ARTICLES

HUMIDITY AND COMFORT

EXPERIMENTS reported by the New York State Commission on Ventilation (1922) indicate that a variation of 30 per cent. in relative humidity (20 to 50 per cent.) at a room temperature of 75° F. does not exert any very distinct influence upon the sense of comfort, after an exposure of as much as three and a half hours. Later work by Miura carried out with care upon a few subjects showed that at 70° F. an increase of 50 per cent. in relative humidity (20 to 70 per cent.) was accompanied by a small but distinct increase in the subjective sense of warmth, although at a lower room temperature (61° to 62° F.) a change in humidity of this magnitude had no perceptible effect. In his effective temperature chart, Yaglou has given a graphic representation of this influence of humidity upon the sense of comfort.

Since the question frequently arises as to whether or not it is desirable to humidify the air of lecture rooms, a series of observations in regard to this point

[1] Palladin-Livingston, "Plant Physiology," 3rd ed, p. 142.

was made upon one of the classes in the School of Hygiene and Public Health of the Johns Hopkins University during the session of 1930–1931. The results are of sufficient interest to warrant a brief report. The class met once weekly for an hour during the fall and winter months. The attendance at each lecture varied between 40 and 45 persons and the personnel changed slightly during the observations, owing to some withdrawals and new admissions at the end of the first trimester. The class contained some 8 to 10 women and a number of nationalities were represented. About one half were foreign students in attendance at the school, representing the following countries: India, Malay Peninsula, China, Japan, Siam, Mexico, France, Italy, Greece, Poland, Bulgaria, Roumania and Czechoslovakia.

The lecture room has a capacity of 16,000 cu. ft. with a height of 13½ ft. A large duct connects the room with an adjoining air conditioning plant by means of which the temperature, humidity and air-movement may be controlled. The incoming air is brought into the room through a wide duct, with lateral openings, running along the ceiling, and air is sucked out through gratings in the walls near the floor level. In all of the observations the supply fan was run at one-half speed, delivering 1,500 cu. ft. per minute, and the exhaust fan at full speed, with an estimated capacity of 3,000 cu. ft. per minute. This combination was selected because it was found experimentally that it gave, in connection with a suitable control of the lateral openings of the delivery duct, the most uniform distribution of air currents throughout the room, when occupied by a class. The air in the room was renewed approximately ten times during the course of the hour.

The object of the observations was to keep the room at a temperature of 70° F. and to vary the humidity on different days. Readings were taken, at the beginning and end of the hour, of the dry bulb and wet bulb thermometers, the dry kata and the temperature of the incoming and exhaust air. Readings were made also for the temperature and humidity of the outside air. The readings in the room were taken from an elevated platform at the rear center of the room. At the beginning of the hour the students were given a printed slip upon which they recorded their sensations of comfort during the hour in accordance with the following classification:

1. Too cold—(uncomfortably cold).
2. Comfortably cool.
3. Comfortable.
4. Comfortably warm.
5. Too warm—(uncomfortably warm).

In three experiments the room temperature rose to 71.5°–73° F. and for this reason they were not used in summarizing the results. One additional experiment was rejected because a cold north-west wind was blowing upon the northern exposure of the room and the leakage through the windows set up cold drafts of air on that side of the room. In the balance of the experiments the room temperature was kept uniformly at 70° F. throughout the hour in 13 cases. On one day the temperature was 69° F. and on another occasion it rose to 71° F. The maximum variation, therefore, in the observations that were compared was 1° F. on each side of the 70° line. In six of the observations the relative humidity was kept between 55 and 60 per cent., once at 48 per cent., twice at 33 to 40 per cent., twice at 20 to 30 per cent.,

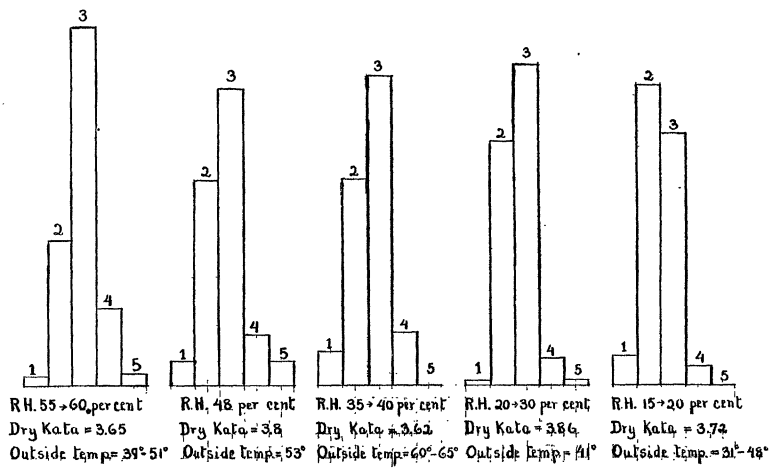


FIG. 1. Graph showing the comfort vote of a group of 40 to 45 persons for a dry bulb temperature of 70° F. (69°–71°) with varying degrees of relative humidity. The ordinates indicate the percentage of the total attendance voting for each specified degree of comfort, according to the classification, 1—Too cold; 2—Comfortably cool; 3—Comfortable; 4—Comfortably warm; 5—Too warm.

and four times at 15 to 20 per cent. The dry kata reading varied on these different days between 3.62 and 3.86. In spite of the active ventilation the kata reading was low throughout. Experience has shown that a reading of 6, designated as optimum for Great Britain, is too high for class-room conditions in this country.

A summary of the results of these fifteen observations is given in Table 1 and Fig. 1. The figures and graphs represent not the actual number of individuals voting for the different grades of comfort, but the percentage of the total attendance for each day that so voted.

TABLE 1

DRY BULB TEMPERATURE IN ROOM, 69° TO 71° F.
DRY KATA 3.62 TO 3.86

Comfort report	Relative humidity 55 to 60 per cent.	Relative humidity 48 per cent.	Relative humidity 35 to 40 per cent.	Relative humidity 20 to 30 per cent.	Relative humidity 15 to 20 per cent.
Too cold (1)	1.7	4.2	5.6	1	5.1
Comfortably cool (2)	24.3	34.0	34.25	40.4	49.55
Comfortable (3)	59.3	49.0	51.3	53.0	41.7
Comfortably warm (4)	12.6	8.5	8.8	4.45	3.4
Too warm (5)	2.1	4.2	0	1.0	0

1. The record shows that in the experiments as a whole from 91 to 97 per cent. of the group found 70° F. comfortable, irrespective of the humidity. That is to say, they reported that the conditions were either comfortable, comfortably cool or comfortably warm. Much the larger portion, 83 to 93 per cent. made a selection between comfortable and comfortably cool. The composition of the group who voted 3, comfortable, on the different days varied considerably. For example, in the six experiments in which the physical conditions were kept constant at a dry bulb of 70° F. and a relative humidity of 55 to 60 per cent. only four voted "comfortable" consistently for the six days. The others on one or more occasions reported themselves as comfortably cool or comfortably warm.

2. It will be noted that as the humidity decreased the size of the group voting 2, comfortably cool, increased from 24 per cent. at humidity 55 to 60 to 49 per cent. at humidity 15 to 20, giving an indication of the cooling effect of the drier air when the dry bulb remains constant. On the other hand group 4, comfortably warm, shows an increase from 3.4 per cent. to 12.6 per cent. as the humidity increases.

3. The small groups who found the conditions too warm or too cold were composed for the most part of the same individuals. There were two or three in the class for whom 70° F. at any humidity was uncomfortably cool, and a few others for whom the same conditions were at times uncomfortably warm.

4. While the optimum humidity seemed to be 55 to 60 per cent. it may be concluded that in an auditorium kept at the standard temperature of 70° F. variations in humidity between the limits used, which are those that ordinarily prevail indoors in temperate climates under winter conditions, make but little difference in the sense of comfort and well being of the occupants. It is doubtful, therefore, whether there is any justification for the installation of expensive equipment for the control of humidity. For such conditions the dry bulb temperature is the important standard to maintain, together with provision for the renewal and adequate movement of the air.

W. H. HOWELL

THE JOHNS HOPKINS UNIVERSITY

MODIFICATION OF THERAPEUTIC SERA WITH A VIEW OF AVOIDING COMPLICATIONS OF ALLERGIC NATURE[1]

THERAPEUTIC as well as prophylactic administration of various sera derived from immunized animals has proved of such great value that it is resorted to in a constantly increasing number of instances. However, a certain not insignificant hesitancy still exists among the practicing physicians due to the fact that occasionally parenteral introduction of therapeutic sera has been known to be accompanied by grave complications and even by the death of the recipient.

While Park[2] estimates that only one out of 20,000 of those receiving serum for the first time develops alarming symptoms and only 1 in 50,000 succumbs as a direct result of the treatment, one can readily understand the hesitancy of a physician who goes through the experience of losing his patient in spite of his taking all known precautions to ward off this calamity.

In this paper we are suggesting a procedure which promises to minimize if not eliminate entirely the risk involved in the practice of serum therapy.

With respect to possible response to parenteral introduction of therapeutic sera, the human race can be divided into four categories.

(1) A significant portion (about 10 per cent.) show no visible response whatever to injection of serum.

[1] Presented before the joint meeting of American Association of Pathologists and Bacteriologists and American Association of Immunologists at Cleveland, April 1–3, 1931. This investigation has been aided by a grant from Eli Lilly and Company.

[2] W. H. Park, *Am. J. Pub. Health*, 18, 354, 1928.