in which p_s is the vapor pressure at saturation, p_e at evaporation and d the difference between dry and wet temperatures. These values can be read directly from the new type instruments. Example: M 76 dry, and M 56 wet. The value of the right-hand part of (4) is 17.4 − 4.0 (kilodynes per square centimeter). We have then directly the ratio of the vapor pressures, 13.4/24.5, or 55 per cent., as the relative humidity.

On these new instruments one can read also the saturation *weights* as well as pressures, hence it is an easy matter to compute the absolute humidity; thus, for above values,

$18.1 \times .55 = 9.6$ grams per cubic meter of space.

We now have values conforming to the C. G. S. system of units. In order to bring the mb (millibar of meteorologists) into step with the bar of physicists and chemists, in use long before meteorologists woke up to the need of scientific units, we simply read kilobar for millibar. The bar like the dyne is a basic unit, the force which would give an acceleration of one centimeter per second per second to one gram.

It is interesting to note the increasing use of the prefix *kilo,* for we now meet in common usage not only kilogram, kilometer, kilocycle and kilowatt but also kilovolt, kilojoule (10^{10} ergs), kilocal and kilobar.

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SPECIAL ARTICLES

IS OSSIFICATION INFLUENCED SOLELY BY ULTRA-VIOLET LIGHT?

OWING to the increasing interest in the physiological properties of ultra-violet light in the prevention and cure of rickets, legweakness in poultry and nutritional paralysis in swine, the following data, obtained in 1926, may be of interest to workers in the field of light therapy.

At that time we were conducting routine determinations of the ossifying potency of different sources of light, by means of the bone-ash method.[1] The question arose relative to the effect of diffused laboratory light and ordinary electric illumination on the ossification process. This question was raised because of rather constant variations in the bone ash of rats which were reared in different parts of the laboratory. Rats whose cages were continuously shaded or darkened invariably manifested a lower rate of calcification as compared with their own litter mates on the same ration, but whose cages were less shaded during the ordinary working hours.

The animal laboratory is situated in a half-story attic on the third floor, and the building is almost entirely surrounded by tall trees. As a result, the windows, which are small, are partly shaded. Practically no direct sunlight can reach the windows and little of this can penetrate into the laboratory, and the windows are usually closed during the cooler months. Consequently, it is necessary to work by electric light most of the year. These lights consisted of 75-watt Mazda bulbs hung at a distance of about twelve feet above the floor. The cages, which consisted of wood frame and wire mesh, were of the apartment type, consequently, most of the animals were shaded most of the time.

To determine, if possible, the effect of laboratory light on the calcification rate, litter mates twenty-one days of age and weighing approximately forty grams were divided into four experimental groups, all of which received the Wisconsin rachitogenic ration.[2] Group I was placed in a cylindrical wire-mesh cage covered with loosely woven black muslin cloth in which an opening was made through which was introduced a 100-watt Mazda bulb which was allowed to burn eight hours per day. Group II was placed in a similar cage which was covered completely with the black muslin cloth. Group III was placed in a similar cage without cover of any kind and exposed to the ordinary laboratory light. Group IV was treated the same as Group II except that the covering material consisted of cardboard arranged in such a manner that light was excluded completely but with facilities for air circulation. The following results were obtained when the femur bones were dried, extracted and ashed at the end of a twenty-one-day feeding period, the percentage of ash being calculated on the dry, fat-free basis.

Group	Treatment	Bone ash per cent.
I	Mazda bulb 8 hours per day	31.82
II	Dark cage—muslin cloth	22.44
III	Laboratory light	25.33
IV	Dark cage—cardboard cover	16.65

An additional experiment was conducted in which the feeding period was lengthened to thirty-five days, the results of which were as follows:

Group	Treatment	Bone ash per cent.
V	Mazda bulb 24 hours per day	50.59
VI	Dark cage	18.46
VII	Laboratory light	26.48
VIII	Two drops cod-liver oil daily	38.95

[1] R. A. Dutcher, M. Creighton and H. Rothrock, *J. Biol. Chem.*, 1925, 66: 401.

[2] H. Steenbock and A. Black, *J. Biol. Chem.*, 1925, 64: 263.

While we have had no facilities for determining the amount of ultra-violet light to which these animals were exposed, we have every reason to believe that it must have been negligible, since most authorities are agreed that the production of ultra-violet light by the ordinary filament is small and that this is largely if not completely absorbed by the glass bulb. While the possibility is not excluded that the variations in bone deposition are due to ultra-violet light, we can not escape the conclusion that the longer wave-lengths also possess ossifying power.

These observations are in accord with our observations (R.A.D.) on poultry, in which we have noted definite superiority of birds reared on a leg-weakness-producing diet and exposed to sunshine, as compared with birds subsisting on the same ration but irradiated with ultra-violet light from the quartz mercury vapor lamp.

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A COMPARISON OF THE COPPER CONTENT OF OKLAHOMA WHEAT WITH THOSE OF OTHER STATES

As part of a study on the copper content of Oklahoma plants, we secured wheat samples from various states[1] and analyzed them for copper according to the tentative method published in the proceedings of the Association of Official Agricultural Chemists.[2] Ash and moisture determinations were run in the conventional manner.

It was thought that these figures might be of interest in indicating the relative abundance of copper in the different parts of the United States, such an assumption being based on the work of several scientists, most recent of which is the work of Elvehjem and Hart,[3] in which they indicate that the copper content of the soil is reflected in the plants grown thereon.

As might be expected, there are considerable differences in the various percentages, reaching in one case slightly over 100 per cent. On the other hand, the totals are small in any case and the percentages are not such as to show any great abundance or lack of copper in any section represented.

TABLE I

ANALYSIS OF OKLAHOMA WHEATS

(Copper expressed in milligrams per kilogram of material)

Variety	Per cent. Moisture	Per cent. Ash	Cu. in Fresh Wt.	Cu. in Ash Fresh Wt.
Kanred	9.3	2.07	6.0	289
Blackhull	10.5	2.00	6.3	315
Fulcaster	9.1	2.21	7.0	313
Unnamed	9.1	1.64	5.1	314
Turkey	7.8	1.99	6.8	343
Average	9.2	1.98	6.2	315

TABLE II

ANALYSIS OF WHEATS FROM VARIOUS REGIONS OF THE UNITED STATES

(Copper expressed in milligrams per kilogram of material)

State	Variety	Per cent. Moisture	Per cent. Ash	Cu. in Fresh Wt.	Cu. in Ash Fresh Wt.
Rhode Island	Golden Chaff	8.8	1.52	5.3	348
Virginia	V. P. I. 112 wheat	8.8	1.68	6.8	403
Texas	Denton	9.6	1.49	7.8	524
Indiana	Fultz	10.0	1.94	6.6	339
Oregon	Unnamed	8.2	1.50	4.2	281
Arizona	Boart	10.3	1.45	6.0	414
New Hampshire	Ohio Trumbull	6.8	1.73	4.4	254
Wyoming	Unnamed	6.6	1.73	4.5	261
Colorado	Kanred	7.9	1.61	5.8	362
Ohio	Average of six	9.2	1.84	6.1	331
Missouri	Michigan Wonder	8.6	1.84	6.2	339
California	C. I. 1442	6.3	1.75	8.7	497
Oklahoma	Average of five	9.2	1.98	6.2	315
Average of states		8.8	1.78	6.0	345

The only noticeable trend in the percentages is that the northern samples are, as a rule, the lowest. There are, however, not enough analyses reported here to make this fact assume any great importance. Finally, there seems to be no relation between the ash content and the copper content, which fact is perhaps surprising in view of the probable adsorption of copper along with other mineral elements.

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[1] We desire to thank the various experiment station workers who so generously furnished us with the samples for these analyses.

[2] *Journal* of the Association of Official Agricultural Chemists, xii: 35–36, 1929.

[3] C. A. Elvehjem and E. B. Hart, "The Copper Content of Feeding-stuffs," *J. Biol. Chem.*, lxxxii: 473–477, 1929.