mechanism that works well supplies its own drive, it must not work too well; there must be some stimulus of difficulty. But may it not be argued that when a person loses interest in his work because his task is too easy, his mechanism too good, the reason must be either that the consummatory reaction is not connected with one of the great biological drives, or that he is not the kind of person to whom unsolved problems, that is, mechanisms some of whose parts are still undetermined, are *ipso facto* very strong drives; one who turns always from the familiar to the new task? If he is of this type we may as well say that he is urged by the drive of curiosity, whose biological value is clear. In other words, while special talents, specially good mechanisms, may involve special readiness of their consummatory reactions to be excited, without certain general traits of the personality like energy, curiosity, pugnacity, mere excellence of a mechanism would not suffice for its prolonged and effective use. The reviewer has elsewhere pointed out the possible function of the activity attitude in connection with those intellectual tasks which are only indirectly related to the primitive drives.

Of the many other points for discussion that are suggested by these lectures, there is space to mention but one. Those of us who hold, with the author, that introspection has furnished some scientific results "with such regularity that they command general assent, and probably even the extreme behaviorists in their hearts believe them," will be interested to observe how much of the evidence for Professor Woodworth's contentions is of an introspective character. In his arguments on the nature of human motivation the appeal is constantly to introspection.

Margaret Floy Washburn
Vassar College

*A Laboratory Outline of Neurology.* By C. Judson Herrick and Elizabeth C. Crosby. Philadelphia and London, W. B. Saunders Company. 8 vo. 120 pp.

After many years of teaching experience on the part of the senior author, C. J. Herrick and E. C. Crosby have produced an excellent laboratory outline of neurology. The outline includes directions for the dissection of the brains of elasmobranchs and of mammals. The directions for the elasmobranchs are especially acceptable for they are accompanied by some much needed and novel diagrams from the unpublished work of Norris and Hughes. In addition to a very clear and well-arranged account of the subject matter, the volume contains abundant references to the literature. The text is arranged so that it may serve for a variety of courses, seven of which are outlined in the introductory chapter. The volume is compact and well printed both as to text and illustrations.

G. H. P.

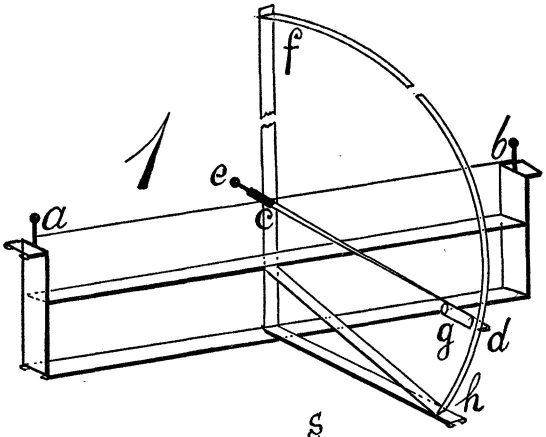
## SPECIAL ARTICLES

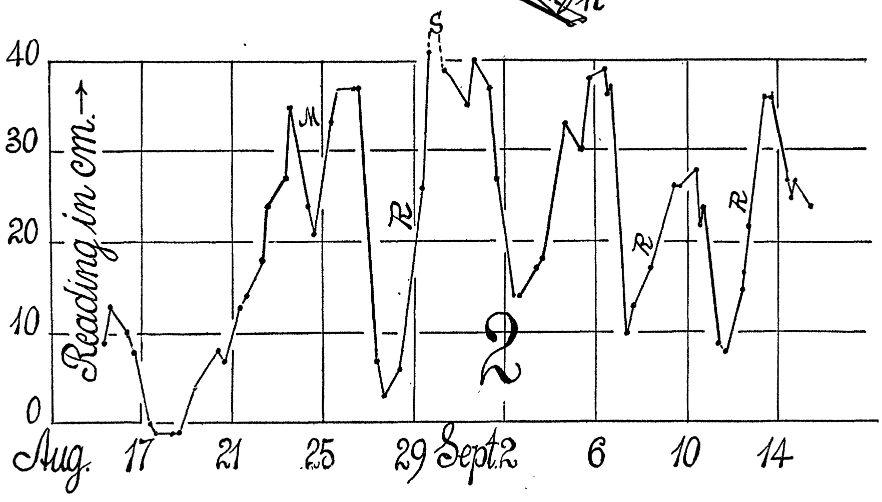
### HYGROMETRY IN TERMS OF THE WEIGHT OF A FILM OF GELATINE

I have recently had occassion to reconstruct a form of horizontal torsion balance which I used in 1890 in measuring the absolute viscosity of steel.[1] Even when quite robust, it can easily be made so sensitive that an excursion of over 10 cm. is equivalent to a milligram. It should therefore be available for indicating the absorption of atmospheric vapors on the part of light bodies.

Fig. 1 shows the apparatus, the suitably braced frame being made of strips of tin plate, bent C-shaped in cross section to secure rigidity. The torsion fiber, *ab*, of brass wire, .2 mm. in diameter 35 cm. long, is stretched between vertical screws (around which the end are wound), each provided with a lock nut so that a fixed tension may be imparted to the wire. The pointer, *cd*, also about 35 cm. long and of light varnished wood, is carried at the middle of the tense wire (threaded through a fine hole in the stem and looped around it), with an adjustable screw counterpoise at *e* in the rear. The index at, *d*, plays over a light circular scale of brass, *fh*, which in my apparatus comprehended about 130°, though it

1 *Phil. Mag.*, XXIX., p. 344, 1890. The change of the electrical resistance of gelatine in relation to hygrometry has been studied by Dr. G. B. Obear.




would be much better to make it 180° from the ends of a vertical diameter. The film of gelatine (conveniently bent in form of an open cylinder and fastened with a little wax) is shown at *g*. The mantel contained about $3 \times 13$ sq. cm, of area and the film was less than .1 mm. thick, weighing about .4 gram.

As the observations contained in Fig. 2 are tentative, I merely chalked a centimeter scale increasing downward on the strip *fg*, to specify the position of the index. If absolute data were to be reached, the scale would, of course, have to be graduated in terms of $(\theta_0 - \theta) \sec \theta$ where $\theta$ is the variable angle measured in a given direction from the horizontal diameter of *fh*; or a torsion head could be provided at *b*. Fig. 2, in which the position of the pointer *d*, on successive days are laid off vertically, the curve rising as the weight of the gelatine increases, is sufficiently interesting without this and I merely placed the apparatus (without a case) in a quiet corner free from draft and read off the centimeters from across the room. It is in fact fascinating to watch it from day to day; for the play of the pointer, in spite of the handicap of leaverage, is over 40 cm. along the strip. The lowest position occurred during the relatively cool weather following August 15. After that the weight increased until the very muggy weather at *M* toward August 25 was passed through. With the arrival of a cold wave the weight drops almost suddenly, to increase again with equal abruptness to herald the rain at *R*. Here the pointer, at *S*, actually gave up in despair and rested for a while on the stops; but it soon got free again and has not succumbed since, etc. The lag condition inside of the room as compared with those outside were well marked. At mid-day there is usually a slight rise of the pointer, owing to increased temperature and dryness.

So far as I can see there is no reason why such an apparatus should not be quite trustworthy. Without using mirrors, it could easily be made twenty times more sensitive. The gelatine film attached has been in the laboratory for at least twenty-five years under the same atmospheric conditions. The question is therefore pertinent whether we know as much about the continuity of thermodynamic equilibrium, or about colloids, as this simple instrument might answer.

C. Barus
Brown University,
Providence, R. I.

## SOME ANALYSES OF THE URINE OF REPTILES

It is generally stated that in the urine of the Sauropsida, birds and reptiles, the urea of the urine is replaced by uric acid, and that uric acid is the sole nitrogenous excretory product of importance. That uric acid is practically the sole nitrogenous constituent of the urine of a reptile of the arid regions, the horned lizard (*Phrynosoma cornutum*) of southwestern United States has been recently shown by the analyses of Weese[1] from this laboratory. Examination of the urines of some aquatic or semi-aquatic reptiles has indicated that uric acid is of less importance quantitatively in the urine of reptiles of this type than is generally assumed.

The urine was removed from the urinary bladder immediately after the death of the animal by bleeding, and analyzed promptly. The use of the newer analytical methods (colorimetric determination of uric acid and creatinine (urease determination of urea) made possible the accurate analysis of small volumes of dilute urine. The specimen of alligator urine was obtained through the courtesy of Professor Henry B. Ward, of the department of zoology. The results are expressed as milligrams per 100 c.c. urine and in the case of the turtles in percentages of total nitrogen.

| | Turtle | | Turtle | | Alligator |
|---|---|---|---|---|---|
| | Mgs. | Per Cent. | Mgs. | Per Cent. | Mgs. |
| Total N | 62 | — | 150.0 | — | — |
| Urea N | 28 | 45.1 | 46.7 | 31.1 | 29 |
| Ammonia N | 11 | 17.7 | 21.8 | 14.5 | 44 |
| Uric acid N | 12 | 19.1 | 21.0 | 14.0 | 47 |
| Creatinine N | 1 | 1.6 | 1.4 | 0.9 | — |
| Creatine N | 6 | 9.7 | 3.9 | 2.6 | — |

It will be noted that in both of the turtle urines examined the amounts of urea and ammonia nitrogen exceed that of uric acid nitrogen, the latter constituting only 19.3 and 14.0 per cent. respectively of the total nitrogen. In the case of the alligator urine the uric acid content was somewhat higher. The relatively high elimination of ammonia nitrogen in comparison to the amount present in most other types of vertebrate urine is of interest in suggesting that the uric acid may occur in the form of ammonia salts. The occurrence of creatinine and creatine or substances that give similar color reactions is also noteworthy. The relatively high content of creatine (or substances which react similarly on hydrolysis and subsequent treatment with picric acid and alkali) was confirmed by determinations by both the Folin-micro and S. R. Benedict methods.

Howard B. Lewis
University of Illinois

[1] Weese, A. O., Science, N. S., Vol. XLVI., No. 1195, p. 517, 1917.

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