ber of species and the relationship of every genus of vascular plants ("Phanerogamen und Pteridophyten"). Whether the remainder of the vegetable kingdom is to be covered in this manner by the author is not stated, but we may here express the hope that this will be done.

By leaving out synonyms, and by printing two columns on each page the author and publisher are able to bring the whole book into 260 pages, including a four-page "Uebersicht der Familien" and a three-column, sixteen-page index. The sequence of families is essentially that of Engler and Prantl, *reversed,* and the older ideas as to the limits of families are generally adopted. Thus we find *Compositae* undivided, as also *Convolvulaceae, Ericaceae, Rosaceae* and *Cupuliferae,* while on the other hand we have *Leguminosae* divided into *Mimosaceae, Caesalpiniaceae* and *Papilionaceae,* and *Sapindaceae,* into *Sapindaceae,* proper, *Hippocastanaceae* and *Aceraceae.* The number of species is given for each genus, tribe, family, series, class and phylum, and for the larger groups the numbers of genera and families are given. We know of no other work in which numerical relations have been so fully worked out as in this little book. Incidentally we find in these latest estimates that the number of known species of plants[1] is considerably larger than has been supposed, and we have the data for making the following changes in the table as given on the pages cited:

Pteridophyta	3,820	species	instead of	2,500
Calamophyta	24	"	"	20
Lepidophyta	701	"	"	900
Cycadophyta	137	"	"	140
Strobilophyta ...	386	"	"	450
Anthophyta 132,584		"	"	110,000

The latter are divided into: Monocotyledons, 23,747 species instead of "about 20,000," and Dicotyledons 108,837 instead of "about 90,000." These corrections bring the total number of species of plants now known up to somewhat more than 233,000 (instead of 210,000).

Charles E. Bessey
The University of Nebraska

[1] See Science for November 11, 1910, pp. 669–670.

Societies and Academies

The Philosophical Society of Washington

The 684th meeting of the society was held on November 19, 1910, Vice-president Rosa in the chair. Three papers were read:

Record of Lightning Stroke at Cheltenham Observatory: R. L. Faris, of the Coast and Geodetic Survey.

This paper gave a description of the occurrence of a lightning discharge which struck the Cheltenham magnetic observatory during the prevalence of a severe thunder-storm on the evening of July 12, 1910, and the effect it produced upon the self-recording magnetic instruments. Lantern slides of the photo-magnetic records during the thunder-storm were exhibited, and tables of base-line values for periods of time before and after the occurrence of the disturbance which showed that no permanent displacement of the magnets had been produced by the electrical discharges. (This paper will appear in full in the *Journal of Terrestrial Magnetism* for December, 1910.)

Recent Work on the Selective Emission of the Welsbach Mantle and the Acetylene Flame: Dr. W. W. Coblentz, of the Bureau of Standards.

The speaker described experiments on the emission and the absorption of the acetylene flame. The results obtained show that, within the limits of experimental error, in the visible spectrum the emissivity is a simple function of the thickness of the radiating layer of the flame, while in the infra-red the emissivity is a more complex function of the thickness. The acetylene flame has an absorption band at .6 μ, with regions of greater transparency in the violet and in the red. No emission band exists at .7 μ, as was previously supposed. The conclusion reached is that the radiation from the acetylene flame is purely thermal, and that it is not necessary to introduce the question of luminescence to explain the observations.

Experiments were also described on the radiation from the Welsbach mantle and from the same material used as a solid rod. The spectral energy curves of these two forms of radiators of the same material are entirely different, due to the difference in the thickness of the radiating layer. Cerium oxide changes its pigment color

with rise in temperature, due to a broadening of the absorption band in the violet. This rapid broadening of the absorption band into the visible spectrum makes the cerium oxide a more efficient radiator of light than it would be if it did not have this property. The conclusion reached was that the radiation from the gas mantle is a thermal phenomenon, not requiring the introduction of catalytic action to explain the observations.

Some Bugbears in Calorimetry: Dr. W. P. WHITE, of the Geophysical Laboratory of the Carnegie Institution of Washington.

The speaker briefly mentioned the fundamental principles upon which the accuracy in calorimetry depends, and stated that during the last four years the accuracy had increased tenfold. The principal bugbear in calorimetry is the cooling correction. This correction was discussed at some length and the things heretofore considered essential in connection therewith were mentioned. By taking advantage of these the cooling correction is easily handled. The lag, and the error due to it, were then discussed, this question being investigated here in Washington for the first time and with the result that there is now no error left due to this cause.

In speaking of the error in the measurement of the temperature (now the only real error remaining) the different kinds of thermometers that had been employed were mentioned. Different types of calorimeters were described and one form was exhibited for inspection. Diagrams were shown giving some results in which the errors due to the cooling correction were negligible. The final accuracy was 1/10,000 part.

R. L. FARIS,
Secretary

THE 685th meeting of the society was held on December 3, 1910, Vice-president Day in the chair. Two papers were read:

Explosions in Gaseous Mixtures: Mr. L. H. ADAMS (by invitation), of the Geophysical Laboratory of the Carnegie Institution of Washington.

The speaker described certain conditions under which explosions in gaseous mixtures take place, and spoke of the retarding effects of inert gases on the explosion. Explosion is a reaction which proceeds with increased velocity, and is accompanied by a rise of temperature, the ignition point depending on the heat capacity. Causes of mine explosions were briefly discussed, the speaker also pointing out that it would be of great value to be able to predict the explosive conditions of the air in mines.

Explosive experiments with methane mixed with air and carbon dioxide were described and the conditions of explosion explained, and the per cent. of methane defining the upper and lower limits of explosion were given, this being also illustrated by a diagram. In studying how inert gases retard explosion, the explosion wave had been looked into.

The Melting and Boiling Points of some of the Chemical Elements: Dr. G. K. BURGESS, of the Bureau of Standards.

The status of our present knowledge of the best values to assign to the melting and boiling points of the elements was illustrated by means of a diagram representing their periodic distribution in terms of atomic weights, and on which was also indicated graphically, in the case of the melting points, the outstanding uncertainty of each of these temperatures.

The several optical methods used for determining the higher temperatures were described and their relative merits compared, and the results of some of the recent investigations were discussed in some detail.

The availability, reliability and reproducibility of the various melting and boiling temperatures of the elements which are used as fixed points, or standard temperatures in thermometry, were also discussed.

Finally, after showing that the most probable value on the constant volume gas scale of the sulphur boiling point is $444°.70 \pm 0°.08$ from all of the available data, there was given a description of the behavior of boiling sulphur, the method and apparatus employed for realizing a constant temperature in its vapor, including also an account of the explorations of the temperature distribution within the 30 cm. column of sulphur vapor, and within radiation shields of the usual form of S.B.P. apparatus.[1] Use was made of various types of thermo-electric and resistance thermometers, the smallest of the latter being 9 mm. in length and of 13.1 ω resistance in sulphur, capable of being read accurately to 0°.01 C. The sulphur vapor was found to be of a temperature constant to 0°.03 C. throughout 27 cm. of

[1] See Waidner and Burgess, Bull. Bureau of Standards, 6, pp. 149–230, 1910.

its length. The discrepancies heretofore found with thermo-couples were shown to be avoidable when suitable precautions are taken. The sulphur boiling point, therefore, under readily realizable and reproducible experimental conditions, appears to be the best defined and most reproducible of all the fixed points, melting or boiling temperatures, furnished hitherto by any of the chemical elements.

R. L. Faris,
Secretary

THE AMERICAN CHEMICAL SOCIETY
NEW YORK SECTION

The third regular meeting of the session of 1910–11 was held at the Chemists' Club on December 9 in conjunction with the American Institute of Chemical Engineers, who were holding a general meeting in New York at the time.

The evening was devoted to a symposium on sewage disposal, in which the following addresses were made:

"The Principles of Sewage Disposal," Geo. C. Whipple.

"Sewage Disposal in Europe," Rudolph Hering.

"Sewage Disposal in New York and Vicinity," Geo. A. Soper.

"Sanitary Conditions in their Relation to the Water Supplies in the Vicinity of New York," Nicholas S. Hill, Jr.

"The Unsolved Problems of Sewage Disposal," Chas. E.-A. Winslow.

C. M. Joyce,
Secretary

THE BOTANICAL SOCIETY OF WASHINGTON

The 10th annual business meeting of the society was held on Saturday, November 12, 1910. Officers were elected as follows: *President*, W. J. Spillman; *Vice-president*, R. H. True; *Recording Secretary*, W. A. Orton; *Corresponding Secretary*, W. W. Stockberger; *Treasurer*, F. L. Lewton. The executive committee announced an active membership of ninety, there having been fourteen accessions during the year.

The 67th regular meeting of the society was held at the Cosmos Club on Friday, December 2, 1910, at eight o'clock P.M., with President Spillman in the chair. Thirty-nine members were present. Dr. C. F. Clark, W. W. Eggleston, Paul Standley and G. T. Harrington were admitted to membership.

The following papers were read:

Effect of Variation in Light on Sugar Production in Beets: H. B. Shaw.

Identical strains of high-grade sugar beets were observed to yield widely varying percentages of sugar in different localities. Variations in methods of cultivation, fertilization and in soil do not appear sufficient to account for this. Therefore experiments were carried on to determine the influence of variation in the intensity of sunlight.

During 1909 and 1910 sugar beets in the open field in Utah were treated as follows: a portion of a long row was left under ordinary field conditions, a portion of the same row was shaded with one thickness of white bunting, another part with two-fold bunting and the remainder of the row with three-fold bunting, during the entire season.

The more striking results are tabulated below:

Relative Light Intensities

(Based on the actual duration of bright sunshine and diffused light for the entire season.)

Open row	Single bunting	2-fold bunting	3-fold bunting
100	32.2	16.7	9.7

Relative Temperatures

Shade 82°F.	112°F.	100°F.	96°F.	94°F.
Analyses of the Beets				
Weight (av.) in oz. ..	27.76	11.08	3.84	1.75
Total sugar in beet (oz.)	3.80	1.33	0.32	0.15
Average per cent. sugar in beet	13.70	12.00	8.30	6.00
Purity	76.70	81.00	66.00	61.00
Relative proportion of sugar	25.33	8.86	2.10	1.00

Smelter Injury to Forests: Dr. Geo. G. Hedgcock.

The full paper will be published later as a Bulletin of the Bureau of Plant Industry.

Cultivation of Tobacco in Cuba: Dr. H. Hasselbring.

In this paper, which was illustrated by photographs, the general methods practised in tobacco culture were described. The peculiar methods of obtaining seed and handling seedlings were emphasized. Seed is collected from suckers and is usually sent to the mountains where the seedlings are grown in fresh soil. At planting time the seedlings are packed in bales and shipped to the various parts of the island where they are needed and frequently many days elapse before they are set in the fields.

W. W. Stockberger,
Corresponding Secretary