loosely under the lens for examination, and after it has served the purpose of the moment is brushed aside and lost, or at best preserved in packets upon the sheet with the specimen from which it was taken. This method is mussy and eventually impairs the mounted specimens of an herbarium, and where there are many workers it is not economical of time. To avoid this is quite practicable through the preservation of all such materials dry in cells upon glass slips as opaque mounts for the microscope. The cells are built by gluing to the glass slips brass rings, and the specimens are enclosed by cementing to the top of this ring the ordinary circular cover glass. The method of building this form of cell was suggested by Dr. Griffiths some years ago and is quite familiar. A cell of this form will not accommodate leaves and some other plant structures as well as another form of cell, which is made by gluing a rectangular frame cut from cardboard to the glass slip. A cell of this construction will contain small leaves entire or the tip and basal portions of larger leaves, which can be viewed from either side. A cell of this type must be enclosed by a rectangular cover glass. A supply of slips, upon which cells of various sizes have been built, may easily be kept on hand, and whenever it becomes necessary to remove from an herbarium specimen material for examination, it may be placed in a cell in manner best adapted for its display, labeled, and you have at once, at very small expense, a slide of vegetable material which will be ready for use at any future time; and, if such a collection of slides is properly classified and arranged, it forms a working adjunct to the herbarium of much value, and, besides, provides one constantly with available material for numbers of demonstrations in botanical work.

Hæmaglobin and Its Derivatives. By A. J. Bigney.

On subjecting a dilute solution of arterial blood to spectroscopic examination, certain parts of the spectrum of natural or artificial light will be absorbed. The amount of this depends upon the degree of concentration of the blood; if a one per cent. or two per cent. solution be used, two narrow dark bands are seen in the orange-yellow between the Frauenhofer lines D and E, the one next to E being a wider, but not so deep a band as the one next to D. A little of the red is absorbed and the violet, indigo, and a part of the blue. This is the spectrum of *Oxy.-Hæmoglobin.*

If arterial blood or venous blood which has been shaken with air be treated with some reducing agent such as ammonium sulphide or alkaline iron sulphate with tartaric acid, a decided change occurs in the spectrum, instead of the two

bands only one appears, which is between the two lines of *Oxy.-Hæmoglobin*, and is much broader than either of the bands mentioned above. This is the spectrum of reduced *Oxy.-Hæmoglobin* or simply *Hæmoglobin*.

METHÆMOGLOBIN.

The spectrum of *Methæmoglobin* is obtained by first preparing *Oxy.-Hæmoglobin* crystals by treating dog's blood with ether and shaking it until it becomes laky, then allowing it to stand in a cool place for an hour or so, at which time a firm mass will be formed, due to the crystals. The mother liquor is separated from the crystals by filtering through muslin or linen, squeezing the mass so as to obtain the crystals in as pure a form as possible. The crystals are dissolved in distilled water and a dilute solution is examined with the spectroscope. The two bands of *Oxy.-Hæmoglobin* appear. A few drops of potassium permanganate are added and the solution gently warmed. If sufficient time has elapsed for the oxidation of the *Oxy.-Hæmoglobin*, the two bands will have disappeared and instead a single band in the red near the line C between C and D. Nearly the entire spectrum is absorbed. Sometimes it is a little difficult to get this band, but if the oxidation has taken place it will be seen. In the experiment at hand I left the solution until the next day before it would give the above result.

CARBON-MONOXIDE HÆMOGLOBIN.

If coal gas be passed through blood which has been defibrinated, it will assume a cherry-red color, the carbon-monoxide of the gas having driven off the oxygen of the *Oxy.-Hæmoglobin* and taken its place. The reducing agents have no influence upon this new substance, it being more stable than *Oxy.-Hæmoglobin*. The two absorption bands are nearer to E than in the *Oxy.-Hæmoglobin* spectrum.

HÆMATIN.

The red corpuscles are composed of a *proteid stroma* and a brownish pigment which is called hæmatin. The iron is a part of the hæmatin. It can be obtained either as the acid hæmatin or the alkaline hæmatin.

In making the acid hæmatin, I took 100 cc. of 95 per cent. alcohol and added 2 cc. of sulphuric acid, and then 10 cc. of blood; the mixture was boiled for about an hour in a flask tube three or four feet long so that the vapor passing off would be condensed in upper part of the tube and flow back into the flask.

During this process a precipitate is formed which is acid hæmatin. The solution is filtered and the precipitate is dissolved in alcohol and then examined

Since the precipitate is soluble in alcohol, that which is obtained by filtering does not represent all the hæmatin, for a part would be dissolved while boiling. The spectrum has one broad band near C. Most of the remaining portion of the spectrum is also absorbed.

If 95 per cent. alcohol be added to blood and a small quantity of caustic soda, a still different spectrum is obtained. This is the alkaline hæmatin spectrum. It is similar to the acid hæmatin except the dark band is near and often on D.

Effect of Heat Upon the Irritability of Muscle. By A. J. Bigney.

In these experiments the gastrocnemious muscle of the frog was used. It was suspended in a moist chamber and the tendon attached to a lever for recording movements in contraction on a revolving drum. Surrounding the cylindrical moist chamber was another similar cylinder filled with water; near the bottom was a small tube about one-half inch in diameter passing from it at right angles and forming two sides of a rectangle, returned to the cylinder filled with water. By this arrangement the water could make a circuit through this tube and the cylinder. Heat was applied to the tube, and a thermometer was placed in the moist chamber.

The muscle was stimulated at different temperatures and the result recorded on the drum. Only making shocks were used in stimulation, this being regulated by the automatic maker, or breaker. Between 36° and 38° C. the contractions were the greatest, showing an increase in irritability. Between 39° and 40° the contractions ceased, heat rigor having set in. At the time the contractions ceased, the temperature was lowered and the muscle became irritable again. It would continue irritable for some time, but would soon become exhausted. After several hours' rest it would become quite irritable again.

Heat rigor began to set in at a little more than 36°, sometimes not until nearly 39°. It is different in different frogs and in different seasons. From 45° to 55° C. the rigor would usually be complete. The most important point to be secured is that temperature at which contractions cease and still when the temperature is lowered the muscle will be found to be alive so as to give contractions. When the heat rigor would once begin, it would continue even if the temperature is lowered. This holds true only for a few degrees. Long rest would allow it to pass out of rigor if it had not gone too far. After at least 24 hours had elapsed good contractions were obtained, and this with muscle that had once been exhausted.