Near the sinus or notch of the prothallus a number of small, oval or rounded dark structures may be seen, often appearing to be made up of minute cells. These are the *archegonia*. By the fusion of the contents of antheridium and archegonium, a sexual spore or "egg" results, which on germination produces the fern plant, as it is commonly known.

A CONVENIENT METHOD OF DETERMINING THE DENSITY OF AIR.

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A rapid and reasonably exact method of determining the density of air both for the laboratory and lecture room is of considerable interest and importance to every teacher of elementary science. The method here described is believed to meet the requirements of simplicity, speed, and accuracy better than most of those commonly employed.

The apparatus required consists of a copper or brass globe provided with a stopcock, such as usually forms one of the accessories of an air pump; a balance weighing to centigrams; a bicycle pump; a two-gallon bottle provided with a four-hole rubber stopper, and graduates or graduated flasks for measuring the volume of water. The globe is weighed filled with air at atmospheric pressure, the stopcock being left open. With the bicycle pump as much air is forced into the globe as is thought safe. If the globe has soldered joints, 1.5 to 2 grams of air for each liter of capacity will usually be safe; but if spun without joints, a much larger amount of air could be forced in. The globe is again weighed and the weight of the air introduced noted.

The large bottle is filled about two-thirds full of water at the temperature of the room, and a layer of heavy lubricating oil poured on top to check the formation of water vapor when the relatively dry air from the globe is admitted. Kerosene might be

used instead of the water and heavy oil with good results, but was not employed by the author. A bent glass tube passing through the stopper nearly to the bottom of the bottle and provided on the outside with a rubber tube and pinch cock acts as a siphon for drawing off the water. A second glass tube with a rubber connection for attaching to the stopcock of the globe passes through the stopper and provides for the admission of the air.

A U-shaped open manometer tube 25 centimeters high, and containing about ten centimeters of water with the outer end provided with a rubber tube and pinch cock, passes through the third hole in the stopper. A thermometer is inserted in the fourth hole, the stopper is wired in, and all the connections made tight with soft wax or paraffine.

The globe is attached to the inlet tube and enough water allowed to run from the siphon to make the pressure, as indicated by the manometer, the same inside the bottle as outside. The open end of the manometer is then closed by means of the pinch cock and the air from the globe admitted rather slowly, taking perhaps two minutes to complete the operation. In the determinations made by the author the water is drawn from the bottle directly into liter flasks, the fraction of a liter being measured in a 500 cc. graduate. When apparently enough water has been drawn out the pinch cock is removed from the open end of the manometer and water allowed to run in or out as may be needed to make the pressure inside and out the same. As the air in the globe is cooled by its expansion, two or three minutes must be allowed for it to again reach the temperature of the room. The thermometer and barometer readings are then noted.

The following are fair samples of the results obtained after reduction to 0 degrees and 760 mm.:

Density.	Per Cent Error.
0.001297	+0.31
0.001279	-1.08
0.001289	-0.31
0.001293	0.00
0.001291	-0.15
0.001302	+0.70

The largest error in 15 successive determinations was 1.3 per cent, the average error being 0.54 per cent. The weight of the air taken was from 3 to 4 grams, and the weighings were accurate to centigrams only. The time required for a determination never exceeded 20 minutes, and was usually about 15.

Aside from instrumental errors, the chief sources of error in this method are due to the cooling of the air on expansion, and the formation of water vapor when the relatively dry air from the globe has displaced the water in the bottle. If the bottle is not more than two-thirds full of water and the air is admitted slowly, the error from cooling, which tends to make the result too large, will be small. If we wait till the air has fully returned to the temperature of the room so much water vapor is likely to form that the result is certain to be too small. Until the layer of oil was used this was uniformly the case. The most satisfactory results were obtained when from two to three minutes were taken for the admission of the air and the drawing off of the water.

EXPERIMENTS ON THE REMOVAL OF OXYGEN FROM THE AIR.*

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Quite a number of methods have been devised to separate the oxygen from a measured volume of air, and thus to show the ratio of the volumes of oxygen and nitrogen. Phosphorus and pyrogalllic acid in alkaline solution gives perhaps the most accurate results; copper is good, but requires rather complicated apparatus, while, of course, the use of combustibles, such as alcohol or a candle, is barred, because carbon dioxide is formed, which cannot be readily separated from the nitrogen.

*Translated from "School Science" from *Zeitschr. f. phys. und chem. Unterricht*²³ XIII. 333.