



Variable Light Diffuser for Plant Leaf Gas Exchange Measurements

Chapman Case #2020-008

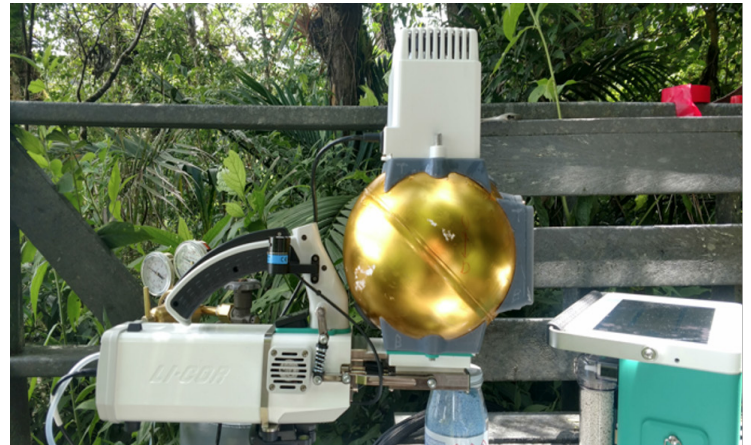
Market Need

A common scientific technique to measure the rates of photosynthesis and transpiration of plant leaves is to measure leaf gas exchange rates using portable infrared gas analyzers. To do so, scientists need to control the environmental conditions experienced by the leaf during the measurement, such as light, temperature, and relative humidity.

Equipment currently available for the measurement of leaf gas exchange allows for the precise control of the quantity of light arriving at the leaf surface. However, recent studies have demonstrated that the angle of light (the proportion of light that is diffuse or direct) can also have a significant impact on rates of leaf gas exchange in a number of plants species. Diffuse light (or light at various angles) occurs when the sky is cloudy, or when there are other aerosols (e.g. particulates from pollution) in the air. In order to measure photosynthesis with existing equipment under diffuse light, there is a need for an apparatus that allows for the precise control of the ratio of direct to diffuse light.

Chapman Solution

[Dr. Gregory Goldsmith](#), Dr. Carter Berry, and researchers at Chapman University have invented a light diffuser that enables scientists to precisely control the ratio of direct to diffuse light and the total quantity of light when using an infrared gas analyzer to measure leaf gas exchange. The diffuser takes the form of an integrating sphere with proprietary mounts that enable custom-fit with the most popular infrared gas analyzers on the market, including the Li-Cor Biosciences LI-6800. To maximize portability for field research, the diffuser is designed and constructed with light-weight materials.



Applications

- Measuring photosynthesis, transpiration and water-use efficiency with a varying ratio of direct to diffuse lights

Key Publication

- [Diffuse light and wetting differentially affect tropical tree leaf photosynthesis](#), New Phytologist, 2019.

Intellectual Property

- Patent pending

Stage of Development

- Working prototype customized for the Li-Cor LI-6800 gas analyzer
- Available for licensing and further research collaborations