

# Calibration Standards For Controlled Environments: History and Use of the NCR-101 Instrument Package

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Rooftop long-term drift study

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Norwich, UK

# History and Purpose

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- Initial funding from NSF in 1972 (T. Tibbitts P.I.)
- Developed as a “standardized instrument package” for distribution to cooperating laboratories in conjunction with baseline growth studies.
- Currently serves two main purposes:
  1. As calibration standards to improve uniformity among studies in different controlled environment facilities
  2. To provide members with a set of unique instruments for characterizing controlled environments

# Current Use

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- Average usage is about 6 to 10 users per year
- 1 month turn around time
  - 2 weeks for use
  - 2 weeks for shipping and handling
- US \$300 per rental
  - Pays for annual recalibration of the instruments
  - Funds purchase of new instruments
  - Compensates managers time by covering expenses to the annual meeting

# Apogee\* Datalogger

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- Hand held
  - Pre-programmed
  - 8 sensors
  - Hourly and daily averages
  - Downloadable files
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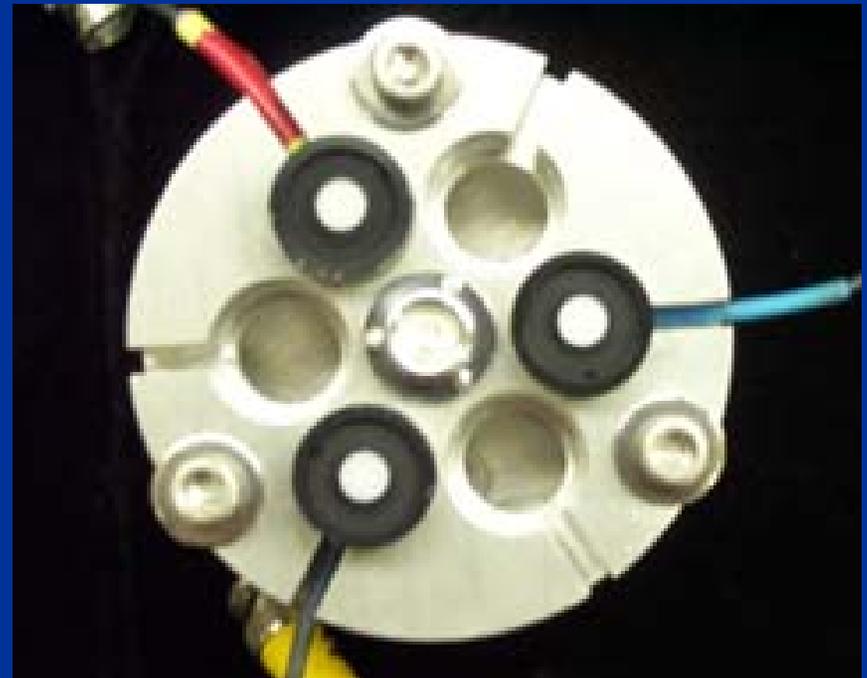
\*Donated by  
Apogee instruments



# LI-COR Quantum Sensors

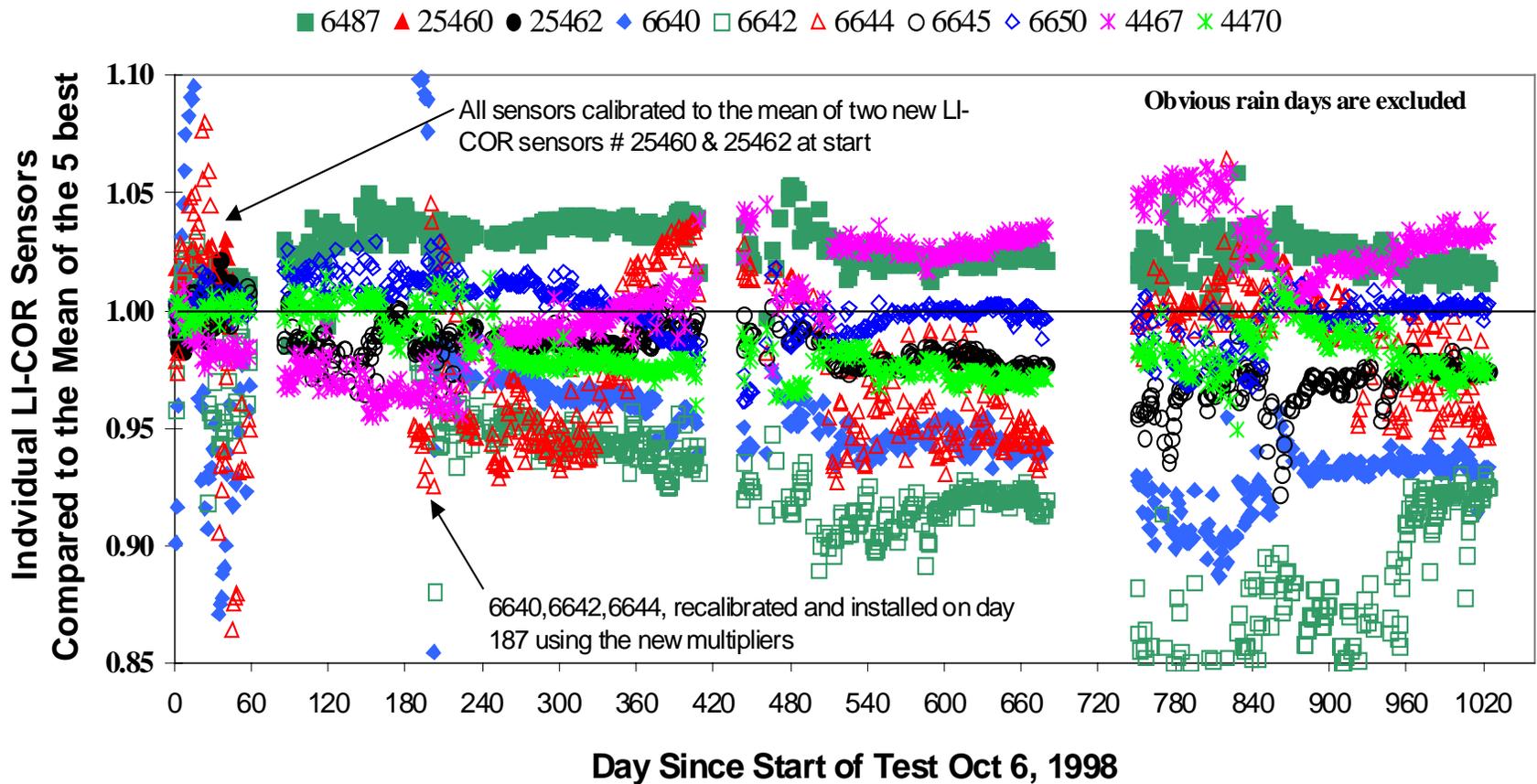
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- PAR  $\mu\text{mol m}^{-2} \text{s}^{-1}$
- World standard
- Silicon chip
- Good cosine response



400-700 nm

# LI-COR Quantum Sensor Drift



- Quantum sensors drift and need regular recalibration

# Eppley Pyranometer PSP

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- Short-wave  $W m^{-2}$
- World Standard
- Thermopile



285-2,800 nm

# Eppley Pyrgeometer PIR

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- Long-wave  $W m^{-2}$



4-50  $\mu m$

# Eppley Pyranometer PSP/RG715

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- Non-photosynthetic  
Short-wave  $W m^{-2}$



700-2,800 nm

# Skye Red/Far Red Sensor

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- Phytochrome Response

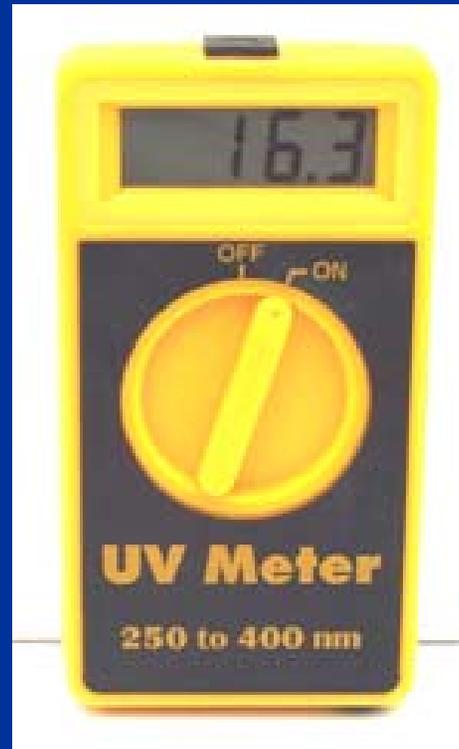


660/730 nm

# Apogee Hand Held UV Meter

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- Total UV  $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Evaluate filtering by light barriers



250-400 nm

# TSI Hotwire Anemometer

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- Average air velocity  $\text{m s}^{-1}$
- Omnidirectional



0-5  $\text{m s}^{-1}$

# StellarNet Spectrometer (testing)

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- Characterize light
- Remote sensing of plant health
- UV/VIS
- Portable
- Available soon!



200–850 nm

# Make good measurements !

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