

The Phytotron at Duke University
2006 Station Report to the NCR-101 Committee
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Paraphrasing Mark Twain, reports of the demise of the Duke Phytotron were greatly exaggerated.

Much has happened since Dave Tremmel's last report in 2003. NSF funding ended in 2002, and the National Phytotron became a component of the Duke Biology Department Plant Teaching and Research Facility.

STAFF CHANGES

The Phytotron is now staffed by long time employees Jerome Smith, Norman Hill and Todd Smith along with newcomer Mel Turner, all under the direction of Marcia Kirinus, Greenhouse and Phytotron Manager.

NEW MISSION

As the facility went from a NSF facility to Duke operated, our clientele became localized. Space charges dropped, as dictated by university standards, and current faculty members were encouraged to use the facility. For the first time in years, all chambers were operating and waiting lists developed. The primary focus of the facility also shifted slightly. Though global change experiments still dominate our space, other less labor intensive experiments were also introduced. *Arabidopsis* moved in along with genetically altered corn, tobacco and soybeans. Crops for evolutionary biology research come and go.

FACILITY IMPROVEMENTS

Improvements have been made to the CO₂ control system. Injection side programming was improved, and scrubbing control added. Externally mounted scrubbers were added to 8 step-in (S) chambers, and quick-change portable scrubbing units were constructed for the small reach-in (R) chambers.

The large (L) chambers and the tall (T) chambers were upgraded to EGC TC2 controllers connected to a central computer running EGC ControlNet. The TC2 controllers for the 10 L chambers were a gift to Duke University from EGC, for which we are very appreciative. We would not have been able to upgrade those chambers at this time if not for EGC's generosity.

One L chamber was converted to a seed storage chamber running at 12°C and 10% RH.

Supplementary HPS lighting was added to 4 glasshouses, now all 6 glasshouses have supplementary HPS lamps.

A National Instruments system is being installed to collect and process data from the R chambers, replacing an ancient homemade system.

An RO water treatment system has replaced the SuperStill vapor pressure stills that have been in use for about 15 years.

Building air handlers are being upgraded.

Improvements continue on the carbon-11 facility. Underground conduits are being installed to connect the Phytotron to the TUNL (Triangle Universities Nuclear Laboratory), allowing for direct transfer of the ^{11}C isotope to the Phytotron C-11 Chamber. The conduits will also allow for direct communication between the Phytotron and the nuclear lab.

RESEARCH

We continue to provide controlled environment space for a number of experiments in the area of global change research, providing both superambient and subambient CO_2 levels. Work continues on the use of stable isotopes, labeling plants with both ^{15}N and ^{13}C .

FUTURE PLANS

We hope to obtain funding to purchase new reach-in chambers and replace the light caps on the L chambers.

WEBSITE

<http://www.biology.duke.edu/plantfacility/>

SELECTED PUBLICATIONS

Maestre, F.T., M. Bradford, and J.F. Reynolds. 2005. Soil nutrient heterogeneity interacts with elevated CO_2 and nutrient availability to determine species and assemblage responses in a model grassland community. *New Phytologist* 168:637-650.

Wiegner, T.N., L.A. Kaplan, J.D. Newbold and P.H. Ostrom. 2005. Synthesis of a ^{13}C -labeled tracer for stream DOC: labeling tulip poplar carbon with $^{13}\text{CO}_2$. *Ecosystems* 8:1-11.

Baruch, Z. and R.B. Jackson. 2005. Responses of tropical native and invader C_4 grasses to water stress, clipping and increased atmospheric CO_2 concentration. *Oecologia* 145:523-532.