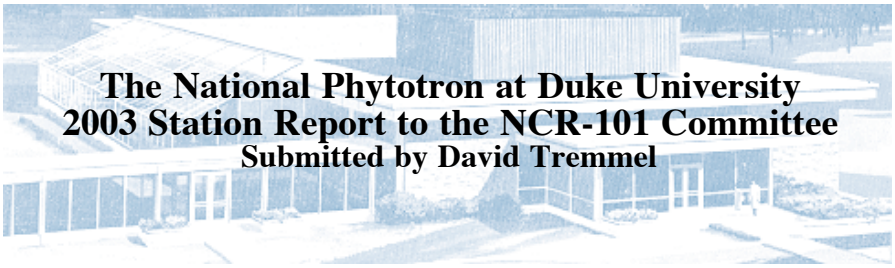


The National Phytotron at Duke University
2003 Station Report to the NCR-101 Committee
Submitted by David Tremmel

This will most likely be the last station report from the National Phytotron. In August 2002 the Duke administration decided that it would end its support of the Phytotron as a national facility at the end of our current NSF operations grant (which at that time was May 2005). When NSF was informed of this decision, the directorate that currently funds the Phytotron – which is unfortunately not the ideal directorate for the facility to be associated with – decided to eliminate our final 18 months of funding. Given that we have commitments to funded researchers beyond this date, the Duke administration has agreed to fund operation of the facility until June 30, 2004.

The future of the facility beyond that date is unclear. The building and its contents will become part of the Duke Biology department. At present it appears that all the greenhouses and a majority of the growth chambers will remain in place, but will be available only to Duke researchers. It seems likely that the facility will retain only a minimal staff, given the priorities of the current departmental administration. It is possible that the staffing level will be so minimal that the facility will only be useful for providing growth rooms – i.e. so minimal that many of the types of controlled environment experiments that the facility is used for currently could not be performed reliably.

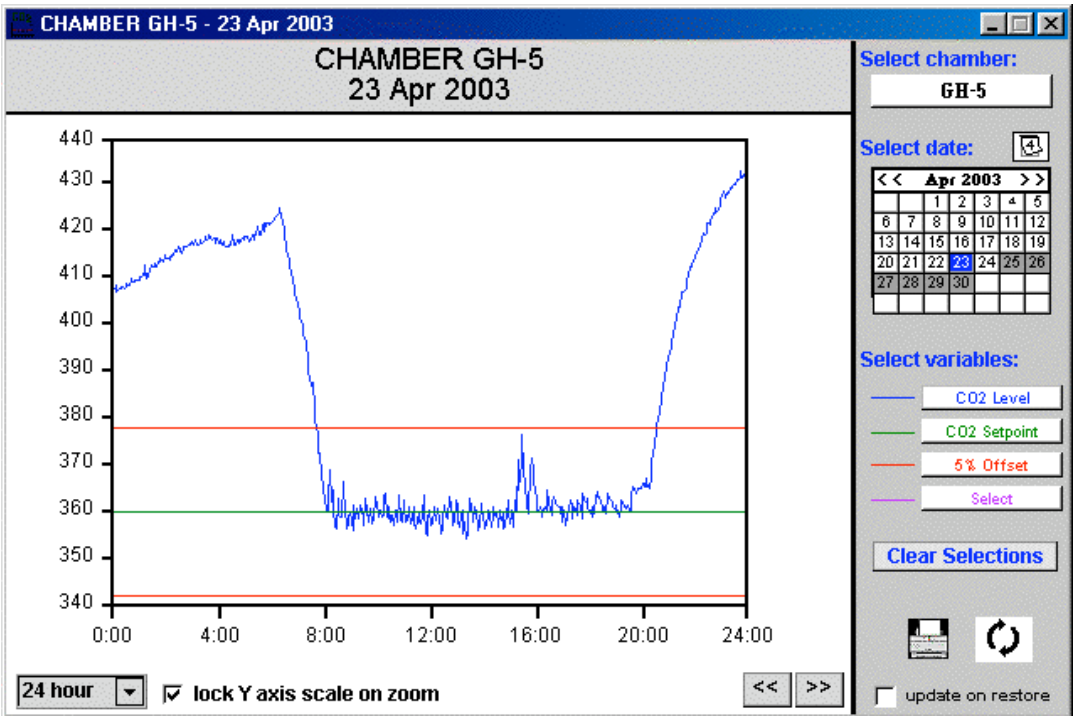
Additionally, a new building – which will house the Duke Chemistry department as well as parts of the Physics, Math, and Biology departments – is being built just south of the Phytotron. Unfortunately, this building will partially shade the Phytotron greenhouses during the morning hours. As part of the overall plan for the new building and allocation of space, much of the lower level of the Phytotron building will be renovated to house Duke's vascular and cryptogamic plant herbaria. Additionally, new departmental research greenhouses will have to be built, as the current greenhouses occupy the new building site. Currently, these new greenhouses as slated to be built adjacent to the Phytotron, and some portions of the lower level of the Phytotron building will be renovated to serve as headhouse space for these greenhouses. If this plan is adopted the new greenhouses will also be significantly shaded by the new building. Needless to say both the Phytotron and greenhouse staffs are actively trying to convince the architects in charge of the building project to find a more suitable site for these greenhouses.

NEW FACILITIES INSTALLED OR PLANNED

No new facilities have been installed in the Phytotron over the past year. However, supplemental lighting was added to two of our greenhouses. Twelve 1000W HPS lamps were mounted in each 525 ft^2 house, adding approximately 300 μmol m^{-2} s^{-1} PAR. This project was partially funded by one of our corporate users so that they could grow corn throughout the winter in these houses.

NEW CONTROL SYSTEMS

A major upgrade of our central CO_2 control system – which controls CO_2 levels in all of our chambers and greenhouses – was completed in 2002. The new system was built by the staff using LabView hardware, and programmed using LabView software. Many NCR-101 members who attended the 2002 annual meeting (hosted by the Duke and NC State Phytotrons) will remember seeing this system, which at that time was still under construction. The system has performed very well – it has not only simplified the process of setting up CO_2 control and data logging, it has also resulted in more precise CO_2 control that our previous system. An example graph of CO_2 in one of our greenhouses is shown below – note that CO_2 is not being controlled at night in this case.



RESEARCH

Over the past two years work has proceeded on establishing a carbon-11 facility in the Phytotron. Carbon-11 tracing – which allows real-time observation of the fate of carbon fixed by plants – is a powerful tool for plant physiologists. There are few places in the world where this technique is available, and no ^{11}C facilities exist in the U.S. The Phytotron is uniquely suited to housing such a facility, because of the presence of excellent plant growth facilities and ready access to a supply of ^{11}C isotope – a combination of conditions that is hard to find elsewhere.

The facility is being established through a partnership between Drs. Chantal Reid (Research Scientist in Biology) and Calvin Howell (Professor of Physics), and in collaboration with Dr. Peter Minchin who ran a similar facility in New Zealand that has recently been shut down. Members of the Phytotron staff have also been instrumental in getting the necessary equipment up and running. Preliminary test runs of the system have yielded promising results; with these as baseline data, the researchers expect to be able to submit a grant in the near future to obtain funds to set up a fully functional ^{11}C facility.

WEB SITE

The Phytotron's web site is **www.biology.duke.edu/phytotron**.

SELECTED PUBLICATIONS

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