Scott Leisner, an associate professor in the Department of Biological Sciences assumed the Directorship of the Plant Science Research Center (PSRC) on July 1, 2007. One of his duties as Director is to provide annual reports of the activities occurring within the UT PSRC. This is Dr. Leisner’s second year as PSRC Director and this report covers PSRC activities occurring from July 1, 2008-June 30, 2009. This report only covers the events occurring during the time mentioned above. For a more detailed history of the PSRC, please see last year’s Annual Report, available on the website at: http://www.utoledo.edu/as/psrc/annual_reports/reports.html. This report is organized into 7 sections. The first section describes the status of the PSRC, in terms of facilities and equipment. The second section provides a history of the events occurring during the designated time period. The third section reports the accomplishments of the PSRC including the academic and other achievements its various members. The fourth section indicates the outreach work that the PSRC has engaged in during this time. The fifth section describes the PSRC budget. The sixth section describes the weaknesses of the PSRC. Finally, the seventh section provides information regarding the future plans for the PSRC.
I. STATUS OF PSRC GROWTH FACILITIES AND EQUIPMENT

The UT-PSRC contains a variety of plant growth facilities as well as other research equipment. The status of these items are described below.

I.A. Plant Growth Facilities

The UT-PSRC contains five 600 square foot greenhouse modules, a large walk-in growth room, and 6 Conviron growth chambers. At this time, all of the greenhouse modules are functional and being used by the various researchers. The ceiling vents leak in the first module, but the rest are fine. In addition, all of the Conviron growth chambers as well as the walk-in growth room are functional and being used as well.

I.B. PSRC Equipment

The PSRC contains several large pieces of laboratory equipment including: a low-speed and high-speed centrifuge, a scintillation counter, a spectrophotometer, a laminar flow hood. All items except the last two are covered by a service contract with the company Technical Alternatives. The spectrophotometer was covered last year, but since it was not used by anyone and several spectrophotometers are available, we chose to not cover this item with a service contract to save money.
II. EVENTS OCCURRING IN THE PSRC 2008-2009

Below is a chronology of the events taking place in the UT PSRC over the past year.

9/18/08    Seventh PSRC Advisory Committee meeting.
10/16/08    Greenhouse/Growth Chamber space requests processed
11/19/08    UT Foundation account set up for PSRC to receive donations.
1/23/09     Eighth PSRC Advisory Committee meeting.
4/15/09     Provide a tour of PSRC greenhouses to Congresswoman Marcy Kaptur.
4/24/09     Ninth PSRC Advisory Committee meeting.
4/30/09     Greenhouse/Growth Chamber space requests processed
5/20/09     Present PSRC research to the Catholic University of Leuven, Belgium
5/28/09     Present and discuss results of the Belgium trip with Drs. Calzonetti, Reid and Krause.
6/3/09      Present PSRC research to Scott’s Corporation.
III. ACCOMPLISHMENTS OF THE PSRC

Over the past year, the PSRC has accomplished a variety of things. For one thing, a rejuvenated image for the PSRC, catalyzed by more direct contact with area growers as well as interactions among plant scientists. The faculty comprising the advisory committee have been very successful, both with respect to their publications (3 submitted, 5 accepted, and 26 manuscripts published) and funding (>$7,260,000.00). Below we describe these achievements.

III.A. Collaboration And Shared Use

As described last year, space allocations within the PSRC are determined by a democratic means. Hence, all members of the PSRC advisory committee participate in deciding growth chamber/greenhouse space, arguably the most important factor in the PSRC. The researchers have embraced these opportunities and are working together as never before, both sharing space and collaborating with each other. These collaborations include intra- and inter-departmental interactions as well as departments interacting with the USDA-ARS.

III.B. Infrastructure

Changes, up-grades, repairs, and personnel all fall under this category.

III.B.1. Greenhouses

The PSRC greenhouses are being maintained and repaired on a regular basis. For example, lights have been cleaned, along with fans and vents. A sump pump had to be replaced for one of the modules, which was accomplished. Hence, the greenhouses are functioning well.

III.B.2. Growth Chambers

Currently all PSRC growth chambers are working as they should. For two of these, we will eventually need to replace the controllers, but at this time, they are functioning properly and are being used. A preventive maintenance schedule has been implemented. Hence, all of the growth chambers are working properly.

III.B.3. PSRC Equipment

All pieces of PSRC major equipment are currently on a service contract to repair them if need be. Thus far, it has been necessary to repair the centrifuges multiple times, so the service contract has paid for itself.

III.C.4. PSRC Personnel

The PSRC Greenhouse Manager (Vera Lynn Biltz) has done a great job taking care of the greenhouses and growth chambers.
III.C.  Education

The PSRC website has been up-dated with a variety of new information including contact information for diagnostic laboratories for identification of problems. In addition, we are almost finished with the PSRC brochure, which will provide additional information on the center to interested parties.

III.D. PSRC Members’ Individual Accomplishments

As reported above, the PSRC members are from a variety of departments and government institutions. Below are described the individual achievements and collaborative efforts in the form of manuscripts and grant funding contributed by PSRC members.

III.D.1.  Department Of Biological Sciences

Two researchers from the Department of Biological Sciences are currently using PSRC facilities: Drs. Gray and Leisner.

III.D.1.a. Dr. John Gray

In the Gray laboratory we currently have two main areas of plant biology research of which the second makes most use of the PSRC resources. I also collaborate with other investigators to provide bioinformatical analysis in their projects.

1: Regulomics in Corn (NSF and OPBC funded). An emerging theme in the regulation of gene expression is the identification of the regulatory networks in which transcription factors (TFs) participate. It is estimated that the number of TFs in maize could be up to 10% of the genome, representing more than 4000. As part of a long-term effort to investigate and understand grass regulatory networks, we have initiated The Grass Transcription Factor ORFeome Project. The aim of this part of the project is to establish a collection of TF ORFs that can be overexpressed for protein production. These proteins will be used to raise antiserum to be employed in developing chromatin-immunoprecipitation (ChIP) techniques aimed at TF target genes in the maize genome, for ChIP experiments aimed at identifying the regulatory targets. In addition information on grass TFs will be mined from databases and used to populate the GRASSIUS database. In the second year of this project we have reached two thirds of our goal for the ORFeome collection. In addition we have overexpressed the DNA binding domain of several proteins for SELEX experiments and generated antibodies for use in the study of negative regulators of lignin metabolism. In the past year a book chapter and a peer reviewed paper have both been published based on this work. In addition we have developed a recommendation for the uniform naming of grass transcription factors and this has been published in the journal Plant Physiology.

2: Nutrient stress in Plants (USDA funded). Nutrient-stressed plants exhibit internal changes prior to the display of visual symptoms (e.g., “Hidden Hunger”). A USDA Specific Cooperative Agreement with two University of Toledo investigators (John Gray, Scott Heckathorn) investigates this phenomenon. In the Gray lab we are using genomic techniques to identify molecular markers of nutrient imbalance.
Monitoring these markers will permit nutrient correction before plants show visual symptoms (and thus help avoid commercial losses). Earlier work defined changing nutrient requirements during *Pelargonium* (geranium) growth and is being used to more carefully define nutrient regimes. Also, we previously identified novel genes whose expression is altered following boron (B) deficiency stress in the model plant *Arabidopsis*. In the past year, we isolated full-length genomic clones of these markers from *Arabidopsis* and from greenhouse geraniums. We demonstrated that some of these markers are induced significantly in response to B deficiency. One of these genes is a novel mitochondrial protein found only in plants, and current work is aimed at identifying its link to B metabolism. Currently Dr. Gray’s laboratory consists of: 1 post-doc, 2 Ph.D. students, 8 undergraduate students and 1 technician.

**Manuscripts**


**Grant Funding**

National Science Foundation, PI: Grotewold, E. (Ohio State University), Co-PIs: Gray, J. (UT) and Dauluri R. (OSU), total: $2,600,000; UT Budget: $701,332; TRPG - The Grass Regulome Initiative: Integrating control of gene expression and agronomic traits across the grasses. 2007-2010.


III.D.1.b. Dr. Scott Leisner

Dr. Leisner is the current PSRC Director and his research examines how plants respond to both heavy metals (copper) and viruses. His work has shown that providing plants with silicon (Si) helps alleviate both types of stress and a main focus of his laboratory is to investigate these phenomena. His laboratory is working on a manuscript describing the alleviating effects of Si on virus infection. He is currently investigating the ability of Si to help plants to deal with copper stress with Jonathan Frantz (see below). His laboratory is also working on a number of other projects. They have determined the complete nucleotide sequence of a virus they discovered at UT and this was written as a manuscript that is currently under review. They completed a project examining Cauliflower mosaic virus protein interactions, which was published. They also are examining the protein interactions of a pair of ornamental plant pathogens, Pelargonium flower break virus and Pelargonium line pattern virus. Finally, a manuscript is currently under review describing a Pelargonium gene implicated in virus resistance. Currently Dr. Leisner’s laboratory consists of: 1 post-doc, 3 Ph.D. students, 2 undergraduate students and 1 technician.

Manuscripts
J. He, J. Gray, and S. Leisner A Pelargonium ARGONAUTE4 Gene Shows Tissue-Specific Expression And Differences In RNA And Protein Levels. Submitted to Journal of Plant Physiology.

Grant Funding
III.D.2. Department Of Environmental Sciences

Three researchers from the Department of Environmental Sciences are currently using PSRC facilities: Drs. Dwyer, Heckathorn and Weintraub.

III.D.2.a. Dr. Daryl Dwyer

The Environmental Remediation and Restoration Laboratory is under the direction of Daryl F. Dwyer, Associate Professor in the Department of Environmental Sciences and Director of the Stranahan Arboretum. Research projects focus on the interactions of soil, water, microorganisms and plants for the purpose of remediating our environment, mitigating pollution, and restoring degraded sites, ideally by incorporating native plants. Current projects are fairly applied in scope and focus on the design of:

1. Treatment wetlands with native plants to extract arsenic from contaminated soil and groundwater;
2. Treatment wetlands to decrease fecal contamination and nutrient loads to Maumee Bay to protect the recreational beaches of Maumee Bay State Park;
3. Evapo-transpiration covers that utilize native plants to control leachate formation for older, regional landfills that exist within the Oak Openings area.

Currently, Dr Dwyer’s laboratory consists of: 4 technicians, as well as 2 Ph.D., 2 M.S. and 5 undergraduate students.

Manuscripts


Grant Funding


U.S. Department of Agriculture, Dwyer, D.F., $504,504; Lake Erie wetlands and shoreline restoration: MBSP phytoremediation. 2009-2011

III.D.2.b. Dr. Scott Heckathorn

Dr. Heckathorn’s research is focused on plant, and more recently algal, ecological physiology and biochemistry, stress physiology and stress proteins (especially heat-shock proteins, or HSPs), photosynthesis and respiration, and nutrient relations. Most of the current and recent research is focused on the following on-going projects:

1. Effects of environmental factors associated with global environmental change (e.g., CO$_2$, nitrogen, mean temperature) on tolerance and adaptations of plants to acute heat stress [with particular focus on photosynthesis and HSPs, plant productivity, and community composition];
2. The patterns, functional consequences, and causes of natural variation in protection of metabolism by small HSPs;
3. Micro-nutrient (especially boron) deficiency and toxicity effects on physiology and protein expression in plants;
4. The causes of Microcystis cyanobacterial blooms in western Lake Erie; and
5. The feasibility of using Lake Erie algae for bio-fuel production.

Currently Dr. Heckathorn’s laboratory consists of: 1 post-doc, 1 Ph.D., and 2 M.S. students, as well as a co-advised M.S. student with Dr. Tom Bridgeman.

Manuscripts


Grant Funding

III.D.2.c. Dr. Michael Weintraub
Global climate change, nutrient deposition, changes in plant community composition, increases in atmospheric CO2 concentrations, and other disturbances all have the potential to alter important ecosystem properties such as nutrient availability to both plants and soil microbes, soil organic matter (SOM) decomposition rates, and the quantity and quality of carbon (C) inputs to the soil. However, in many cases we don’t understand the mechanisms underlying important ecosystem processes well enough to predict the effects of disturbances. Since soil microorganisms mediate C and nutrient fluxes, we need a better understanding of their role in regulating biogeochemical processes in order to predict how ecosystems will respond to changes. In an effort to improve our understanding of how ecosystems function and predict their responses to disturbances, my goal is to gain insight into the controls on soil nutrient dynamics and SOM decomposition by linking the ecology of soil microorganisms to ecosystem processes. In addition to his research, Dr. Weintraub has also established connections with the UT Garden Steering Committee and is the chair of the Research Subcommittee of the Native Plant Working Group. Dr. Weintraub’s laboratory currently contains: 1 Ph.D., 2 M.S., and 2 undergraduate students. In addition to his research, Dr. Weintraub also has connections with the University of Toledo Garden. In this capacity, Dr. Weintraub used the PSRC facilities to raise plants from seeds to plant in the UT Garden.

Manuscripts


\textbf{Grant Funding}


\textbf{III.D.2. Other Researchers}

In addition to the personnel described above several other scientists are also using the PSRC facilities for a more limited period of time. Those researchers are listed below with a short description of what they are doing.

\textbf{III.D.2.a. Tom Bridgeman.} Dr. Bridgeman, of the Department of Environmental Sciences, is working in collaboration with Dr. Scott Heckathorn studying Lake Erie algae.

\textbf{III.D.2.b. Hans Gottgens.} Dr. Gottgens, of the Department of Environmental Sciences, is working on phytoremediation of soils by wetland plants.

\textbf{III.D.2.c. Daryl Moorhead.} Dr. Moorhead, of the Department of Environmental Sciences, used the PSRC to propagate plants for his ecology class to show allelopathic effects.

\textbf{III.D.3. USDA-ARS}

Three researchers from the USDA-ARS are currently using PSRC facilities: Drs. Frantz, Krause and Locke.

\textbf{III.D.3.a. Dr. Jonathan Frantz}

Dr. Frantz’s research mainly focuses on plant nutrition, and primary activities consist of running a plant analysis laboratory. Over 15,000 samples were analyzed during the last 12 months. We also continue to develop the decision support software
Virtual Grower, with over 6,000 copies distributed worldwide. A collaborative project continued with Dr. Scott Leisner and his laboratory that investigated the interactive effects of Si and Cu toxicity in zinnia. Another collaborative project continued with Drs. Gray and Heckathorn in which geranium exposed to boron stress is exposed to high and low light, and high and low CO2 to examine how the plant responds and interacts with carbon supply. There have been several studies investigating the potential interaction of phosphorus supply with geranium’s susceptibility to the root pathogen *Pythium ultimum*. A cellulose polymer to be used as a potential substrate for containerized production was tested for it’s stability after natural microbial colonies were allowed to develop. Finally, a series of studies began in collaboration with Dr. Locke and other ARS scientists (off-location) investigating the potential for biofuel crops switchgrass and poplar to be used as substrate components. Dr. Frantz’s laboratory currently consists of 1 student worker and 3 full-time technicians.

**Manuscripts**


### III.D.3.b. Dr. Charles Krause

Major personal research focuses on formulating theories of phylloplane interactions between plant pathogens, host cuticular structures and pesticide residue with either on-farm or laboratory. Current and projected long-term efforts involve discovering alternatives to conventional fungicides for control of diseases of floral and nursery crops. Other research focuses on comparison of various delivery systems and their impact on improved disease management. Teaching is limited to graduate ultrastructural and cytological instruction and guest lectures are presented as requested. Extension is on behalf of the USDA, ARS, Application Technology Research Unit/OSUE, and ENLTT technology transfer activities. Service activities include: 1) Cooperation with faculty from Plant Pathology, MCIC and other OARDC departments providing assistance in light and electron microscopy and video digital imaging; 2) Membership in APS; 3) UT ARS liaison committee for implementing the Ornamental Plant Germplasm Center (OPGC), Columbus Campus.

### Manuscripts


III.D.3.c. Dr. James Locke

Dr. Locke’s research program is focused on the development of innovative approaches to reduce disease losses in greenhouse floricultural crop production. His current research involves: 1) the potential role of silicon in reducing biotic and abiotic stress on floricultural crops, 2) the evaluation of alternative substrate materials to reduce the dependency on peat moss, and 3) the interaction of fungal pathogens with plant nutrition. His laboratory uses the facilities of the PSRC to propagate and maintain test plant materials, to evaluate the uptake and accumulation of silicon in crops utilizing hydroponic culture, to monitor various delivery systems to supply silicon to selected “accumulator” species through root uptake from various silicon sources growing under greenhouse conditions, to determine the phosphorus x Pythium ultimum interaction in seed geranium, and to evaluate the horticultural acceptability of selected potted flowering crops grown in alternative substrates. His laboratory currently consists of a post doc and a technician.

Manuscripts
IV. PSRC OUTREACH WORK

The PSRC has engaged the stakeholder community. This engagement has taken many forms (described below) that are grouped together into 3 major categories: Groups; Educational Resources and Foreign and Domestic Relations. These interactions are described below. Other interactions not listed here have also been carried out.

IV.A. Groups

The PSRC is working with two major groups. The Maumee Valley Grower’s Association (MVGA) and the Native Plants Working Group (NPWG). Several members of the PSRC advisory board regularly attend monthly meetings with the MVGA. During these meetings, the PSRC members learn about problems that the growers face and develop strategies to deal with these issues. Several members of the PSRC advisory committee also serve on the NPWG. The function of the NPWG is to promote awareness and sales of native plants, to help generate a more natural local landscape. Dr. Weintraub is the leader of the Research sub-committee and Dr. Leisner also serves on that committee.

IV.B. Educational Resources

To aid local stakeholders, the PSRC has provided a variety of informational resources to help them make more effective decisions for growing their plants. Information is only useful, if it is accessible and can be understood. Therefore, the PSRC has made several efforts provide information that fulfills these two criteria. We have further updated the PSRC website to include useful grower information, like diagnostic laboratories where they can send samples for analysis. In addition, a new version of the Virtual Grower program developed by Jonathan Frantz’s (USDA-ARS and a member of the PSRC advisory committee) laboratory has been recently released.

IV.C. Foreign and Domestic Relations

From May 18-24, Drs. Leisner and Krause visited Belgium. They attended a research conference on plant protection. In addition to that, they visited a number of growers and most importantly, made a number of contacts. Most interestingly, they presented talks to the Catholic University of Leuven (KULA) to set up collaborations among the two institutions, KULA and the University of Toledo. It looks like this will become a fruitful relationship between the two universities. On the domestic side, Drs. Leisner and Krause also presented work they were doing to the Scotts Corporation on June 3, 2009. Drs. Heckathorn, Gray, and Bossenbroek described their work as well. This resulted in an invitation to visit their Merrysville, OH facility later in the summer.
V. PSRC BUDGET EXPENDITURES

The PSRC requires a budget for a variety of items including: pesticides, parts and supplies, service and licenses/education. The important part of the budget is the salary for an excellent greenhouse manager. Note, I may have missed a few items on this budget.

V.A. Salary For Greenhouse Manager
These costs were used to pay the salary of the greenhouse manager:

V.B. Pesticide Costs
These funds are to pay for the pesticides used to control problems in PSRC greenhouses and growth chambers.

<table>
<thead>
<tr>
<th>Date</th>
<th>Cost</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/22/09</td>
<td>$153.04</td>
<td>Waldo</td>
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<tr>
<td>Total Cost:</td>
<td>$153.04</td>
<td></td>
</tr>
</tbody>
</table>

V.C. Parts And Supplies
These costs were used to pay for the parts necessary to repair the PSRC greenhouses and growth chambers. Please note, phone costs (6/9/09) are being disputed.

<table>
<thead>
<tr>
<th>Date</th>
<th>Cost</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/2/08</td>
<td>$485.00</td>
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<td>7/11/08</td>
<td>$12.89</td>
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<tr>
<td>7/26/08</td>
<td>$103.59</td>
<td>Water Solutions</td>
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<td>8/7/08</td>
<td>$43.90</td>
<td>Menards</td>
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<td>8/11/08</td>
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<td>8/22/08</td>
<td>$16.88</td>
<td>Lowes</td>
</tr>
<tr>
<td>8/25/08</td>
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<td>Conviron</td>
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<td>11/20/08</td>
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<tr>
<td>8/28/08</td>
<td>-$500.00 (credit)</td>
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<td>6/9/09</td>
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<tr>
<td>Total Cost:</td>
<td>$6,590.03</td>
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</table>
V.D. Service Costs
These are the costs to pay for the repairs done by non-UT personnel. The largest portion of this is to pay for a service contract for PSRC equipment.

<table>
<thead>
<tr>
<th>Date</th>
<th>Cost</th>
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</thead>
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<tr>
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<td>M &amp; M</td>
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<td>11/25/08</td>
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<td>M &amp; M</td>
</tr>
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<td>12/17/08</td>
<td>$150.00</td>
<td>M &amp; M</td>
</tr>
<tr>
<td>2/10/09</td>
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<td>3/18/09</td>
<td>$461.25</td>
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</tr>
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<td><strong>Total Cost:</strong></td>
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<td></td>
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</tbody>
</table>

V.E. Licenses/Education
These are the costs to pay for our Greenhouse Manager to renew her Pesticide Applicator’s License.

<table>
<thead>
<tr>
<th>Date</th>
<th>Cost</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/28/08</td>
<td>$35.00</td>
<td>Ohio Dept. Agri.</td>
</tr>
<tr>
<td><strong>Total Cost:</strong></td>
<td><strong>$35.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

V.H. Total Costs
Taken together, the total costs for the PSRC over the past year (excluding the Greenhouse Manager salary and fringe benefits) are: $13,004.32
VI. WEAKNESSES OF THE PSRC

As described last year, the weaknesses of the PSRC are in the areas of funding, and expansion (described below).

VI.A. Funding

Over the past year, we have established an UT Foundation account for external donors to provide funds. While this is useful, it is far from what the PSRC needs to run its daily operations. The electronics for all of the greenhouse modules need to be upgraded. The total cost for the upgrade is approximately $15,000.00. Therefore, instead of doing this all at once, we have chosen to do this over a period of several years. However, before this can be done, it is first necessary to run new wiring from each of the modules to the central computer. The UT Plant Operations personnel have just completed this, so we can now begin replacement of the circuit boards in the greenhouse control panels. We have purchased enough circuit boards to upgrade the first module. In addition, the controllers for two of the growth chambers contain internal batteries. These chambers are functioning correctly now, but if we have a power failure or someone shuts off power to the chambers, the circuit board will be destroyed. We have upgraded the remaining chambers in the PSRC so they do not have this problem. To complete upgrades for the remaining two chambers, approximately $3,200.00 will be required.

VI.B. Expansion

It is anticipated that plant science on the UT campus will grow. This means that collaborations among plant researchers will expand, and hopefully, additional new faculty performing research in plant sciences will be hired. This means that space such as greenhouse or growth chamber space eventually will need to expand. To accommodate this increase in activity, it would be helpful if additional greenhouses could be built for the PSRC. The PSRC greenhouses are located on the East side of the 4th floor of Wolfe Hall. Interestingly, the West side of the 4th floor of Wolfe Hall has been prepared for greenhouse construction, but no greenhouses have been erected nor are they currently planned in the near future. Due to shading effects, it would be possible to erect 3 new greenhouses on this part of the building. This would increase PSRC greenhouse space by 60%.

Dr. Daryl Dwyer currently does not have real lab space on UT Main Campus. To permit Dr Dwyer to have lab space on Main Campus, He has been assigned WO 4276. Unfortunately, this room contains the PSRC growth chambers, which we would like to move into and set up in WO 4225. Furthermore, WO 4276 is currently not organized well for research space. Therefore, both WO 4276 and WO 4225 would require some renovations.
VII. FUTURE PLANS FOR THE PSRC

Ohio is a state rich in agriculture and The University of Toledo is located within the heart of the ornamental plant industry. Therefore, the PSRC is in the optimal location to aid the Ohio economy and increase crop productivity. The PSRC’s interactions with growers are strengthening and the research that they are doing will benefit both the stakeholders and society as a whole. Therefore, plant science will flourish here at UT. To enhance plant science on the UT campus, we describe where we believe things need to go below.

VII.A. Faculty

As should be obvious by Section III above, the PSRC scientists have been successful in their research endeavors. To enhance this productivity, it would be best to hire additional faculty performing plant science research. These faculty would increase the level of plant research occurring at the PSRC, expand our visibility (next section), enhance collaborations among PSRC researchers and permit more effective competition for larger grants. New faculty, because of the research they perform would generate new information regarding the plant sciences, but they would do it at a place where plant scientists have already been successful. This means that the new researchers would take less time to get set up and could be productive earlier. These faculty could also help fill in the gaps in research areas that would permit larger, more inclusive grants to be more effectively applied for.

VII.B. Visibility

As additional faculty are hired and those already present continue to do excellent research, the PSRC will gain notoriety. This will aid in the recruitment of additional faculty as well as students, both graduate and undergraduate. One particular problem that plant scientists face at the University of Toledo is to recruit students. The large majority of Biology majors are not as interested in the plant sciences as they are in medical research, which can be challenging at times to faculty to recruit students for plant work. To address this problem, the PSRC Advisory Committee, in discussions with Dr. Geoffrey Martin, came up with the idea of a Concentration in Plant Science. This Concentration would span the Department of Biological Sciences and The Department of Environmental Sciences. Brief discussions with the Chairs of both departments were encouraging and so we are now in the process of developing this concentration.

To aid us in increasing our visibility, we are working on a brochure. The brochure is nearly done. When finished, it will provide basic information on the PSRC to interested parties. This will also be useful for generating interactions with other Universities and with industry.

As described previously, the Belgian University KULA, is interested in pursuing interactions with UT. Likewise, Scotts Corporation has shown interest in our programs and in possibly developing an internship program for students. It is our goal to foster these interactions, which will further enhance PSRC functions. In an effort to strengthen the interactions with Scotts Corporation, we will be visiting their Merrysville, OH location in July.
VII.D. USDA Involvement

There is no way that the PSRC would be as successful as it has been if it were not for the assistance of the US Department of Agriculture-Agricultural Research Service (USDA-ARS). The USDA-ARS has helped in so many ways it is hard to enumerate them all. As plant science grows on the UT campus, the number of faculty performing this work will also increase. However, laboratory space at the University of Toledo is limited. In addition, it is critical to have additional laboratory space for visiting scientists. This is important because as our reputation as a Plant Science program grows, it is expected that other researchers in this field will want to come to UT for things like sabbaticals, or workshops. Finally, it is critical to also permit growers access to the researchers and their work. In the current climate, this is challenging and somewhat problematic, especially where parking is concerned. The most useful solution to these problems would be the construction of a dedicated Plant Science building. The new building would house researchers from both UT and USDA-ARS. It would provide lab space, and additional lab space for outside researchers to work. It would also be a landmark for growers to visit so they could easily follow plant science research occurring at the UT. Therefore, the PSRC completely supports the development of this building and will help however possible.