

# PLANT SCIENCE SAYS



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The Department of Plant Sciences and Plant Pathology

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## **The Curse of the Colonel By Luther Talbert**

I recently spent several days in Korea and Japan with a team of US wheat workers discussing issues associated with hard red spring wheat. Asian countries are primary importers of spring and winter wheat produced in Montana. A farmer-funded group called US Wheat Associates is devoted to marketing US wheat to overseas customers. The marketing effort includes visits to importing countries, where technical staff, managers, and executives of grain importers, mills and bakeries meet with US wheat workers. The goal of the meetings is to insure that grain exported from the US meets the needs of these important customers.

It is always quickly apparent that the Asian participants in our meetings are not there to dispense platitudes and congratulate the U.S. group for their efforts. US wheat is extremely important to them, and they have issues that they would like the US group to address. The genetic attributes of Montana varieties have a major impact on their bread industry. For instance, a significant percentage of the flour in a slice of bread from Korea or Japan is the MSU variety 'Vida'. Setting quality goals is quite difficult, as every country has different expectations, and even within a country, a desirable trait for the milling industry is often undesirable for the baking industry. Thus, it is safe to say that it is not possible to please everyone. My impression is that displeasure is expressed differently than is typical in the U.S. For instance, a memorable Japanese executive is able to combine politeness with sarcasm in a uniquely effective manner. ("Dr. Talbert, I sincerely congratulate you on your ability to recognize the serious defect we have identified in your new wheat variety."). However, all in all, the impression of our group was that most of the Koreans and Japanese were relatively pleased with the quality of the hard red spring wheat crop over the past few years. Some of the issues

that they had raised in past years have been addressed through the selection efforts of the breeding programs. Other issues remain and new ones have arisen, thus Deanna, Jackie, and Harvey in the Cereal Quality Lab still have plenty of work to do.

Business meetings with the Japanese and Koreans are very formal. Social events at the close of the day are more relaxed. The high alcohol content of soju in Korea and sake in Japan had the welcome effect of steering the conversation away from topics such as 'water absorption of hard red spring flour' (boring!) to topics such as 'baseball in Asia versus the US' (interesting!). We discussed over dinner the 'curse of the Colonel' that befell a local professional baseball team. A team celebration many years ago involved an abusive act directed at the Kentucky Fried Chicken icon. The motivation for this regrettable incident was not clear, though there was general agreement that sake was somehow involved. The team has subsequently suffered losing season after losing season, a similar story to the 'curse of the Bambino' that befell the Boston Red Sox for many years.

It is humbling and inspiring, as well as a bit exhausting, to visit Asian end-users of the wheat varieties developed here at MSU. Montana is one of many potential sources for buyers of wheat, and these visits help insure that we make the right choices as we seek to develop a competitive product.

## **2015 Beekeeping Workshop By Ruth O'Neill**

Colony collapse disorder has generated significant public interest in beekeeping and bee conservation producing a demand for extension education provided to beginning beekeepers. To continue to meet this need Kevin Wanner's lab again hosted the annual "Beekeeping Workshop for Beginners" held on campus Saturday, February 21<sup>st</sup>, at the Burns Technology Center. Enrollment in past workshops was capped at 40 students, but a



growing waiting list (some people had been waiting for three years to enroll!) convinced us to increase the size of the class to 100 students. One hundred new and prospective beekeepers enrolled two weeks before the date of the workshop! We were surprised to see such a broad audience with more than 20 counties across Montana represented.

The workshop includes information on how to purchase bees and equipment, how to introduce a new package of bees to a hive, yearly hive maintenance, and honey harvest. Rick Molenda, from Western Bee Supply, set up a very nice trade booth in the hallway, where people could ask practical beekeeping questions, and look over beekeeping equipment and reference books during breaks. Many people ordered their equipment ahead of



*Rick Molenda gives a hands-on equipment demonstration*

time to save on shipping costs, so the hallway was jam-packed with boxes ready for pick-up. Many thanks to Rick for offering over a dozen door prizes including two \$75 gift certificates, and one complete hobby hive kit. Thanks also to Laurie Kerzicnik, Amy Dolan, and Ed Sanders for staying all day to help out.

The morning session started off with an introductory talk on the biology of



*Participants of the 2015 Beekeeping Workshop*

honey bees by Kevin Wanner, followed by Ruth O'Neill, presenting on hive establishment and maintenance over the course of a year. Rick Molenda gave a hands-on demonstration of hive components and beekeeping equipment like smokers and bee veils. After the lunch break, Ruth gave a summary of management



*Kiawe honey is naturally white, with a minty undertaste*

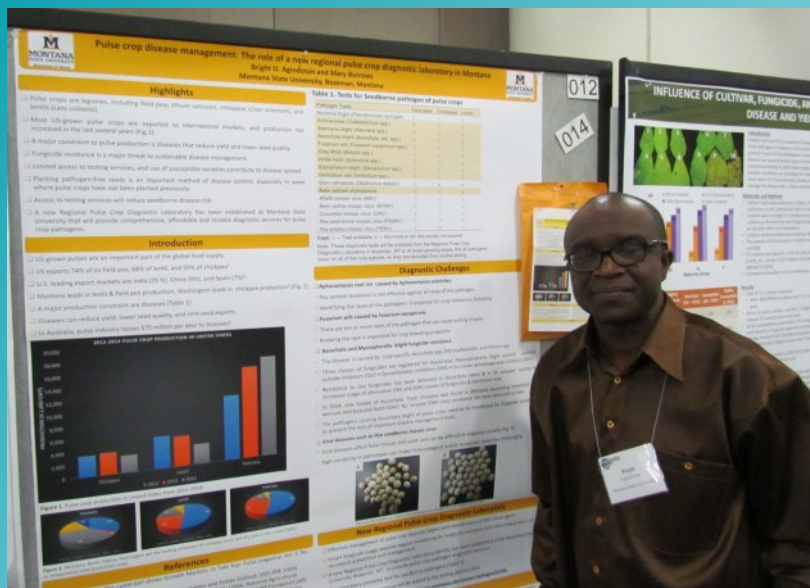
practices for the control of diseases and pest of honey bees, including *Varroa* mite, a nasty external parasite of bee brood. After the final talk, David Baumbauer (PGC Manager) gave a demonstration explaining how to harvest wax and make beeswax candles, which included a lot of candle giveaways. At the end of the day, people gathered in the lobby area to sample varietal honeys with crackers and butter. Varietal honeys are unique-tasting monofloral honeys, each type made with nectar collected from a single plant species. This year we offered tupelo honey from Florida, rapeseed honey from Germany, leatherwood honey from Tasmania, kiawe honey from Hawaii, and a few other varieties.

### **It Takes a Pest to Control a Pest, and More: The 2015 IPM Conference Report By Bright Agindotan**

The 8<sup>th</sup> International Integrated Management Symposium themed: "IPM: Solutions for a Changing World" was held in Salt Lake City, Utah, from March 23 – 26, 2015. The symposium provided opportunities to network and discuss recent trends, challenges, and opportunities in the area of integrated pest management (IPM). The program included plenary speakers, concurrent sessions, poster sessions, professional development workshops, and roundtable discussions. As the manager of the recently established Regional Pulse Crop Diagnostic Laboratory at MSU, I advertised our services through a poster I presented. Below are the highlights of the sessions I attended.

The first plenary session presentation, "Integrated Pest Management on a Hotter, Flatter, More Crowded Earth", was





Bright Agindotan presenting his poster at the 2015 International Integrated Pest Management Conference, Salt Lake City, Utah.

presented on behalf of Dr. Sonny Ramaswamy, the Director of USDA's National Institute for Food and Agriculture (USDA-NIFA), by Dr. Parag Chitnis, the deputy director USDA-NIFA. He spoke on the challenges associated with the projected global population of nine billion by 2050, which included feeding, clothing and sheltering that population in an environmentally friendly manner. One of the ways he suggested for tackling these challenges is to reduce pre-harvest and post-harvest losses, each accounting for 50% of the losses in developing and developed world's harvest, respectively. He also suggested integrated pest management approaches that include new technologies, such as robotics, sensors, and synthetic biology, to detect, control and prevent pathogens and pests. As part of integrated pest management, he stressed the role of monitoring and surveillance. He concluded that tried and tested practices, combined with new technologies, should be creatively applied to agriculture to help provide safe, healthy and abundant food supply and meet the challenges of a rising global population.

The second planetary session titled "Herbicide Resistance — A Wicked problem" was presented by Dr. David R. Shaw, Vice President for Research and Economic Development, Mississippi State University. He warned of the consequences if the increasing global incidences and severity of herbicide resistance is not proactively managed. He was worried about the increasing acres infected with glyphosate resistance in wheat, corn, rice and soybean, and the fact that

Poaceae and the Astraceae are leading in weed resistance. He restated a known fact that the spread of weed resistance is a consequence of repeated use of herbicides with the same mechanism of action. He lamented that although weed management professionals understand the cause of resistance and many of the management practices that can prevent it, herbicide resistance is still on the rise. Surmising that herbicide resistance evolution is a biology, technology and human problem that needs to be tackled holistically, he urged all stakeholders to collaborate with each other and take ownership for finding innovative solutions to the problems. Finally, he emphasized the need for innovative solutions by quoting Albert Einstein's definition of insanity, "Doing the same thing over and over and expecting different results".

There were many interesting presentations during the concurrent sessions as well. In the presentation titled: "Pest management Partnerships for Food Safety Success", James Sargent, Copesan Services, Menomonee Falls, Wisconsin, warned that pest management companies that food companies contract to provide pest management services cannot do it alone and that pest management requires commitment and participation by the client as well. He stated that the client has major responsibilities for structural integrity and exclusion, maintenance, cleaning and sanitation, drainage, lighting, landscaping, employee behavior, and other important components of a successful IPM program to keep pests away and food safe. He emphasized the importance of partnership.

Another presentation entitled "Integrated management of Asian citrus psyllid" was presented by Jawwad Qureshi, University of Florida-IFAS". Dr. Qureshi warned that the Asian citrus psyllid (ACP) is a threat to citrus production throughout Asia and the Americas, and it is a vector of huanglongbing (HLB) or citrus greening disease. He stated that biocontrol agents such as the stingless wasp (*Tamarixia radiate*), are a natural predator of the Asian citrus psyllid, and it can help lower populations of this pest, thereby protecting citrus trees; however, it is inadequate alone. He suggested including cultural controls such as mulch for young trees and enhanced nutrition to mitigate HLB symptoms. He stated the limitation of insecticidal control: It is only effective at different life stages thus requiring repeated applications which is a challenge. He cautioned that for synergistic



effects, pesticides used must be compatible with biocontrol agents and cultural practices.

Lastly, there were several presentations on the application of nematodes as biocontrol agents. Three of the presentations will be summarized. In his presentation: "Entomopathogenic Nematodes: A Tool In Integrated Pest Management Systems", Dr. Parwinder Grewal, OARDC, Ohio State University, affirmed that entomopathogenic nematodes (EPNs) have been shown to be effective against nearly 200 pest species under field conditions. He highlighted the advantages of EPN as biocontrol agents, which include broad host range and the ability to seek and kill insects in soil and in hidden habitats including roots and tree trunks, where most chemical pesticides fail to reach. Other advantages include ease of application and the very important ability of EPNs to boost plant immunity against a broad spectrum of pests and pathogens.

"Mass application of entomopathogenic nematodes prevented an outbreak of the pine defoliating sawfly *Acantholyda posticalis* in Finland" was presented by Heikki M. T. Hokkanen, University of Helsinki, Finland. He used *Steinernema feltiae* at the rate of 0.4 million IJ/m<sup>2</sup> to effectively control the sawflies and protect the pine forest. Sawfly is a ubiquitous pine defoliator, which occurs throughout Asia and Western Europe.

Other successful applications of entomopathogenic nematodes include 80% reduction in damage to the roots after application of *Heterohabditis bacteriophora* to control white grubs of *Maladera matrida*. The grubs cause substantial damage of ornamentals, peanuts and sweet potatoes (Dr. Itamar Glazer, The Volcanic Center, University of California at Santa Barbara). Good results were achieved when *Steinernema feltiae* was used to control fungus gnats and suppress western flower thrips.

In summary, the conference converged on the fact that it takes a pest to control a pest, and other measures — that is, a holistic approach in an environmentally friendly manner.

### **Bark Beetle Workshop By Laurie Kerzicnik**



I attended a bark and ambrosia beetle workshop in Salem, Oregon March 2-6. It was hosted by Jim Labonte (Oregon Department of Agriculture) and Sarah Smith (Michigan State University). There were 26 participants,

representing the US Forest Service, APHIS, and extension from many different states. These beetles are difficult to identify, so the workshop was key to work with representative samples and bark beetle specialists. Each day we had instruction followed by several hours under the microscope to identify the beetles. Both of the instructors provided us with great keys, screening aids, and tips to help in the future. Salem was also unseasonably warm with magnolias in bloom much earlier than usual!

### **Not so Freaky Eight-leggers By Laurie Kerzicnik**

The Bozeman Public Library is hosting a Spider Display through April 12. The fear of spiders has spread through unrealistic and exaggerated movies such as [Eight-Legged Freaks](#) and [Arachnophobia](#). To reduce fears, resolve myths, and promote their beneficial role in the environment, I am running a spider display at the Bozeman Public Library with the help of Cindy Christin, Supervisor of Children's Services. The display is just outside the Children's center and is geared toward kids and adults. There are live tarantulas and spiders, spiders from Montana, and several facts about spiders in our state.

The display has sparked a lot of conversation! During the first week of the display, I brought the tarantula to story time for some of the younger children. Since they are at a formative age, this was a good educational opportunity for them. I also had the children suggest names for the tarantula, and her new name is "Tickle Toes". Tickle Toes also made the news that



*Spider display at the Bozeman Public Library.*



night. The display is up all hours that the library is open.

### **Vipan Awarded Scholarship**

Vipan Kumar, a Ph.D. graduate student (Major advisor: Dr. Prashant Jha) in the department of Plant Science and Plant Pathology, has recently received the Elena Sanchez Memorial Outstanding Student Scholarship at the Western Society of Weed Science (WSWS) conference. The WSWS conference was held from March 9-12 at Portland, OR this year. Kumar is one of the three graduate student winners who have been awarded scholarships this year. The scholarship prize is comprised of a certificate and \$1000 check.



**Left to Right:** Dr. Drew Lyon, President-Western Society of Weed Science; Kelli Belmont, Graduate Student-University of Idaho; Breanne Tidemann, Graduate Student-University of Alberta and Vipan Kumar, Graduate Student-Montana State University.

### **New Employees GunNam Na (Chaofu Lu)**



My name is GunNam Na and I am originally from South Korea. I am a new Post-doc working with Dr. Chaofu Lu, and I conduct research related to understanding the biosynthesis of seed oils and developing an economical oilseed crop.

I moved to Bozeman a month ago and my first impression of Bozeman and Montana was that it is a beautiful place to live. And, of course, there are friendly people and there is clean air!

I received my Ph.D. from Purdue University under the guidance of Dr. David E. Salt and I completed my first Post-doc under the advice of Dr. Jody Banks of Purdue University. During the course of my Ph.D. and Post-doc research, I

focused on two main projects: enzymatic characterization of sulfur assimilation-related enzymes and understanding the heavy metal accumulation mechanism in plants.

I am excited to work with the great people at Montana State University and look forward to interacting with Plant Science and Plant Pathology faculty, staff and students.

### **Course Focus HORT 105 Miracle Growing: An Introduction to Horticulture By Tracy Dougher**



**Format:** This course is taught in an entirely flipped format. Students work through a series of exercises and quizzes online before attending class. The class meets once a week and spends two hours working through several stations that test their abilities and

knowledge of the online material. One station is always devoted to answering questions about the online exercises.

**Content:** Is it really a miracle that plants will grow better if you put fertilizer on them? Students get their hands dirty in an effort to explore the myths and realities behind the horticultural industry touting better plants through growth-enhancing products. We first explore the five environmental factors affecting plant growth: light, water, temperature, gas exchange, and nutrients, and tie them to the three basic plant processes: photosynthesis, respiration, and transpiration. A semester-long project is growing plants in 'high' and 'low' conditions for each of the five environmental factors (for example, low and high water). Students keep a journal of their observations, as well as charting the growth of the plants. Students are always surprised that plants can look healthy and normal with sub-optimal environmental conditions, but optimal conditions can make a HUGE difference in the pace of development and growth. This project results in poinsettia plants for the winter COA graduation ceremony.

Students also explore horticultural careers in two ways. Individually, they are required to interview an owner or employee in the



horticulture industry. For the final exam industry leaders are invited into the classroom for a Career Fair and share their experiences or provide some hands-on training on an aspect of their industry.

The last facet of Miracle Growing is the exploration of current issues in horticulture. This year students worked on a project entitled 'Two Sides'. Students were surveyed at the beginning of the semester for their opinions on current issues in horticulture, such as 'organic food is more nutritious' and 'greenwalls are environmentally friendly'. Students were assigned a topic and asked to research a position that agreed or disagreed with the topic (they were generally assigned the opposite of what they indicated on the survey). The project included searching first the mass media of the internet and then digging through those websites to find references to scientific literature to back up their claims. Students presented the scientific literature in class to kick off discussion on these topics.

Students who bring in current horticulture issues articles (last 3 months) or horticultural personal experiences earn points toward 'Grade Insurance'. While a small percent of their grade, the experiences and articles spur discussion at the beginning of class. On many occasions, it has helped to illustrate the topics we are working on that week with the intention of helping students make a connection to their own experiences.

### **Montana Ag Live April Shows**

April 12 — Joseph Janzen, MSU Ag. Economist, will help us understand grain marketing strategies and factors affecting long term commodity prices.

April 19 — Dr. Charles Boyer, MSU's new Vice President for Agriculture and Dean of the College of Agriculture, will discuss MSU's role in the future of Montana agriculture, the state's most important industry.

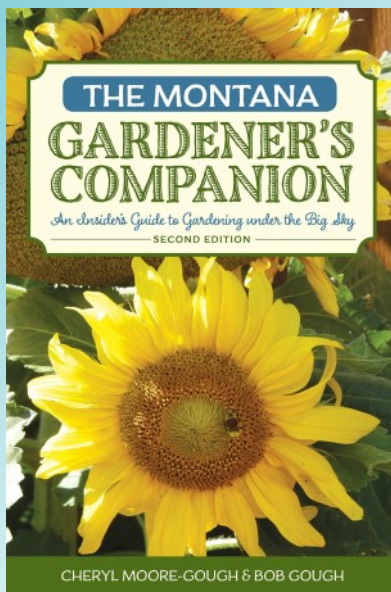
April 26 — Bob Peterson, MSU entomologist and risk assessment specialist, will discuss the risks associated with mosquitoes, West Nile virus, pesticides, and genetically engineered crops.

### **Invited Talks**

Florence Dunkel, 1 hour invited conference presentation for the 28th Annual Southern California Food Industry Conference on Labels, Regulations, and Consumer Expectations. 4/4/15.

Dunkel, Florence, seminar for the MSU Institute of Ecosystems Rough Cut Seminar Series. 2/25/15.

### **Gardening Under the Big Sky By Cheryl Moore Gough**



*The Montana Gardener's Companion*, 2nd edition, will hit bookstands April 1. Dr. Bob and I wrote the first edition in 2007, before his cancer was diagnosed, and it was released in 2008. It was the second popular press book we enjoyed writing together.

According to Globe Pequot's press release, "*The*

*Montana Gardener's Companion, second edition*, is the only guide devoted to the challenges of cultivating a successful garden in Big Sky Country. Whether you are an experienced green thumb or a curious novice living in the Northern Rockies or the Northern Great Plains, this easy-to-understand guide, updated for 2015, will help you grow tasty vegetables, abundant flowers and lush lawns."

Updating the book was a bit of a bittersweet trip down memory lane, and I think it turned out well. I was particularly pleased they selected two of my photographs for cover art!

Watch for author events at Cashman Nursery in April and the Country Bookshelf in May.

### **Publications**

Cripps, C.L. 2015. Ghost Forests— Conservation of whitebark pine. *Biosphere* 4: 32-41.

Mike Ivie, *Chalcophora virginiana* (Drury, 1770) (Coleoptera: Buprestidae), a Newly Established Invasive Species in the Dominican Republic. *The Coleopterists Bulletin*.

Enhanced Rice Growth is Conferred by Increased Leaf ADP-Glucose Pyrophosphorylase Activity Giroux, Michael J., Martin, John M., Schlosser, Alanna J.



## Invited Blog

Laurie Kerzicnik, Oxford University Press online blog. "Save a Spider Day". March 14, 2015. The title is: Spiders: the allure and fear of our eight-legged friends  
<http://blog.oup.com/2015/03/spider-arachnid-slideshow-biology-fascinating-facts/>

## Grants

Mary Burrows, Farm Bill APHIS 10007, "Pulse Crop Diagnostic Laboratory".

Mike Ivie, Montana Dept. of Agriculture, "Pine Shoot Beetle Survey".

## Farewell to Ryan By Ryan Quire



I am so grateful for the experiences I have gained as a student and as an employee at MSU. I studied sagebrush steppe biodiversity patterns with Matt Lavin and graduated from MSU in 2013 with a Masters degree in plant

science. I have been the Seed Lab Coordinator for the Montana State Seed Testing Lab and a botanist for the Helena National Forest from 2014 until now.

I will begin a new position as a botanist and wetland scientist for Confluence Consulting, an environmental consulting firm based in Bozeman, in early May.

Thanks to everyone at MSU who has supported me throughout my time here! I am having a farewell potluck Friday, April 17th, at 12:00 pm, in the Montana Seed Growers conference room by Marsh Lab, for anyone who wants to stop by and chat with me. You can bring something if you like, or not... I'm sure there will be enough for everyone. Thanks!

## Philadelphia Flower and Garden Show By Toby Day Extension Horticulturist

Twenty-two Montana Master Gardeners and I went to Pennsylvania for the Philadelphia Flower and Garden Show and Longwood Botanical Gardens March 5-7. We convened in the city of brotherly love and experienced the wonder that is touted "the world's longest running and largest indoor flower show." The show dates back to 1829! We also traveled to see Longwood Gardens, a 1,077 acre botanical garden near Philadelphia.

The flower show, sponsored by the Pennsylvania Horticulture Society, was themed "Celebrate the Movies." There were dozens of



*One of the halls at Longwood that they flood to increase humidity. When dry at night it can be used for dinners or dancing. All photos in this article courtesy of Toby Day.*



*Judges at the show judging cactus miniatures.*

large displays (some 2-3 stories tall) as well as hundreds of small and even minute displays. There were hundreds of unique plants and flowers being judged during the show. When our group was there, houseplants and succulents were the 'lots' that were being judged. Also, throughout the show there were demonstrations on floral design and other interesting topics.



*Even the chandelier at the flower and garden show was an impressive flower arrangement!*

On Saturday, through 6" of new snow, we travelled by bus to





*A necklace made from only plant parts. Photo courtesy of Toby*

Kennett Square to tour Longwood Gardens. Although the grounds were closed due to the snow, we were still able to see the house and original conservatory, as well as the 4.5 acre indoor conservatory that was built just after the

turn of the century. I can tell you that the conservatory exceeded my expectations 10 times over! There are over 5,000 types of plants all grown and propagated on site. The research greenhouses were equally impressive, but because it was a Saturday, most were closed to the public.

Overall the trip was a rewarding, educational and fun experience many Montana gardeners would not normally be able to see. We will be going again in two years (it is a biennial event). If you are interested in going with the Montana Master Gardener to the flower show in 2017 contact me at [toby.day@montana.edu](mailto:toby.day@montana.edu) or call x6523.



*Apparently, the blue poppy was the hit of the gardens. There was only one blooming when we were there. At any given time, there were 6 or more professional photographers photographing this flower. Photo courtesy of Toby Day.*

### **April Birthdays**

Ryan Quire	8
John Sherwood	12
Mike Giroux	12
Toby Day	15
Matt Lavin	20
Andreas Fischer	25
Charles Hart	25
Nina Zidack	26
Rebekah VanWieren	28



**See next page for some amazing photos!**





The flight of the snow goose occurs in the U.S. twice each year. In the springtime the birds move by the thousands from southern climes, following migratory routes in the west, east and central North America, to breeding areas in the artic. This photo was taken at the freeze out lake waterfowl area near Choteau, Montana during the 2015 spring migration. Total numbers of snow geese in the Montana migratory route top out at 300,000. This year up to 2000 birds literally fell from the sky in Eastern Idaho as a result of avian cholera caused by *Pasteurella multoceda*. Photo courtesy of Gary Strobel.



Cover Photo by Gary Strobel, *Microbial Ecology*, Volume 69, Number 3, April 2015. Standing on the inside and looking up through the "Quinault Lake Redcedar" in western Washington State which is the largest known western red cedar (western arborvitae) in the world. It has a diameter of 5.9 meters and a height of 53 m. *Thuja plicata* does not belong to the true cedars in the genus *Cedrus*. This tree has withstood the tests of time given high winds, fires, and the invasion of people with saws and axes. Interestingly, the heartwood of this tree has not withstood the invasion of a mixture of wood degrading fungi having cellulolytic, hemicellulolytic and lignolytic enzymes resulting in the almost complete decay of the interior (heartwood) of the tree. Generally, some of the fungi involved in wood decay are *Pleurotus*, *Armillaria*, *Ganoderma*, and *Phellinus*. Annually, the decay of wooden structures as a result of these and a host of other fungi is in the billions of dollars, yet the environmental service provided by these organisms is also enormously beneficial.