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UNIVERSITY OF IDAHO
ARBORETUM
& BOTANICAL GARDEN

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our web site at

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Inside this Issue

What's in a Name? 1

U-Idaho Arboretum Joins Select Few in Accredited Ranks 3

The Lush Mixed Mesophytic Forests of Idaho—14.5 to 15 Million Years Ago 4

Clarkia Fossils 4

The U. of I. Arboretum and Botanical Garden: 30 years of Planting and 35 years of the Arboretum Associates 7

Report from the Horticulturist 8

Arboretum Associates Annual Meeting 10

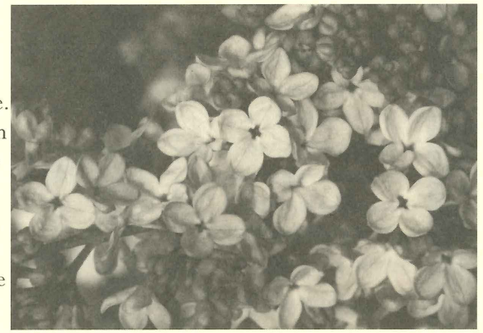
'Conifers Around the World' by Zsolt Debreczy and István Rácz, edited by Kathy Musial 10

Intact Cells, Tissues, Structures Recovered from Anoxic, Waterlogged Miocene 11

ArborNotes

A Newsletter of the Arboretum Associates May 2012

What's in a Name?



New Hampshire State Flower Syringa vulgaris photo by Richard Naskali

I know *Syringa vulgaris*, the lilac, as the state flower of New Hampshire, my childhood home. I grew up selling lemonade between the boughs of a purple-petaled lilac in my family's yard and a white-petaled one in my neighbor's. I like to think that this simple floristic difference—how can one plant have different colored flowers?—is the root of my interest in botany.

Last year, upon moving to Idaho, I realized that people here know syringa as *Philadelphus lewisii*, also the mockorange, which happens to be the state flower of Idaho. This kind of confusion over plant nomenclature happens all the time. A hardy plant that spreads, or is taken, to disparate locales is bound to be known by different names in each region, as language and cultural values vary across space and time. Before modern science, the long-standing inhabitants of a place named their flora according to the curative properties derived from the plants. In the 1500s, European herbalists began traveling wide to discover and collect such plants for medical practices in their home countries. Sure enough, they found uncharted territory: similar plants with overlapping, and sometimes contradicting, names.

Enter Matthias de l'Obel. Born in 1538 in Belgium and trained as a physician at Montpelier, de l'Obel covered new ground as an herbalist. Eschewing the philosophic or folkloric bases his contemporaries considered to be plant knowledge, he insisted on observing the innate characteristics of flora—plants' habits and morphology. He pondered identities: is this the same plant as that? He recognized patterns: is this plant like other plants? How so? His first book, *Stirpium Adversaria Nova*, "A New Account of Plants," published in 1570, is said to be the first to organize plants based on natural features (specifically, leaf venation). De l'Obel published another book in 1576 and became the physician to James I and curator

continued

Arboretum Associates Plant Sale

Saturday, June 2, 2012 9:00 am to Noon

Palouse Ice Rink Latah County Fairgrounds

Come Grow With Us

ARBORNOTES

A Newsletter of
the Arboretum Associates
University of Idaho
Arboretum and Botanical Garden

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University of Idaho
P.O. Box 443143
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Arboretum Horticulturist
Paul Warnick
P.O. Box 442281
Moscow, ID 83844-2281
Phone: (208) 885-5978
arboretum@uidaho.edu

Emeritus
Arboretum Director
Richard J. Naskali
625 E. 6th St.
Moscow, ID 83843
Phone: (208) 882-2633
naskali@uidaho.edu

MAY 2012

of the gardens of Edward Zouche, an English aristocrat. He died in 1616 in England, but his contributions have crossed the globe as several names of plants—one being "syringa" for *Philadelphus*.

What's curious to me is how de l'Obel, working to decouple plants' names from their applications as cures, would end up naming a shrub with stems that could be hollowed after a syringe (though, I read, the stems were used for pipes, not medical implements).

Common names based on morphology are not problematic per se. They clarify as much as, or more than, they confuse. After all, creating an association between plants and people—how a plant is relevant to you or me—is what helps make a moniker memorable. True, de l'Obel named a plant after a physician's tool, but in doing so, he called attention to a specific part of the plant and its attributes. He set the foundation for the plant to be analyzed as discrete parts and treated as the sum of those parts—a necessary step towards more advanced ways of grouping organisms.

Common names based on morphology can become problematic when their multitude offers different starting points for developing a classification system. *Philadelphus lewisii* and *Syringa vulgaris* both have stems that can be hollowed. It makes sense, then, that they share a common name of "pipe-tree." Shared common names, though, beg the question of whether the plants are botanically related, which is what interested de l'Obel and, 150 years later, Carl von Linné (better known as Linnaeus). While de l'Obel's classification criterion was leaf venation and Linné's was sexual parts, both botanists separated the two shrubs based on the plants' innate features. The problem is that de l'Obel's syringa referred to the *Philadelphus* and Linné's referred to the *Syringa*.

And as science has come to recognize evolution and genetic inheritance as fundamental processes of life, Linné's classification system stuck. Today, though phylogeneticists classify based on ever-more intricate criteria of DNA, we who appreciate plants seem to agree that *Syringa*, the botanical name, refers to lilac, and syringa, a common name, refers to mockorange (another common name!). It would behoove me to follow in this tradition of names and acknowledge the utility of an identifier that teaches both about culture and chromosomes. I can learn to love the *Philadelphus*, and how it is, and isn't, like my cherished *Syringa*.

~Amy Whitcomb

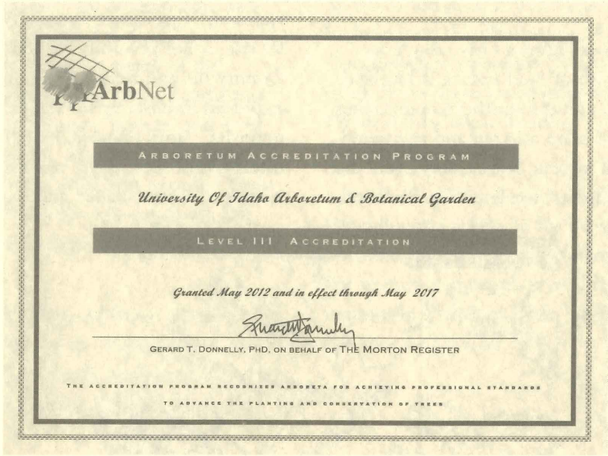
Idaho State Flower Philadelphus lewisii photo by Richard Naskali

Amy Whitcomb is a graduate student in both the Environmental Science and Creative Writing programs at the University of Idaho.

U-Idaho Arboretum Joins Select Few in Accredited Ranks

MOSCOW, Idaho – The 63-acre University of Idaho Arboretum and Botanical Garden was recognized this week as one of only a handful of arboreta that has been accredited by the Morton Register of Arboreta.

The U-Idaho Arboretum received a Level III accreditation, on a four tier scale, that recognizes an arboretum with more than 500 varieties of trees and woody plants, a dedicated curator, professional collaboration with other arboreta and an active education and conservation efforts.



ArbNet

ARBORETUM ACCREDITATION PROGRAM

University Of Idaho Arboretum & Botanical Garden

LEVEL III ACCREDITATION

Granted May 2012 and in effect through May 2017

GERARD T. DONNELLY, PHD, ON BEHALF OF THE MORTON REGISTER

THE ACCREDITATION PROGRAM RECOGNIZES ARBORETA FOR ACHIEVING PROFESSIONAL STANDARDS TO ADVANCE THE PLANTING AND CONSERVATION OF TREES

"This recognition comes thanks to the hard work of Paul Warnick (Arboreta Superintendent) and the many Arboretum supporters whose tireless efforts have continued to grow this University of Idaho jewel," said Brian Johnson, assistant vice president for facilities.

The Arboretum and Botanical Garden fills the valley south of the president's residence on Nez Perce Drive. Organized into geographical groupings of Asian, European, Eastern, and Western North American sections, and display plantings are hundreds of species and cultivars of North Temperate trees and shrubs and a xeriscape garden. In addition to native Idaho species, there are over 120 dedicated trees and groves, trails, water features.

"Individuals and organizations have long sought definitions, standards and means of establishing an official arboretum," said Gerard Donnelly, President and CEO of The Morton Arboretum and the Morton Register.

The Morton Register provides a system of accreditation as a service to foster the establishment and professionalism of arboreta; identify arboreta capable of participating or collaborating in certain scientific, collections, or conservation activity; and advance the planting and conservation of trees.

Donnelly explained that an arboretum is a specialized type of botanical garden that focuses on trees and other woody plants. Arboreta collect, grow, and display trees, shrubs, and other plants for people to study and enjoy, and ideally are open to the public for education and inspiration. A principal goal of arboreta is to encourage and support the planting and conservation of trees for environmental improvement and enhanced quality of life.

Charles Houston Shattuck began the university's arboretum effort in 1910 by planting a 14-acre weedy slope with hundreds of introduced trees and shrubs for education and beautification of the campus. His legacy, "Arboretum Hill," west of the Administration Building, was named for Shattuck in 1933, two years after his death.

~University Communications and Marketing

Summer Concert - Summer Breezes and Sweet Sounds

Presented by Arboretum Associates and
The Lionel Hampton School of Music

Monday July 9, 2012 7 p.m.

Join us for an evening of music in the arboretum

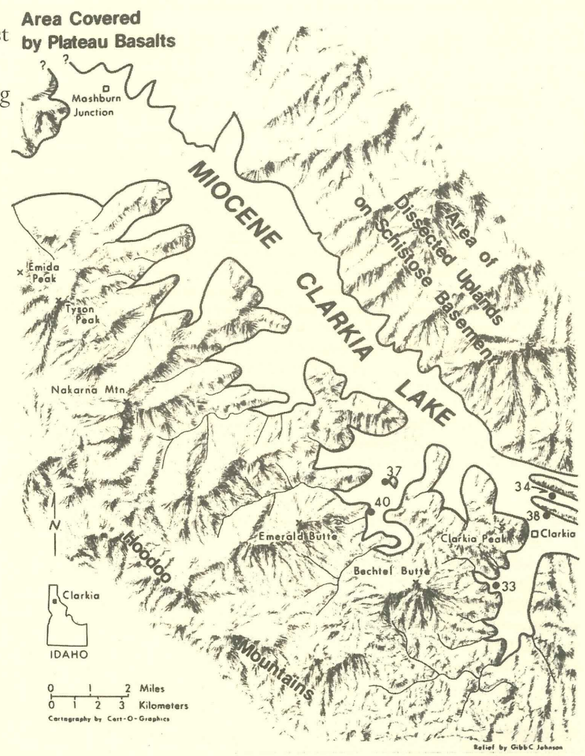
The Lush Mixed Mesophytic Forests of Idaho—14.5 to 15 Million Years Ago

The characteristic Boreal Forest of northern Idaho and much of the Intermountain West, dominated by pines, spruces, firs, Douglas-firs, larches, and Western red cedars, have lulled many residents of these areas into thoughts that this vegetation may have been eternal.

Over the last century, many fossil hunters have dug into the eroding volcanic ash deposits at road-cuts at Whitebird, Kendrick and Juliaetta, Idaho, and the southern approaches into Spokane, Washington, and been amazed and rewarded with some fragile remnants of insects, leaves, and fruits that that lived long ago. The 'specimens' were not the hard and stable 'keepers' like the pilfered petrified woods of the Southwest or the pilfered or trophy shop-purchased Green River Wyoming fish fossils.

In November 1972 the world's knowledge of the ancient flora of Idaho changed remarkably after Francis Keinbaum, a Clarkia, Idaho, resident built a snowmobile race course there. Mr. Keinbaum excavated into the night by the light of his bulldozer—digging into the wet clay and volcanic ash deposits of long ago. The following morning, Francis explored his diggings and found drying leaves curling up and drifting away in the breezes. Most fortunately, his native wit and curiosity caused him to contact the University of Idaho Palaeobotanist Professor Charles "Jack" Smiley, a notable student of many paleobotanical studies in the Arctic and other venues. Subsequently, Dr. Smiley and his graduate students investigated the Clarkia site and related fossil deposits in northern Idaho. Of the many Clarkia investigations, William C. Rember, earned his University of Idaho Ph. D. degree in 1991 with "Stratigraphy and Paleobotany of Miocene Lake Sediments Near Clarkia, Idaho" a UI dissertation of text and photographs illustrating some of the plants which dominated the Clarkia site in the Mid-Miocene period 14.5 to 15 million years ago.

Since 1972, the late Frances Kienbaum's original intended snowmobile race tract has been developed into a motorcycle race course, privately owned and operated by his son, Kenneth. Elsewhere in the SW corner of Shoshone County, ID site, other privately owned adjacent corners of Latah County ID, and Benewah County, ID have been found and explored intensively for their related mid-Miocene fossil deposits. Until exposed by excavation, the fossil-containing interbeds of silts, clays, volcanic ash, and fossils have remained water soaked and oxygen free.



Map of the Lake Clarkia area, after Smiley and Rember, 1985, used with permission

Prior to the massive uplift of the Cascade Mountains and the emergence of the large coastal volcanoes (e.g., Mt. Ranier, Mt. Hood, Mt. St. Helens, etc.), the warmer, moisture laden Pacific winds encountered the first mountains of the Hoodoo Range immediately west of Clarkia. At that time, 14.5 to 15 millions of years ago, the vegetation of the area was sub-tropical and rather similar to the vegetation of the SE United States and the bayous of Louisiana and Mississippi in the U.S.A. and the Metasequoia Valley of China today. Common plants at Clarkia included Magnolias, Baldcypress, Oaks, Maples, Beeches, Hydrangeas, Persimmons, Chestnuts, Birches, Hop-hornbeams, Honey Locusts, Tupelos, Incense-cedars, and scores of other taxa.

In those days, the northwest-flowing St. Maries River drained the Clarkia area toward what is now St. Maries. Prior to the volcanoes of the Cascade Mountains, earth fissures opened on a northwest trend from the Oregon, Washington and Idaho borders to Spokane. Most of lava flowed westward; however, lava that flowed eastward

damned the St. Maries River, creating Miocene Clarkia Lake in the west-sloping valley along the Rocky Mountain spine. A lake, near what is now Clarkia, ID, developed; it was about 20 to 30 miles (31 to 48 km) long and some 300 feet (91 m) deep. The lake rapidly filled with tightly layered silts, volcanic ash, and future fossils. Leaves, branches, flowers, fruits, pollen grains, spores, diatoms, cones, seeds, insects, fish and subsequent volcanic ash fell and sank into the "Clarkia Lake" where they remained wet and anoxic (oxygen-free) for the millions of years in many of the fossil sites until they are excavated today. Such conditions have preserved the cells, leaves, flowers, insects, and even whole fishes to an amazing degree. At some sites, fallen leaves retained autumnal pigments until first exposed again by researchers; in seconds after being exposed to air, the autumnal pigments oxidize and change colors before human eyes for the first time.

Between Santa and Emida the St. Maries River cut through the basalt dam to the extent that the St. Maries River now flows into Coeur d'Alene; the cut basalt layers can be seen when one drives the White Pine Drive from Emida to St. Maries on Idaho Route 3.

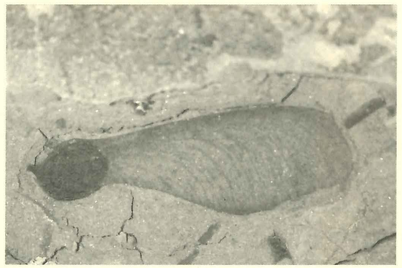
The lush Miocene forests of Clarkia once had scores of taxa of conifers and flowering plants which became extinct in North America and continued having many related species in Asia. These include Asian Calocedrus (Incense Cedar), *Cunninghamia*, *Caldesia*, *Metasequoia*, *Amenotaxus* (Catkin-yew), *Cercidiphyllum*, etc. Today the *Calocedrus decurrens* (California Incense Cedar), native to the higher California Sierra Mountains, is widely planted around the world, including on the UI campus. On campus, there are two *Cercidiphyllum japonicum* (Katsura Tree) specimens: the Edith Betts commemorative tree near the west entry to the Physical Education Building and one tree in the courtyard of Life Sciences South.

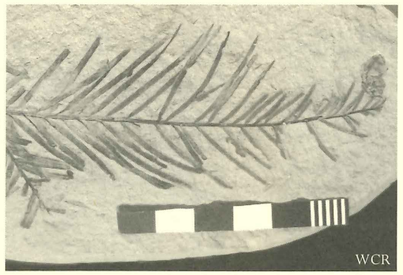
I gratefully acknowledge and thank Dr. W.C. Rember for providing me access to his personal Clarkia fossil site and museum specimens collected at Clarkia sites since 1972. For errors or misinterpretations in this essay, I am solely responsible. Photos by R.J. Naskali unless credited to W. Rember by (WCR).

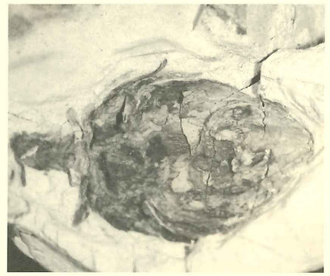
~Richard J. Naskali

A major collection of Clarkia fossil photos in parallel with modern plant specimens photographed in the UI Arboretum and Botanical Garden, Lewiston, ID, or in London, U.K.

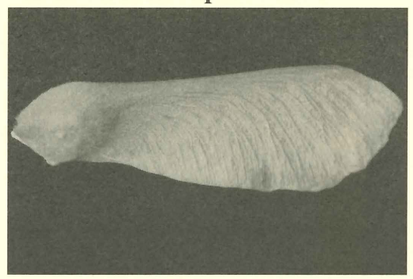
Clarkia Fossils



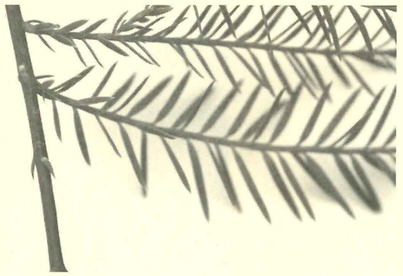




Modern Plant Specimen



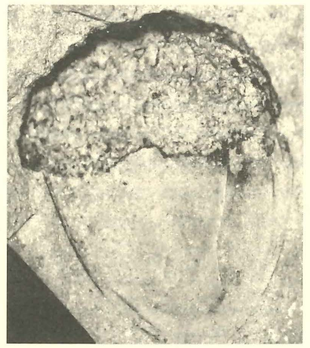
Fossil Maple (*Acer*) samara (fruit) (Top) and modern Maple fruit (Bottom).

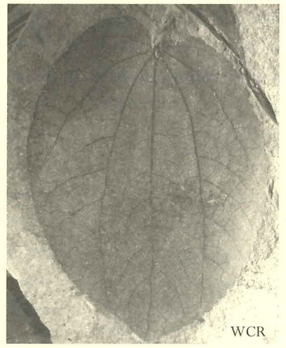


Fossil Bald Cypress (Metasequoia) short shoot (Top) and Bald Cypress short shoot (Bottom).

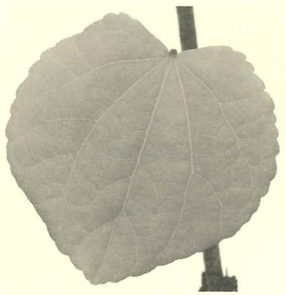
Fossil China-fir seed cone remnant (Top) and modern China-fir seed cone (Bottom).

Clarkia Fossils





Modern Plant Specimen

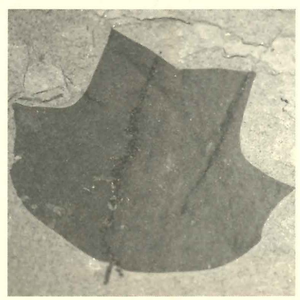


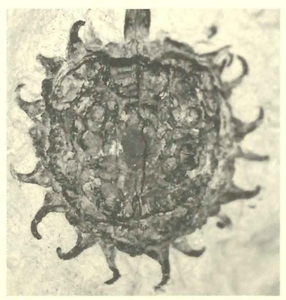
Fossil Oak acorn (Top) and modern Oak acorn (Bottom).

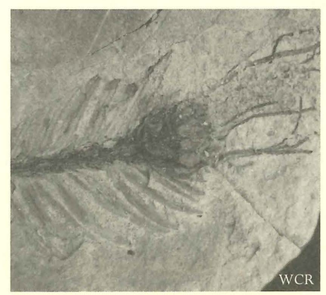
Fossil Katsura (Tree Cercidiphyllum) leaf print (Top) and modern Katsura leaf (Bottom).

Fossil Incense Cedar seed cone (Top) and modern Incense Cedar cone and seeds (Bottom).

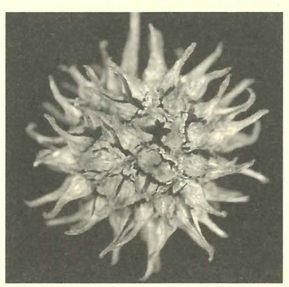
Clarkia Fossils







Modern Plant Specimen



Fossil Tulip-tree (*Liriodendron*) leaf (Top) and modern Tulip-tree leaf (Bottom).

Fossil Sweetgum (*Liquidambar*) fruits (Top) and modern Sweetgum fruits (Bottom).

Fossil China-fir (*Cunninghamia*) branch with terminal pollen cones (Top) and modern China-fir branch with pollen cones (Bottom).

The University of Idaho Arboretum and Botanical Garden: 30 years of Planting and 35 years of the Arboretum Associates

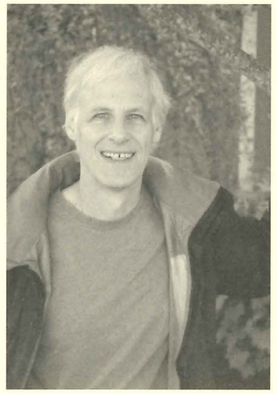
2012 marks the thirtieth year of planting in the campus valley that became the University of Idaho Arboretum and Botanical Garden and the thirty-fifth year since the founding of the UI Arboretum Associates in the summer of 1978. On the rainy-snowy Easter weekend, April 10-11, 1982, many members of the Moscow Rotary Club gathered near the UI Golf Course parking lot and planted the first trees and shrubs in the NW section of the Arboretum—the beginning of the first dedicated groves in the Asian section of the Arboretum. President Ernest W. Hartung, the 12th UI President, instigated the beginnings of the Arboretum with the U of I Foundation, Inc. May 28, 1975 with the note of approval signed "High Priority." Fund-raising through the Foundation underwrote the original Master Plan by Richard Carothers and Associates of Seattle accepted in 1980.

That Easter Sunday, April 11, 1982, Dr. Hartung (20 Jan., 1917 – 26 Sept., 2003) demonstrated his passions for the Arboretum, his skills with a spade in helping with the first plantings, and a fearless work ethic even under muddy and rainy conditions. Since that monumental 1982 weekend, thousands of Arboretum Associates members, donors to the U of I Foundation, Inc., together with participants at the Associates annual plant sales, have underwritten the purchase of the plants, granite benches, dedicated trees and groves, purchase of much Arboretum equipment and machinery, and installation of major portions of the semi-automated irrigation system in the Arboretum—at no expense to the State of Idaho.

Another unsung hero organization in the development of the Arboretum is the J. Frank Schmidt & Son Company of Boring, OR—one of the largest wholesale nurseries of the U.S.A. Annually since 1990, the Schmidt nursery has donated to our Arboretum for testing (hardiness, landscape merits, disease resistance, foliage and flower coloration, etc.) as one of its 40+ test sites around the U.S.A. To date, more than 300 new species and cultivars of trees and shrubs have been contributed to the Arboretum as two specimens each of 12-15 taxa given annually to the Arboretum. In return we annually report on the specimens in terms of qualities, hardiness, and survivability of these new introductions.

Key individuals in the J. Frank Schmidt introductions are two individuals: Paul Lother and Keith Warren, longtime Schmidt employees. Paul Lother, a UI alumnus, earned a B.S. Forestry degree in 1973 as a Naval Science scholar. After his service in the US. Navy (1973 - 1976), Paul was Vice President of Sales for J. Frank Schmidt from 1976 until retirement in 2008. Keith continues his 38-year career at the J. Frank Schmidt nursery as Director of Product Development.

Paul Lother



Keith Warren.
Photos contributed by J.F. Schmidt

Since 1990 the UI Arboretum has received over 300 J. Frank Schmidt plants for introduction and testing. These include *Ginkgo,* bald cypress *(Taxodium)*, and dicotyledonous woody plants of 168 taxa and 84 species in 16 plant families. The scores of maples *(Acer)*, ash *(Fraxinus)*, dogwoods *(Cornus)*, serviceberry *(Amelanchier)*, honey locust *(Gleditsia)*, crabapples (*Malus*). Ornamental cherries an plums (*Prunus*), poplars (*Populus*), flowering pears (*Pyrus*), oaks (*Quercus)*, willows (*Salix*), lindens (*Tilia*), elms (*Ulmus*), and *Zelkova* are planted in their appropriate geographical blocks of Asia, Europe, and Eastern and Western North American sections of the Arboretum.

Once again, a hearty Thank You to all of our donors. You have made an academic Arboretum appropriate to Idaho's flagship Land Grant University.

~Richard J. Naskali

Report from the Horticulturist

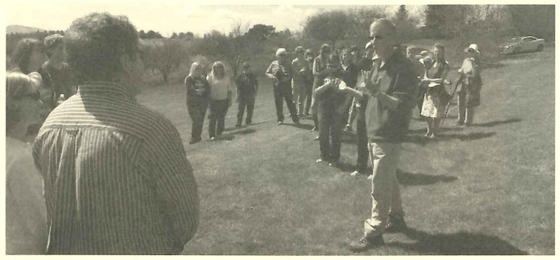
Once again, we have just been through another weird winter here in Moscow. Whatever winter we had came on both ends of the season—without any extreme cold. Hopefully, that means there will be little winter loss this year. So far, flowering seems to be on a fairly normal schedule with the Forsythia starting the spring show in early April. Of course, then it snowed 2-3" inches two or three times, so the rest of the spring flowering may not behave 'normally.'

The normal winter activities of updating the data base, formatting new labels, and planning and ordering plants for the coming year take up most of the available time in the winter months. There are now 13,981 documented plants in the Arboretum collection, including 2,383 different taxa or types of plants; 6,308 of those plants are considered to be woody trees or shrubs, as opposed to herbaceous perennials or grasses.

New plants have been ordered and shipped for three new collections in the Arboreta. We are planning to begin planting in the John Dixon Butterfly Garden, which will be developed just north of the Xeriscape Garden to take advantage of the stream for a water source and the existing wide range of existing butterfly-attractive plants in the Xeriscape Garden. Unlike the Xeriscape Garden, which demonstrates a wide range of potential plants, the Butterfly Garden will use larger swaths of fewer plants, chosen to provide season-long color, along with nectar and pollen for the butterflies.

We will also be planting a collection of Full Moon Maples (*Acer japonicum*), donated by Jan and Dick Leander in memory of Joan and Donald Worden. The maples will be planted in the Asian section, north of the upper pond, taking advantage of the shade and protection provided by the existing grove of Russian Olives.

The last collection, donated in memory of Jerrod R. Rockwood by his daughters, Melissa Rockwood and Betsy



Paul leads a Mom's Weekend tour of the Arboretum photo by Bill Bowler

New Baby Geese 4-19-12. Photo by Paul Warnick

Rockwood Snyder, is a collection of trees and shrubs native to the west side of the Cascade Mountains. These will be planted primarily in the Shattuck Arboretum to take advantage of the protected topography and mature canopy to provide some protection. There is one existing Big Leaf Maple (*Acer macrophyllum*) in the Shattuck Arboretum, and Vine Maple (*Acer circinatum*) are doing well in the Arboretum and Botanical Garden as well as around town. So I am fairly confident we can grow those there, but we are also going to try some more marginal plants like Oregon White Oak (*Quercus garryana*), Red Alder (*Alnus rubra*), and Pacific Dogwood (*Cornus nuttallii*).

Another project this winter has been working with the Arboretum Associates Board to find funding for a new software program to digitally map the Arboretum. The software BGMap will work together with our existing Arboretum database, BGBase, to map the plants in the Arboretum. That process will require someone to locate the plants using a GPS unit, a process I estimate will take one person most of two summers to accomplish. Once the data are collected, the goal is to have the information on the Arboretum website, with the idea that anyone could enter the name of a plant and the website would come back with a map showing the locations of that plant in the Arboretum. These are links to two different sites, Longwood Gardens and the Coastal Maine Botanic Garden, that use the same software:

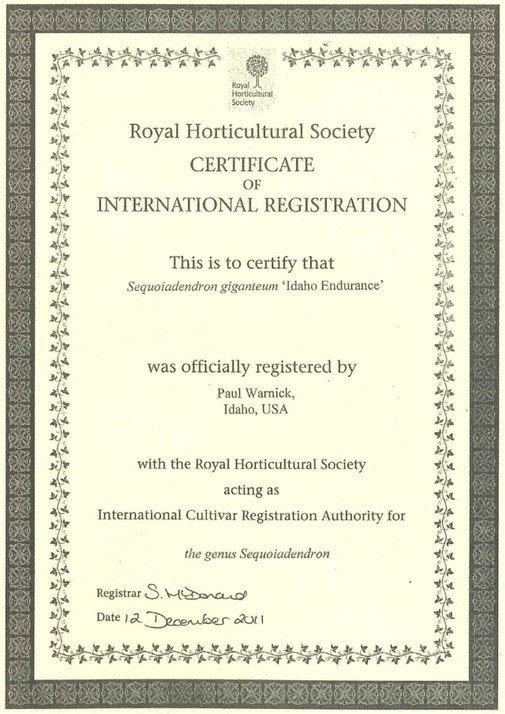
http://plantexplorer.longwoodgardens.org/
http://florafind.mainegardens.org/

We are still exploring the possibilities of introducing some new plants to the nursery trade. We now have several grafted plants from the Giant Sequoia in the Shattuck

Arboretum, and the winning entry in the naming contest 'Idaho Endurance' has been officially registered with the Royal Horticultural Society's international registry. We will distribute several of the trees to other interested Arboreta and growers to help determine if it really is more cold hardy than the typical species. We are also working with two different commercial growers in Oregon, trialing the Weeping Pussywillow that has been very striking down by the Arboretum barn. It is not currently widely available, and I think it has potential to be a popular ornamental tree. We have also grafted two other conifers, one a dwarf Scot's Pine that turns striking golden yellow in cold temperatures, tentatively named 'Vandal Gold'; and an extremely dense, uniformly shaped Engelmann Spruce, tentatively named 'Albert's Cousin,' to reflect the resemblance to the popular cultivar of Colorado Blue Spruce named 'Fat Albert.'

All of the new labels and plants in the Arboretum's collection, along with the new mapping software are only possible with funds provided by private donors. That private support is vital to the continued development of the Arboretum, and I am continually amazed and grateful for the level of support we receive.

~Paul Warnick



Royal Horticultural Society
CERTIFICATE
OF
INTERNATIONAL REGISTRATION

This is to certify that
Sequoiadendron giganteum 'Idaho Endurance'

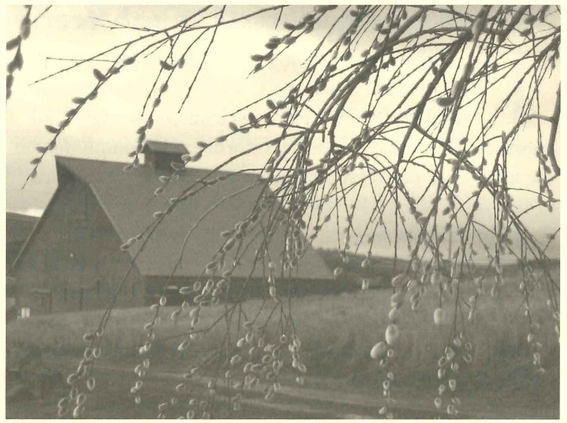
was officially registered by
Paul Warnick,
Idaho, USA

with the Royal Horticultural Society
acting as
International Cultivar Registration Authority for

the genus Sequoiadendron

Registrar S. McDonald
Date 12 December 2011

'Idaho Endurance' Name Registration 4-20-2012



Weeping Pussywillow 3-16-12. Photo by Paul Warnick

Weeping Pussywillow graft 4-12-12. Photo by Esteban Herrara

'Idaho Endurance' Giant Sequoia 1 year graft 4-19-12. Photo by Paul Warnick

Arboretum Associates Annual Meeting

The 35th annual meeting was held on May 2, 2012, at the University of Idaho College of Law courtroom. President Howard Peavy welcomed members and guests as he called the meeting to order. He complimented the hard work of everyone who contributed to the success of last year's plant sale. He also reviewed the questionnaire distributed at last summer's concert in the arboretum, sharing the top priorities for the Arboretum determined by the questionnaire: 1) Palouse Prairie area, 2) restroom, 3) entry garden, 4) electronic tour, and 5) barn renovation. President Peavy then thanked the Moscow Garden Club for raising funds for the butterfly garden.

Joy Fisher reviewed the treasurer's report for calendar 2011, pointing out the revenue of $11,043 from the plant sale with expenses of $2,691. She indicated the Associates received a record number of gifts of $21,264 in 2011. She reviewed the highlights of the 2012 budget.

President Peavy presented the slate for membership in Arboretum Associates. Nominee Mary Ann Judge and Maureen Taylor-Regan were elected as members at large for a 3-year term expiring in spring of 2015. The nominees were elected by a unanimous voice vote.

New Board Member Maureen Taylor-Regan
photo by Bill Bowler

Paul Warnick, the Arboretum Horticulturist, reported on activities and events for this past year in the Arboretum and Botanical Garden as well as the Shattuck Arboretum. He presented numerous photos to accompany his report. Among the highlights were the addition of 1,158 permanent plants to the collection and the addition of 7 crabapple cultivars bringing the total to 67.

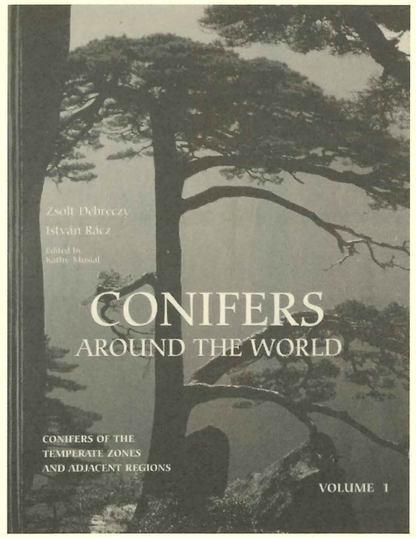
Dr. Richard Naskali was the program speaker. He provided a brief history of the Royal Botanic Gardens at Kew and then showed many photos of the architecture and statuary in the garden along with some unique plants.

Cookies and punch were served in the lobby following the program.

~Beverly Rhoads

'Conifers Around the World' by Zsolt Debreczy and István Rácz, edited by Kathy Musial

This stunning new book, published by DendroPress Ltd, Budapest, Hungary in 2011, has recently become available in the U.S.A. It is a masterpiece reference for anyone interested in conifer data, distribution, geography, and references. The brilliantly printed quarto tome in two hard-bound volumes (1089 pages total) includes 3700 color photos, 1300 illustrations, 474 distribution maps, and a unique "Bark Gallery" of 646 color photos taken in the native habitat sites.



The Debreczy and Rácz duo are author and accompanying photographer, respectively. This work summarizes 30 years of research and world travel. The large and clear photographs are professional quality; in addition to native site photos, there are detailed close-up pictures of pollen and seed cones, and 1200 detail drawings. The richly illustrated 86-page introduction to conifers is highly educational. Kathy Musial, Editor in Chief, is the plant data records keeper at the prestigious Huntington Botanical Gardens, San Marino, CA.

Overall, the book is geographically arranged to include most of the native temperate conifers of the world. It will be a long time before this masterpiece is superseded or excelled. The ISBN for the two volume work is 978-963219-061-7-0; the cost is ca. $290.00 U.S. It has limited availability in the U.S.A. but can be ordered through Bookpeople of Moscow, ID, 521 South Main Street, Moscow, ID 83843, phone (208) 882-2669. The Bookpeople e-mail: bookpeople@Moscow.com

~Richard J. Naskali

Intact Cells, Tissues, Structures Recovered from Anoxic, Waterlogged Miocene Deposits of Clarkia

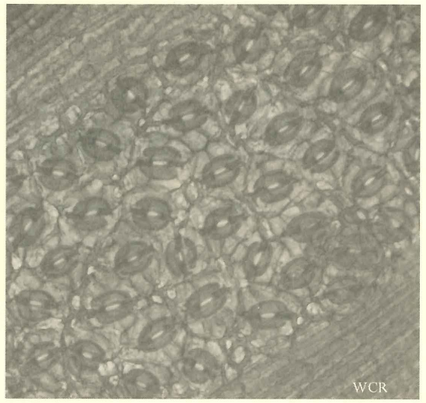
On the basis of leaf vein patterns (venation), shapes, margin characteristics, and epidermal cell shapes and patterns, it is often possible to identify genera and plant families from recovered fossils. In some cases it is possible to refloat leaves and make epidermal peel microscope slides of intact epidermal cells.

One example, shown below, reveals the epidermis with guard cells surrounding the stomata (gas exchange pores in the leaf epidermis--each surrounded by a pair of bean-shaped guard cells) taken from intact, preserved fossil leaves of *Cunninghamia* sp. (China-fir) which became extinct everywhere in the world except China, Vietnam, and Taiwan. Today introduced *Cunninghamia lanceolata* (China-fir) trees thrive in the SE United States, southern England, and many other sites warmer than today's Idaho.

The intact white pine cone, about four to five inches long, was also recovered from the waterlogged matrix of silts, clays, and volcanic ash. Among other rarities from Clarkia Miocene deposits is the single leaf print of *Caldesia* sp.—with its unique pattern of veins. *Caldesia* plants are Old World temperate and tropical, fleshy leaved aquatic plants not usually preserved even in the mud of modern ecosystems. In one other case, fossil *Caldesia* fruits have been recovered and reported (1997) from Early Miocene Lignite near Brandon, VT, U.S.A. Ongoing studies of DNA and other compounds from Clarkia fossils will continue revealing the remarkable preservation of many of the 14.5 to 15 million year old organisms.

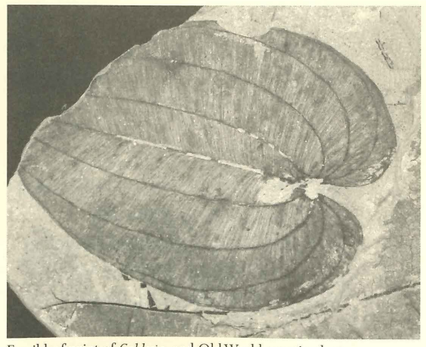
~Richard J. Naskali

Some Rarely Found Clarkia Fossils

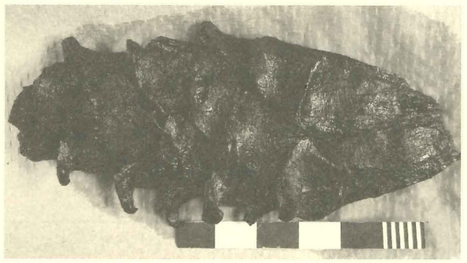


Photomicrograph of a lower epidermis peel of fossil China-fir showing stomata (the pores) between the pair of bean-shaped guard cells.

Fossil leaf fragment of an unknown fern with dark spore containers (sporangia).



Fossil leaf print of *Caldesia*, and Old World aquatic plant.



Fossil cone of a White Pine, ca. 4.5" long.