



Eight hundred thousand folders of dried plant specimens are stored in the Arboretum's Herbarium, forming a valuable plant record. Photo credit: Alan Whittemore



# The Herbarium of the National Arboretum

Karen Zill

The north wing of the Arboretum's Administration Building houses a scientific collection of dried plants. More than half the space in this wing is packed with shelves from floor to ceiling with each shelf containing folders of plant specimens, about 800,000 altogether. This is the Herbarium of the National Arboretum, the only large herbarium in the USDA.



## Value of the Herbarium

Part of the Arboretum's mission is to preserve and document the world's plants, and this is one function served by the Herbarium. According to Dr. Alan Whittemore, manager of the Herbarium, "Living plant collections have major limitations requiring a lot of work and a lot of space. They require gardens and specialized facilities, and there are many plants in the world that won't survive in our climate. You can keep a lot more plants in the herbarium."

Other herbaria have larger collections: those at the Smithsonian, Missouri Botanical Garden, and the New York Botanical Garden number in the millions. What sets the Arboretum's herbarium apart is its large collection of cultivated plants, especially those that have economic uses in the food industry or in horticulture, for example.

## Preservation and Research

The Herbarium has several purposes. It serves as a record of plants, both wild and cultivated, that grew in the past. The American chestnut, *Castanea dentata*, was wiped out a century ago by the chestnut blight, but Herbarium specimens allow us to study chestnuts from native stands across its former range. The Herbarium serves as a record of past research. Frank Meyer, perhaps the most important plant collector ever to work for the USDA, introduced many plants from Asia a century ago. Many of these have been used in breeding projects, and their descendants are still important in our economy. If there are questions about what plants were used in producing our modern crops, we can use his voucher specimens in the Herbarium to study the plants he collected from. (A voucher is a herbarium specimen that serves as documentation for a piece of information about a plant.)

Herbarium specimens are also important as material for research. Many research projects use herbarium specimens, which allow for the comparison of plants collected in different places and at different times, rather than fresh plants.

Herbarium specimens are used:

- For comparison when identifying plants,
- As a source of data for research projects,
- As a record of the plants formerly growing in areas that have since been developed or changed in other ways, and
- As a record of how past botanists applied names and defined species.

## How Specimens Are Obtained

The Herbarium includes specimens contributed by many plant collectors (including Frank Meyer, mentioned above, and in the Director's letter on page 3) whose work in the late nineteenth and early twentieth centuries led to significant expansion of the foods, ornamentals, and industrial crops available to Americans. The collection also contains specimens from such illustrious historical figures as George Washington Carver and John Stuart Mill whose interests ran to more than political philosophy.

Since 1960, the emphasis of Herbarium acquisitions has mostly been related to plants, especially woody plants used in the landscape and nursery industries and their wild relatives. Adding to the Herbarium's collection is an ongoing process. Dr. Whittemore explains, "We [staff of the Arboretum] collect plant material to document our research and plant releases and to document plants now in the trade. When we collect duplicate specimens, we can exchange these with other herbaria that have specimens we want to add to our collection. And occasionally we

purchase or acquire collections when smaller herbaria are closed.”

Currently, the Herbarium has specimens from all groups of plants and all parts of the world, but it is strongest in two areas: cultivated plants, especially landscape and garden plants of the eastern United States, and woody plants of temperate North America and Eurasia.

### Keeping the Collection Safe

To keep the specimens from degrading, conditions must be carefully controlled, especially to guard against insects, which can destroy a collection. All dried plant material brought in to the Herbarium must be pressed and dried and then labeled and mounted. Any time dried plant material has been outside the Herbarium, it is frozen at  $-80^{\circ}\text{C}$  before it is put back in the collection, just in case an insect has



laid eggs on it. The rooms are kept at  $60^{\circ}\text{F}$  and 50% humidity to control the growth of insects and fungi, and they are inspected periodically for problems. A nonflammable gas, rather than water, is used for fire control. When they are well maintained and protected from threats, herbarium specimens remain useful for centuries.

**Left:** This *Humulus lupulus* (common hop) specimen was collected by the famous plant explorer Frank Myer in China in 1914.  
**Top:** *Ulmus davidiana* collected in Maryland in 2011 by Dr. Alan Whittemore, who manages the collections of the USNA Herbarium  
**Right:** Chinese chestnut (*Castanea mollissima*) leaves and nuts collected during a 1980 collection expedition in China.



## Benefits for All

Centuries of inbreeding left commercial coffee plantations vulnerable to disease, and by the 1950s, plant diseases threatened the crop worldwide. Frederick Meyer, the Herbarium's manager from 1959 to 1991, traveled to southwestern Ethiopia where coffee originated and collected an array of wild coffee plants. Coffee breeders, armed with this genetically diverse collection of coffee, were able to develop a hardier, resistant plant. Today, an important research project of the Herbarium involves investigating the diversity of ash trees to help direct conservation of this valuable tree while the search continues for a defense against the emerald ash borer, which is threatening to kill most of the eight billion ash trees in North America. These are just two examples of the Herbarium's contribution to the health of the world's plants and, ultimately, to the benefit of society. 🌱

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## Profile: ALAN WHITEMORE

Alan's interest in botany began in his native state of California and on family trips to British Columbia. During his undergraduate years at the University of California at Davis, he worked at the University's arboretum and herbarium to supplement his class work. After earning his BS degree in chemistry and botany, Alan chose to focus on botany and received his Ph.D. from the University of Texas at Austin in 1987.

He spent thirteen years in Missouri, first at Washington University in St. Louis (WUSTL) doing genetic research on several species of oak, then at the Missouri Botanical Garden where his main project was the *Flora of North America*, a multi-volume reference guide for which he wrote treatments and assisted with editing. He also participated in several foreign collecting expeditions and taught evening classes at WUSTL. In 2000, Alan came to Washington, D.C. to become the research taxonomist in the USDA's Floral and Nursery Crop Research Unit and manager of the Herbarium at the U.S. National Arboretum.

Alan carries out research on the taxonomy and evolutionary genetics of various groups of woody plants, primarily the oaks and hackberries, and has published research on twenty different families of flowering plants. In addition to the United States, his fieldwork has taken him to Mexico, Belize, Kazakhstan, Armenia, China, and the Russian Far East. He is currently editor-in-chief of *Systematic Botany*, the journal of the American Society of Plant Taxonomists.

While having to juggle many projects at once can sometimes be a challenge, Alan says the most satisfying aspect of his work is "being able to ask different biological questions and getting answers."



PHOTOS COURTESY OF USNA.