

T.M. Sperry Herbarium

2013 Annual Report

Department of Biology
Pittsburg State University

From the Director, Dr. Neil Snow

I commenced as Director of the T.M. Sperry Herbarium in August of 2013 as an incoming Assistant Professor of Biology. It is an honor to take the reins of this important facility. I hope to make the herbarium a more useful facility for undergraduate and graduate students, faculty, municipal planners, environmental consultants, and the public at large.

Annual reports are not an entirely new tradition. In 1989 and the early 1990s, Dr. Steven Timme produced several "Annual Herbarium Activities Reports." This followed many years after probably the first substantive paper on the herbarium, entitled *The Kansas State Teachers College Herbarium*, by Sperry, written for *The Educational Leader* in 1951.

The goal of the Annual Reports will be to summarize activities in the Sperry Herbarium to our many students, faculty, alumni, and professional colleagues.

I want commend the excellent assistance provided in the herbarium from undergraduate students in 2013. These included **Samantha Young**, who graduated in December 2013, and is now working on her MS degree here at Pitt State, and **Susan Martin**, who is studying Construction Management with an emphasis in Building Information Modelling. Both have continued working during the Spring semester.

Herbarium Background: The T.M. Sperry Herbarium was founded in 1946 by its namesake, Dr. Theodore M. Sperry, a Professor of Biology at Pittsburg State University from 1946– 1974. Ted, as he was known by

colleagues and friends, was active in the Biology Department at Pittsburg State University until his passing in 1993.

The State Grass of Kansas, Little bluestem
(*Schizachyrium scoparium*) (Photo: Matt Lavin)



The Herbarium's official 3-letter abbreviation in *Index Herbariorum* is **KSP** which at one time stood for Kansas-State-Pittsburg.

Herbarium size: Current estimates are of about 60,000 specimens. Given the number of cabinets (44), approximate average number of specimens typical in cabinets and that most cabinets are > 80% or full, and estimates of unmounted and unaccessioned bryophyte

packets in several dozens of boxes, the figure of 60,000 figure seems reasonable.

The previous Director, Dr. Timme, was a bryologist (mosses, liverworts, and hornworts), and the collections of bryophytes may be 5,000 or greater. Our bryophytes in the process of being digitized (label data photographed and then converted into a digital format) by bryologists at the Missouri Botanical Garden.

Current Herbarium Organization: It is uncertain exactly what family classification scheme KSP has been using, but it is similar to one developed by Dr. Arthur Cronquist and was codified into his 1981 magnum opus "*An Integrated System of Classification of Flowering Plants*". Families are filed phylogenetically, based on perceived evolutionary relationships, an approach that will be continued.

We are currently reorganizing the collections at the familial level to follow (in most cases) the classification of **the Angiosperm Phylogeny Group III (APG III)**, as codified by Dr. Peter Stevens at the Missouri Botanical Garden (see: <http://www.mobot.org/MOBOT/Research/APweb/welcome.html>)

As of January 2014, and in accordance with APG III, the Sperry Herbarium includes about 175 vascular plant families. However, based on our analysis, approximately 25 families need to merged (or partially merged) into other families, or split apart (or partially split apart) into smaller families. We have not yet assessed the bryophyte holdings.

Funding for Sperry Herbarium: Snow's appointment at Pitt State was supported generously with start-up funding from the "K-INBRE", the Kansas Ideas Network for Biomedical Research Excellence" (grant no. P20 GM103418, from the National Institutes of Health). The majority of this support has been directed at enhancing the herbarium. It has enabled us to purchase a large number of badly needed items and supplies to help update KSP,

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including many recently published volumes that are useful or nearly required to reliably identify plants regionally.

Acid-free genus folders and species covers: Since most genus folders were not of archival quality, we purchased several thousand new genus folders and species covers.

Biogeographic subdivisions: Most herbaria of any significant size use variously-colored folders to differentiate between geographical areas. This approach is just common sense, because nearly all herbaria have a local geographical focus and other focal areas representing interests of the faculty and/or collaborative projects in other areas.

The geographical focus of KSP is southeast KS and the adjacent 4-State region (see below Kansas and Regional Reference Collection).

However, KSP has many important holdings from elsewhere, given past activities of curators, students, and other workers. We are thus differentiating collections geographically as follows. **Manila:** Collections from Kansas. **Green:** Specimens from North America north of Mexico, exclusive of Kansas. **Yellow:** Collections from MesoAmerica (Mexico and all lands south, including the Caribbean). **Red:** Specimens from the Old World.

Species from Kansas and North America will all have their own labeled folders. Subspecies or varieties in most cases will be not subdivided with extra folders.

Genera from the Meso- and South America (yellow) and the Old World (red) will have folders made at the generic level only. These will be placed at the top of the respective genera, given that species will be filed alphabetically by genus according to plain (KS) or green (North America) folders. Thus, a worker wanting to look at specimens of *Astragalus* (locoweeds) might first find a yellow folder, a red folder, followed by species of

Astragalus filed alphabetically by Kansas (manila) and North America (green). Specimens of the sunflower *Helianthus maximilliani*, for an example from the sunflower family, will be first found in plain folders (KS), followed by green folders (N. America).

Kansas and Regional Reference Collection (KRRC). The Director was first introduced to a Reference Collection at the Rocky Mountain Herbarium at the University of Wyoming in 1987 when he began his master's degree program. A Reference Collection is a stand-apart collection of one quality specimen of each taxon (species, subspecies, and varieties) known to occur in a given region.

Specimens in a Reference Collection all have been carefully confirmed by specialists or the Director, Curator, Collections Manager, or taxonomic specialist.

By having all taxa from one region together in a few cabinets, the Reference Collection will ***greatly expedite the process of making identifications***, because many species must be compared against authenticated herbarium material to be confident of the correct determination. In other words, a person need not get up and down and return, in and out, to the main collections, grabbing one or a few folders at a time, and bringing them to the dissecting table. Rather, a good representative of all taxa are in one location.

The KRRC presently occupies the first cabinet one encounters entering KSP, about 200 specimens. We hope to have augmented that to 500 by the end of 2014.

The KRRC is for anybody to use! Come by and take it for a test drive.

Adding specimens to the KRRC: One might think that adding representatives to the KRRC is simply a matter of pulling specimens from the main collections. In reality it is more complex.

First, one must search for a high quality specimen that shows the key diagnostic features of that species plainly, such as those (typically) found on flowers and/or fruits. The specimen then must be run carefully through a local dichotomous key to the identification.

Next, a separate but small piece of paper is attached with a paper clip to the specimen that indicates its proper scientific (= Latin binomial) name, one or more of its (locally) common names, whether it occurs in KS, AR, MO, and OK, and whether the taxon is native or non-native to North America. The data is then entered into a database, and a folder and species cover made for that species.

We calculated an average of about 15 minutes for each plant specimen to be pulled from the main herbarium collections, checked for accuracy, making a KRRC label, and placing into the KRRC. At nearly 200 specimens as of this writing, that equates to about 50 hours of work.

When I was the Curator previously at the University of Northern Colorado in Greeley, we also established a Reference Collection. It was and still is used frequently by students in plant taxonomy, graduate students, local consultants, and botanists and land resource managers.

To reiterate, the KRRC is available to anyone with a legitimate need or interest in confirming the identifications of their plant specimens. Although still in the incipient stages, with only about 200 species thus far added, it will soon be an important outreach component of the T.M. Sperry Herbarium.

By the Numbers: 2013 accomplishments

Plant specimens mounted and added to the main collections or KRRC: 607. This included specimens from many states, Madagascar, Australia, Namibia, South Africa, and Peru.

Herbarium specimen labels made: 61

Specimens received as a gift for research: 136
These all were species of Myrtaceae (Myrtle family) from the Missouri Botanical Garden originating in Madagascar for Snow's research. Unidentified specimens sent to a taxonomic specialist for his or her retention – as in this case -- are called “**gifts for dets**”, or “This is a gift specimen in exchange for you eventually **determining** (and telling us) the specimen's correct identification”. Gifts for dets are common among herbaria.

Specimens received as a general gift: 3

Specimens shipped to KSP for research: 442.
These were for the Director for research in the grass family from Arizona State, University of Arizona, and the Botanical Research Institute of Texas. All were annotated and returned in 2013.

Specimens annotated: 1730.
Annotating means verifying or (more commonly) correcting or updating some aspect of the specimen's identification, plant family, or taxonomic name. Annotating a given specimen can take as little as 20 seconds or up to an hour, if one knows the plant is misidentified and it is in a difficult group of plants or a group with many (sometimes dozens of species).

Families curated intensively: 5.
With the help of (then) undergraduate Samantha Young, we moved many genera formerly included in Scrophulariaceae into their newer families. These specimens represent one full herbarium case. The families now well curated (although not all specimens have been checked for their proper identification) are Scrophulariaceae, Phrymaceae, Plantaginaceae, Orobanchaceae, and Linderniaceae.

Specimens sent on loan: 38. Specimens of *Rubus* (blackberries and related species) from our general area were sent to Iowa State University at their request for taxonomic study.

Specimens refrozen: 1153. Many cabinets or specimens lying about before Snow took over as

Director showed signs of insect damage (notably the presence of frass, or insect feces). These were deep frozen (-35 F) for a minimum of 3 days, and sometimes up to a week.

Specimens conserved: 2. Conservation in a herbarium refers to re-mounting a specimen onto better quality paper, or making other changes for preservation purposes, when a specimen clearly is deteriorating.

Specimens geo-referenced: 35. Geo-referencing is the process whereby specimens are given geo-coordinates for their locality (longitude, latitude). As museum and herbarium science has become increasingly data based and digitized, a collective desire for geo-referencing has emerged in the scientific community.

Since these data all eventually go online for anybody in the world to review or use, researchers expect the best estimation possible for latitude and longitude. For example, an older specimen label might indicate “A few miles west of Pittsburg on Highway 126”.

That level of detail is no longer an acceptable description of location to most workers. Rather, they expect geo-coordinates on the specimen with some indication of a confidence interval, typically expressed as a radius in meters or kilometers. Fortunately, the past 20 or 30 years most workers have routinely included latitude / longitude indications on their specimens.

Estimated backlog of specimens: 9,500. At the end of 2014 KSP still had 93 (!) unopened boxes of unprocessed specimens, many of which are bryophytes (mosses, liverworts, hornworts).

Number of returned loans: 1. A long-overdue loan of five specimens was returned to the University of Alabama.

Specimens readied for exchange: 787. These are all duplicate specimens of bryophytes, which have been set aside for exchange with the herbarium at Kansas State University. They have

not been mailed because the Director will visit K-State soon and will deliver them personally.

Specimens de-accessioned: 104. Some of these specimens had never been formally accessioned. These included partially mounted specimens (e.g., lacking collection labels) that had been sitting outside of cabinets for some period and which had sustained serious insect damage. Others were de-accessioned for exchange. Still others were trashed because they were sterile (no flowers or fruits) and were common species of our region. Others were student collections made for classroom requirements that were sterile twigs.

Papers published: One paper cited specimens from the Sperry Herbarium:

Snow, N., P.M. Peterson, K. Romaschenko. 2013. Systematics of *Disakisperma* (Poaceae: Chloridoideae: Cynodontae). *Phytokeys*: 26:21-70. doi: 10.3897/phytokeys.26.5649

Thesis completed in 2013 at KSP:

Baskett, M.L. 2013. A comparative study of moss species on three rock substrates in Montgomery County, Kansas. M.S. thesis, Pittsburg State University.

Dissemination of geographical data: First or otherwise undocumented county records for Kansas and neighboring states were sent to Dr. John Kartesz at the University of North Carolina for inclusion in the Biota of North America (BONAP), an interactive online summary of plant distributional data: <http://bonap.net/tdc>. We did not keep close track of how many, but a dozen or so is a realistic estimate.

Other general information

Removal of insecticide packets: Most herbarium cabinets had 1 or 2 packets of the insecticide "dichlorvos" (2, 2-dichlorovinyl dimethyl phosphate) hung in them in April of 1979. Whereas nearly all cabinets have some lingering

aroma, some retain a much more potent stench, which is not only nauseous, but also probably unhealthy.

Many health-related effects are known from long-term exposure to 2, 2-dichlorovinyl dimethyl phosphate. Concerns have been raised more than once nationally because it can be absorbed through all routes of exposure. And although consideration has been given more than once to its removal, the US EPA has never been banned the substance.

Herbarium tours: Do you know an educational or civic group (school children, scouts, etc.) that would enjoy a herbarium tour? If so, contact the Director. We'll work with you to tailor a presentation to your group's interests.

Herbarium PR. Based on extensive collaborative work between researchers in the USA, Madagascar, and the United Kingdom; an excellent color photograph captured by David Rabehevitra in Madagascar (below); and some plain old good fortune, a species newly described by the Director from Madagascar in 2012 was given a designation of being one of the "Top 10" new species for 2013 by the **Arizona State University International Institute for Species Exploration**.

The species, *Eugenia petrikensis*, was given this honor. The "Top 10" recognition led to requests for interviews of Dr. Snow from KSN Television in Joplin, Missouri, and the *Joplin Globe*.

The take-home message from this "Top 10" recognition is simply that new discoveries in biodiversity are happening constantly around the world, at staggering rates that only rarely reported by general news outlets.

In 2012, for example, 19,232 new (to science) species of organisms were described worldwide. Thus, *Eugenia petrikensis* was but one of many. Other newly "discovered" species since then include saltwater (Australia) and

freshwater (Brazil) species of dolphins. We are glad to have gained the recognition.

Eugenia petrikensis N. Snow & Randriat., new from Madagascar. The magenta flowers have 4 petals and are quite small. (Photo courtesy of David Rabehevitra)



Goals for 2014

As indicated above, we hope to increase the number of specimens in the KRRC to 500, which will represent only about 25% of the known species in Kansas, let alone some that occur in counties near southeast Kansas.

Sam Young, who began her MS degree in Spring semester 2014, is assisting with the process of identifying specimens for the KRRC.

Specimen digitization

The word “digitization” means more than one thing in a herbarium. Initially, prior to about 10 years ago, it implied entering specimen data into a database, and working to have that data

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uploaded to international data aggregators like the **Global Biodiversity Information Facility (“GBIF”)** in Copenhagen.

However, many institutions now take high-resolution digital photographs of each specimen (up to 25 MB per image) and upload these for all to see. Virtually all institutions do this, as a matter of priority, for their (nomenclatural) type specimens.

We are working with SilverBiology to identify a good option to digitize our specimens effectively, and hope to purchase the necessary equipment in the coming months. Next Fall we hope to commence the digitization process.

Hot off the press, and as an example of how digitized specimen data can be used in scientific research, the paper cited below used online digital images from California to test various hypotheses of species distributions. It is a good example of why herbarium specimens are so valuable, and how they can be used more widely if the data are accessible online.

Anacker, B.L., S. Y Strauss. 2014. The geography and ecology of plant speciation: range overlap and niche divergence in sister species. Proc. Royal Acad. Sci B: 281. <http://dx.doi.org/10.1098/rspb.2013.2980>.

Herbarium closure for Summer 2014

Finally, we must point out that the Sperry Herbarium will be inaccessible from late April to early or even mid-September 2014 due to renovations in Ross Hall.

Researchers needing loan material should request it no later than mid-March of 2013.

Small Herbarium Collections workshop

Dr. Snow has been invited to give a paper at a small herbarium collections workshop, sponsored by NSF, in April at Central Michigan University. We will report on that next year.