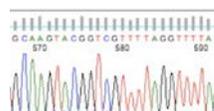


Fall 2015

Renovation: NSF-funded overhaul



p.2

NSF funding is being used to:

- Validate viability and purity
- Re-identify all 7,000 yeasts by ribosomal sequencing
- Expand the database and website

Remote archive



p.2

New acquisitions



p.3

The Phaff collection continues to grow through in-house research, and deposit of strains from external sources.

Source habitats



p.4

Phaff collection yeasts came from an enormous range of locations and habitats.

Museum Day; Visiting scientists



p.5

- International visitors advance research at the Phaff collection.
- February 13, 2016: UC Davis Museum Day!

Curator contact:
Kyria Boundy-Mills
klbmills@ucdavis.edu

"Composition with *Geotrichum*,
Sporidiobolus, *Cryptococcus*,
Pichia and *Rhodotorula*"
Yeast on agar, by Lauren Enriquez (2015)



Inspired by:
"Composition with Large Red Plane, Yellow, Black, Gray, and Blue"
Oil on canvas, by Piet Mondrian (1921)

Preserved for Innovation

For over 100 years, yeasts isolated by University of California researchers have been preserved for discoveries of tomorrow.

The Phaff collection continues to serve academic, government agency and industry researchers by providing access to a broad diversity of yeast cultures. The collection contains over 800 of the 1600 currently known yeast species, plus at least 100 novel species, collected in large part by Herman Phaff (1913-2001) and other University of California researchers. The collection consists of environmental isolates from all seven continents plus several oceans, and a broad host range including hundreds of plant, insect and animal hosts. In addition, enormous volumes of characterization data have been collected and databased, including utilization of nutrients and tolerance of stress such as high temperature or high salt.

Collection curator Kyria Boundy-Mills has worked with the collection since 1999. She is available to assist you with selecting the best species and strains for your research needs.

Phaff collection renovation

With funding from the National Science Foundation, the Phaff collection is enjoying a renewal and revitalization! This project involves validating the viability and species ID of all 7,000 yeasts in the public catalog, preparing a stock for off-site preservation, and making several decades of unpublished data available to the scientific public.

Over 7,000 stocks in the public catalog are being re-identified using modern DNA sequencing methods. About 10% of the species names are being changed based on these results, to match modern taxonomy requirements.

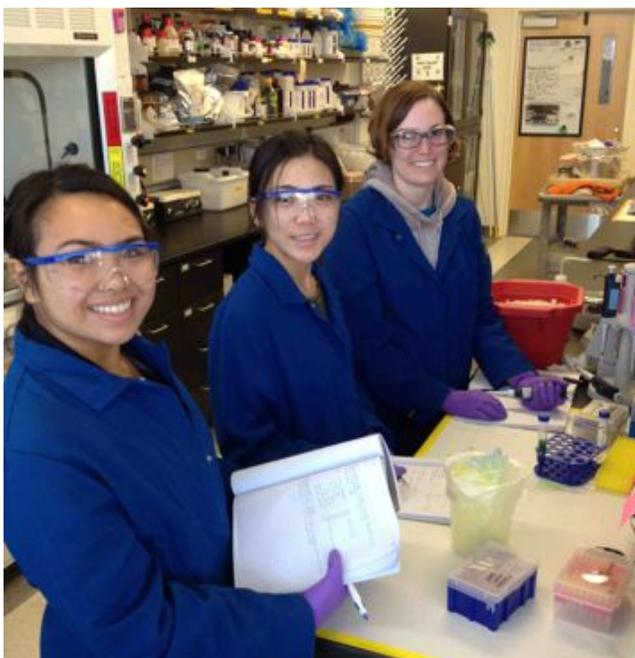
Additional stocks of the yeasts are being archived off-site, at a cryopreservation facility run by USDA in Colorado.

A new database and website are in preparation. This database will include several decades of growth characteristics data collected by Herman Phaff. Access to these data is particularly useful, as the dozens of traditional chemotaxonomic tests that were formerly used to identify and characterized yeasts are no longer routinely performed. These tests include growth on dozens of carbon sources, nitrogen sources, temperatures, and stress conditions such as high sugar, high salt and high and low temperatures.

REMOTE STORAGE

Now that over 4,000 of the yeast strains in the Phaff Yeast Culture Collection are archived off-site, in Fort Collins, Colorado, the Phaff collection curator sleeps much better at night.

In October 2015, the US Culture Collection Network met at the National Center for Genetic Resource Preservation (NCGRP), operated by USDA in Fort Collins, Colorado. This facility serves as a repository for biological materials important for US agriculture, including seeds and shoots of cultivated crops and their wild relatives. Several years ago, they expanded their mission to include microbes held in public US collections. Microbes from several US microbe collections, including 4,000 strains from the Phaff Yeast Culture Collection, are archived at this facility. They are stored in liquid nitrogen, vapor phase, which has been shown to be superior for long-term storage of most yeast species.



Undergraduate students and technicians are learning valuable skills including cultivation of numerous species of yeasts, PCR, DNA sequence analysis, and database management.



Phaff collection curator Kyria Boundy-Mills visited the NCGRP facility in Fort Collins, Colorado. This liquid nitrogen tank contains roughly 20,000 microbes from several public culture collections, including 4,000 from the Phaff collection.



Announcing: New additions

The Phaff collection continues to expand through research activities performed by collection personnel, and by acquisition of strains from other researchers and collections. In 2015, the collection acquired over 100 homozygous strains of *Saccharomyces cerevisiae* that were constructed for a genome sequencing project by John McCusker of Duke University.

Literature reference for these yeast strains: Strobe, P. K.; Skelly, D. A.; Kozmin, S. G.; Mahadevan, G.; Stone, E. A.; Magwene, P. M.; Dietrich, F. S.; McCusker, J. H., The 100-genomes strains, an *S. cerevisiae* resource that illuminates its natural phenotypic and genotypic variation and emergence as an opportunistic pathogen. *Genome research* 2015, 25 (5), 762-774.

The yeasts are arrayed in 96 well format to make screening and comparative projects simpler.

Other recent additions include:

- Type strains of *Dipodascus curatus*, *D. antiquus*, *D. oceanicus*, *D. vulcanicus*, *Kazachstania kunashirensis*, *K. martiniae*, *Lachancea quebecensis*, and *Arthroascus fermentans*
- Pectinolytic yeasts isolated from olive fermentations

Contact Phaff collection curator Kyria Boundy-Mills at klbmills@ucdavis.edu for more information.

Yeast culture collection symposium

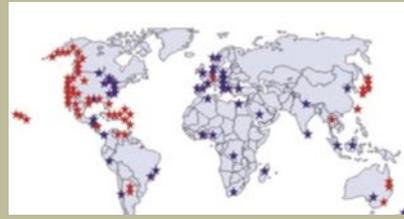
In September 2015, Phaff collection curator Kyria Boundy-Mills and DBVPG curator Pietro Buzzini co-chaired a session on yeast culture collections at the 32nd International Specialized Symposium on Yeasts in Perugia, Italy. Curators of several yeast collections, including Boundy-Mills, presented information about some of the leading yeast collections to the attendees of this conference. The presenters are writing up the highlights of this session for publication.

After the conference, Boundy-Mills was given a tour of the DBVPG yeast collection at the University of Perugia, Italy by UC Davis alumna Ann Vaughan-Martini. Like the Phaff collection, the DBVPG collection is a university-based collection, accumulated through many decades of research by academic personnel, and contains many environmental and food/beverage isolates. The DBVPG collection is housed in very historic facilities, a former monastery.



Examples of sources:

- **Fermented foods and beverages**
- Wine, baking and brewing strains
- Heirloom wine strains dating back to the 1890s; many from 1930s and 1940s
- Spoiled beer and wine
- Traditional foods and beverages (bantu, tsugino, sambul ulele)
- Fermented foods: sausage, sauerkraut, wort, yogurt, olives, pickles, coffee beans
- Food processing facilities: wineries, breweries, dairy, tapioca, dried fruit
- **Fruits and vegetables**
- Apple, apricot, banana, cherry, date, fig, grape, kiwi, orange, papaya, passion fruit, pear, pineapple, plum, prune, raspberry
- Cabbage, hazelnut, lima beans, mustard seed, olive, soybean, tomato
- Fruit juices: apple, cider, black currant, orange, lemon, grapefruit, peach, prune. Grape juice, pomace and must.
- **Other foods and beverages**
- Dairy products: cream, cheese, butter, buttermilk, yogurt
- Macaroni, sourdough bread, soft drinks, sweetened condensed milk, honey
- Meats: Ham, sausage, hot dogs, frozen salmon
- **Plants**
- Dozens of flowers from Allium to Zinnia
- Dozens of tree species including alder, aspen, bay, birch, chestnut, cottonwood, dogwood, elm, eucalyptus, fir, hemlock, holly, magnolia, mesquite, oak, pine, poplar, spruce, willow and many more
- **Animal dung and feces**
- Brown bear, calf, cow, elephant, giraffe, hare, hippopotamus, horse, marmosa, moose, penguin, pheasant, sheep
- Frass from many insect species
- **Dozens of shrubs and grasses including:**
- Wisteria, sugar cane, Spartina grass, Cheirodendron, Rhododendron and more



Geographic diversity

Insects

- May beetle species, many bee species, cockroach, several *Drosophila* species (including *D. suzukii*), lacewing, mites, nereid fly, olive fly, rhagium, wasp
- Insect frass in infested trees
- Anthill, bark-beetle infested wood, *Drosophila suzukii*-infested fruit, olive fly-infested olives, wasp nest

Crustaceans

- Brine shrimp, copepod, lobster, shrimp

Dozens of cactus species including:

- Agave, Agria, Carnegiea (saguaro), Lophocereus, Opuntia, Pachycereus, Rathbunia, Stenocereus

Other environmental and industrial habitats

- Water from oceans, rivers, creeks, salt and fresh lakes, swamp, pond, Antarctic sea, hot springs, glaciers
- Army textiles and supplies (1944 study)
- Air, sewage sludge, wood pulp
- Crude oil, old ore mine
- Soil from many continents
- Tanning liquor

Animal isolates

- Horse tumore, pig digestive tract, trout lower gut, red deer small intestines, mare uterus, bovine fetus

Clinical isolates

- Cerebrospinal fluid, colostrum, sputum
- Dandruff, dental caries, feces
- Hair, tonsils, vagina, lung tissue
- Polio vaccine

PHAFF YEAST CULTURE COLLECTION
University of California Davis
Curator: Kyria Boundy-Mills
Email klbmills@ucdavis.edu

<http://phaffcollection.ucdavis.edu>
7,000 strains in the public catalog
850 different species
Preserved for Tomorrow's Discoveries



Mark your calendar!

On **February 13, 2016**, the Phaff collection will be participating for the first time in the 5th Annual UC Davis Biodiversity Museum Day. This annual public outreach event, which draws up to 1,000 people to campus, will

showcase eleven campus museums, including:

- Anthropology Collections
- Arboretum
- Bohart Museum of Entomology
- Botanical Conservatory
- California Raptor Center
- Center for Plant Diversity
- Häagen-Dazs Honey Bee Haven
- Museum of Wildlife & Fish Biology
- Paleontology Collections
- Phaff Yeast Culture Collection

The Phaff collection displays and activities will be located in a classroom in the Earth and Physical Sciences Building, next door to the Paleontology exhibits. Planned exhibit themes will include:

- What are microorganisms? What is microbiology?
- What are yeasts?
- Yeasts in fermented foods and beverages
- Yeasts in research
- Phaff Yeast Culture Collection history and contents
- Phaff collection research
- Yeast Love (because the event is the day before Valentine's Day!)

Watch for more information, including a map of exhibits and hours, at the Museum Day website <http://biodiversitymuseumday.ucdavis.edu>, on Facebook under UC Davis Biodiversity Day, and Twitter @BioDivDay.

Visiting scientists

International experts work at Phaff collection

In 2015, the Phaff collection was honored to host two visiting scientists who focus on food and beverage fermentations.

Dr. Luca Cocolin was a postdoc at UC Davis in the laboratory of Dr. David Mills 1998-2001. He is now a prominent professor in the Microbiology and Food Technology Sector, University of Turin, where he studies food microbiology. He and his wife Kelly Rantsiou (also an alum of the Mills lab) spent 10 weeks in Davis on a mini-sabbatical. Luca worked in the Boundy-Mills laboratory studying olive fermentations, performing initial work to develop starter cultures to control fermentations. He utilized numerous yeasts from the Phaff collection for this work, including yeasts isolated from olives in the 1970s by Food Science professor Reese Vaughn. Although his visit was brief, he was able to characterize several properties of potential olive starter cultures including killer activity and stress tolerance, and also started some pilot fermentations of olives.

Dr. Elda Vitanovic of the Institute for Adriatic Crops in Split, Croatia is in Davis for nine months as a Fulbright Scholar. She is working with Entomology professor Frank Zalom and with Boundy-Mills on several projects related to olive fermentations and control of agricultural pests that affect olives.

Thanks to Luca and Elda's knowledge about olive cultivation and processing, their valuable skills helped to jump-start a project recently funded by the California Department of Food and Agriculture to develop starter cultures to control fermentations and reduce spoilage of California olives.

