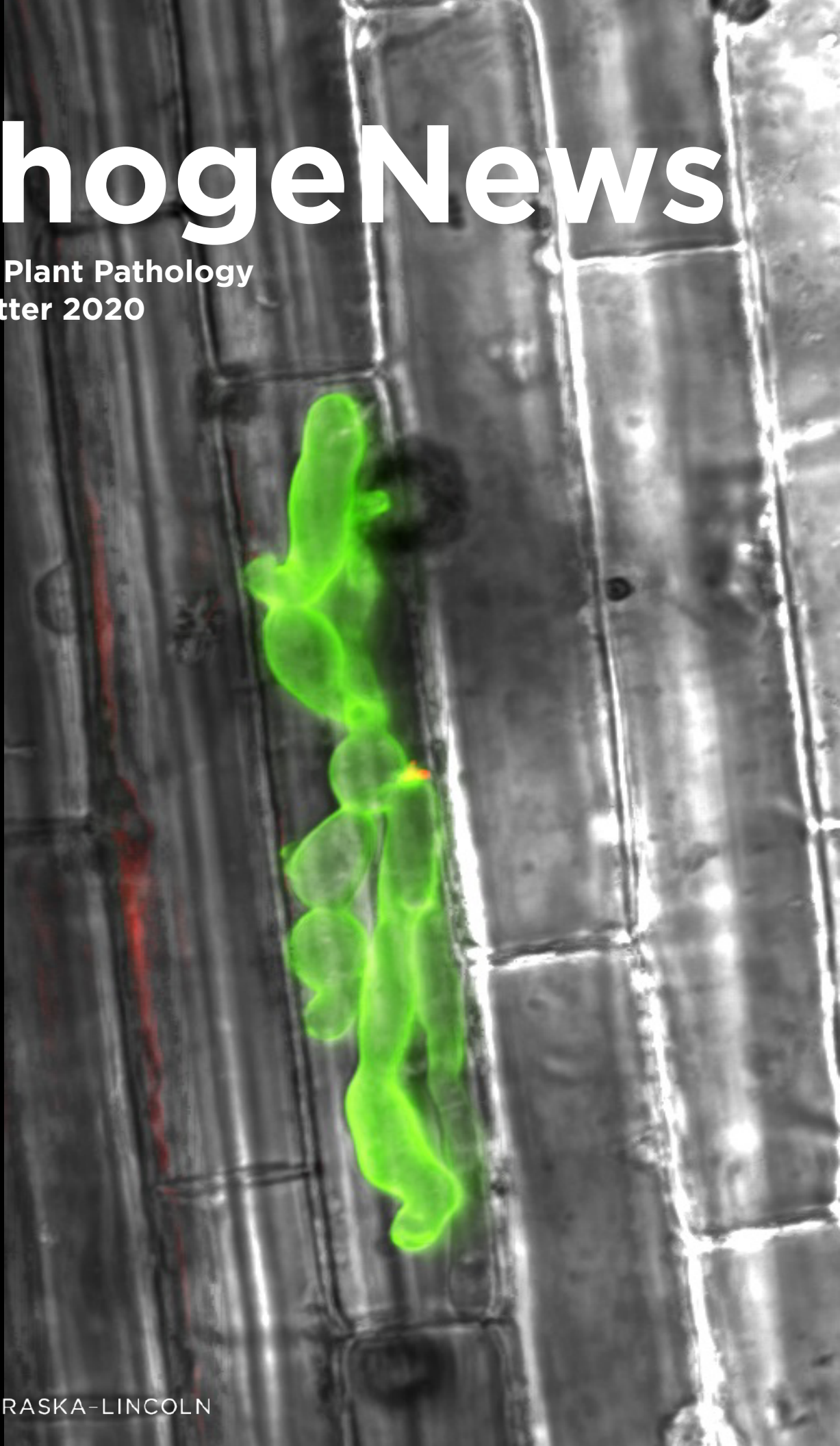
PathogeNews

Department of Plant Pathology
Annual Newsletter 2020



1920 2020
DEPARTMENT OF PLANT PATHOLOGY
100 Years of Discovery, Innovation, and Outreach

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UNIVERSITY of NEBRASKA–LINCOLN

WE ARE NEBRASKA

In the Department of Plant Pathology, we are **MAKING AN IMPACT** on a **GLOBAL LEVEL** by working to **SOLVE CHALLENGES** associated with microbial interactions affecting **SUSTAINABLE** plant productivity while training the **NEXT GENERATION** of basic and applied scientists.

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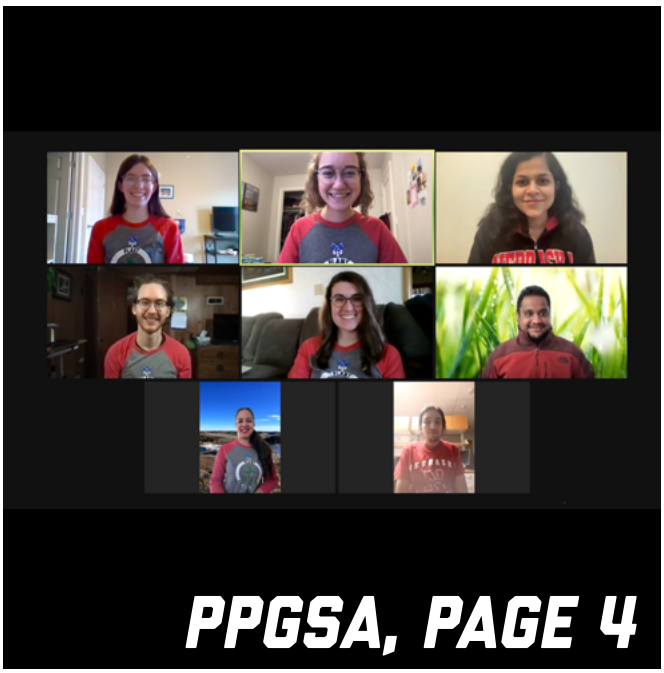

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Front cover photo:
Photomicrograph showing the fungal hyphae of *Magnaporthe* in green growing inside of a rice leaf cell. The yellow dot is a compartment on the fungal hyphae where plant-interacting effectors accumulate before secretion into the host.
Credit: Dr. Richard A. Wilson

PathogeNews is an annual publication from UNL's Department of Plant Pathology.
Editor & Designer: Madilyn McKay
Editor: Amber Hadenfeldt

All Committee Highlights were written by each respective committee. All photos are from faculty and staff within the department, or from the UNL digital photo archive.

Letter

FROM THE HEAD OF THE DEPARTMENT
DR. LOREN GIESLER

Greetings from the Department of Plant Pathology at the University of Nebraska-Lincoln. 2020 was a year to remember with all that happened on our department's centennial year. Interestingly enough, the department formed the year after the influenza pandemic of 1918-1919. Hopefully, we will be able to celebrate in person in 2021, one year after the COVID-19 pandemic that has changed all our lives.

This year we are providing summaries of our department's main committees and teams with one faculty spotlight of our most recent fully promoted member (Dr. Rich Wilson). All of our faculty have amazing programs and do work in basic to applied research, translational research, teaching, and extension outreach. You will see activities by all our faculty throughout. Our plan is to rotate our publication annually to feature committees and teams and faculty labs every other year.

It is hard for me to believe that I completed my second year as head of the department in 2020. I have become more comfortable in my role over the past year and completed a year of leadership training in the LEAD 21 program.

Our faculty, staff, and students all have amazing achievements across our field of science. Below are a few points to highlight from 2020.

- Dr. Hernan Garcia-Ruiz was granted tenure and promoted to associate professor in July.
- Our department graduated 4 graduate degrees with 1 M.S. and 3 Ph.D.
- Our students were recognized with 14+ local and national awards.
- Faculty were honored with 5 awards from state to international groups.
- Technologist Becky Higgins received the Lambrecht Award – an endowed foundation award in memory of Patricia Lambrecht (Technologist for Anne Vidaver)
- Debbie Pedersen retired as our extension office associate in December after 28 years of service.
- Our new office staff evolved into a well-functioning team with graduate program coordinator Madilyn McKay and our main office administrative associate Amber Hadenfeldt completing their first year.
- Dr. Bob Harveson completed a compilation of the history of our department "A Century of Plant Pathology in Nebraska."
- Faculty secured over 2.1 M in funding to support their programs in research and extension.
- In January of 2020, our department graduate program was fully approved. Our first student in the program started in August.

While the pandemic did stifle our planned centennial celebrations, our faculty, staff and students charged forward and continued to make great progress in their research and educational programs. My hope is that all of our friends and alumni are continuing to be safe and adhere to guidelines to maintain all of our safety and health. Throughout the pandemic, UNL has put the health and safety of everyone in our community first. Our amazing department will continue to advance our science and emerge even stronger as a result of the challenges that 2020 offered.

Wishing you all the best in 2021!

Loren

Letter

FROM THE PLANT PATHOLOGY GRADUATE STUDENT ASSOCIATION PRESIDENT, ABIGAIL BORGMEIER

The Plant Pathology Graduate Student Association (PPGSA) consists of both students enrolled in the plant pathology department and other interested students working closely with the department. We have a wide variety of students working on projects from all areas of plant pathology. Our students come from Agronomy & Horticulture, the School of Biological Sciences, and Complex Biosystems. We also invite undergraduates to participate in events to further their interest in plant pathology and network with invited speakers. During a year that necessitated creativity to stay connected, PPGSA moved all events to a virtual format, but that hasn't stopped us from engaging with the faculty, other students, and industry contacts.

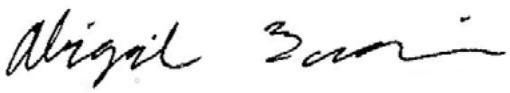
The Second Annual Elevator Speech Contest was an enormous success despite being moved to an online format. The Elevator Speech Contest is a collaboration between the plant pathology, agronomy, and entomology departments which gives students the opportunity to practice communicating their research in three minutes or less. There were several participants from PPGSA, and three members were part of the contest's final round.

In addition to collaborating with students from other departments, PPGSA has continued hosting a monthly faculty-student engagement lunch. These lunchtime talks invite members of the plant pathology faculty or other university members to discuss topics that enhance students' professional development, such as writing grants, setting up an effective experiment, and connecting with industry members.

In November, PPGSA members had an exciting opportunity to virtually tour Corteva and learn about the many different jobs and careers available with the company. Attendees heard about the role of pathologists in the seed company, toured the diagnostics lab, and learned about the phytosanitary measures necessary in a large-scale inoculation production lab. Perhaps the most valuable part of the experience was the chance for students to ask current industry members about their career and how they, as students, can prepare for a position in industry.

This next year, the club looks forward to hopefully returning to some in-person events and continuing these events and activities to increase professional development and engagement with the department. If there is any interest in participating in a PPGSA event, please reach out to the PPGSA president.

PPGSA President,
Abigail Borgmeier



PPGSA IN ACTION

OFFICERS

President: Abigail Borgmeier
Vice President: Gabriella Martens
Treasurer: Michael Richter
Secretary: Katherine LaTourrette
GSA Representative: Natalie Holste & Asha Mane

Social Media Coordinator: Rosalba Rodriguez-Pena
Student-Engagement Lunch Coordinator: Sourav Pal

Above: PPGSA members wearing their Nebraska gear during a virtual social. Top, right: PPGSA held a socially distanced ice cream social while the weather was still warm
Photo credits: Abigail Borgmeier

COVID-19 HAS PRESENTED UNPRECEDENTED CHALLENGES for students to connect, not only with each other, but also with the University and Lincoln community. Conferences, community outreach, and UNL events were either cancelled or moved to an abbreviated online format. In response to COVID-19, PPGSA hosted several virtual events, such as monthly socials, to support increased connection between students while working remotely. They also hosted a panel to address questions undergraduates may have about the application and selection process of graduate school. The panel consisted of current plant pathology graduate students speaking about their own experience.

GROWING THE NEXT GENERATION OF PLANT PATHOLOGISTS

BY DR. SYDNEY EVERHART, GRADUATE COMMITTEE CHAIR

Graduate Chair, Dr. Sydney Everhart

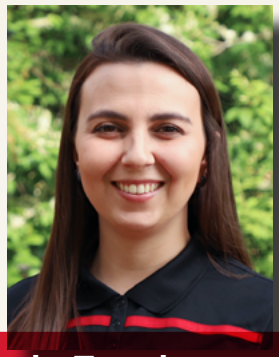
This was a historic year for our department, representing the centennial anniversary and launch of the graduate program in Plant Pathology. Training of the first plant pathologists in Nebraska started in 1884, when Charles Bessey came to UNL as professor in the Department of Botany and dean of the College of Agriculture and, 136 years later, UNL now offers the MS and PhD in Plant Pathology. You might be asking yourself, what took our department so long to create a graduate program? I had the same question and it was ultimately answered by Jim Van Etten, who related that although there was strong interest among our faculty to establish a graduate program in the late 80's or early 90's, the upper administration held the view that academic programs were consolidating and therefore did not approve of our interest to establish a new program. Although motivations were temporarily extinguished, the topic would continue to remerge but did not fully materialize until 2018, at which time our department had a record high number of faculty and graduate students.

In 2018, with support of the faculty and administration, Jim Steadman appointed a committee to propose the new graduate program. The committee was comprised of myself (chair), Gary Yuen (co-chair), and five other faculty: Amit Mitra, Hernan Garcia-Ruiz, Loren Giesler, Rich Wilson, and Tamra Jackson-Ziems. After our proposal obtained support from the Department of Agronomy & Horticulture and the School of Biological Sciences, it was subsequently reviewed and approved by various curriculum and academic program oversight committees within UNL, prior to review by the state-wide Nebraska Coordinating Commission for Postsecondary Education. The graduate program was approved in early 2020 and officially "on the books" with the UNL Registrar starting Fall 2020. Graduate student, Nawaraj Dulal, was the first student to matriculate directly into the new graduate program and many of our existing students have since transferred into the program. Also part of the new graduate program, Madilyn McKay joined our department in December 2019 as the graduate coordinator.

Over the past year, Madilyn and the Plant Pathology Graduate Committee (PPGC) have focused on recruitment, student success, and guidelines for the program. We created a highly successful recruitment program that has paid off, resulting in 71 applications for the 2020 academic year, which is more than five times what we received on average in years prior. We established a formal protocol for annual review of student progress to ensure that every student is getting multiple forms of feedback and support in the graduate program. We also completed and published a new graduate handbook that is a ca. 50-page comprehensive guide that includes information on: admissions, administration procedures, academic program requirements, resources and support in the department, a new student checklist, professional development resources, a code of conduct, expectations of faculty and students, a description of the annual review process, and additional links of relevance. Overall, these contributions to the new graduate program have accomplished what faculty in our department have had interest in pursuing for several decades and have helped to further the national identity as a department that is committed to growing the next generation of plant pathologists at UNL.

GRADUATES

Karen Ferreira da Silva
PhD, May 2020



Thais Egreja
PhD, May 2020

Nikita Gambhir
PhD, December 2020

Natalie Holste
MS, December 2020

While 2020 was certainly an unpredictable time, we were thrilled to celebrate the accomplishments of four amazing scientists.

- **Karen Ferreira da Silva** graduated in May and is currently working with Corteva Agriscience in Woodbury, CA as a field scientist.
- **Thais Egreja** also graduated in May and accepted a post-doctoral position at the University of Florida Tropical Research and Education Center in Homestead, FL.
- **Nikita Gambhir** graduated in December and accepted a post-doctoral position with Dr. Katie Gold at Cornell University in Geneva, NY.
- **Natalie Holste** also graduated in December and is currently working as a research technologist within our department.

Congratulations to our 2020 Plant Pathology Graduates!

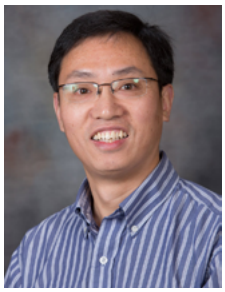
TRANSFORMING THE TEACHING OF PLANT PATHOLOGY

CURRICULUM & INSTRUCTIONAL IMPROVEMENT COMMITTEE

The Plant Pathology Curriculum and Instructional Improvement Committee (CIIC), chaired by Gary Yuen, helped the department meet its goal to provide effective teaching despite pandemic challenges while maintaining momentum in developing new courses. When UNL required instruction to transition from in-person to hybrid or fully online modes, the tools previously utilized by few faculty engaged in online teaching were adopted by all instructors.

The CIIC played a critical role in providing training workshops on creating instructional videos, using Zoom, and organizing instructional materials in Canvas. Training was delivered to teaching faculty as well as graduate students who supported the department's courses as teaching assistants. All instructors and students who experienced online teaching and learning for the first time encountered both difficulties and successes. With this experience, the department has a firmer foundation on which to create new online courses.

The CIIC facilitated the development and approval of three new courses. PLPT 210 "Plant Pathogens & Disease" was created as the required plant pathology course for all students in the new Plant and Landscape Systems undergraduate program that will encompass current Agronomy and Horticulture majors. Beginning in 2022, this course will replace PLPT 369 "Introductory Plant Pathology" as the primary entry into the discipline. PLPT 418/818 "Microbial Genetics & Genomics," to be taught by Lirong Zeng, will focus on the inheritance, exchange, and regulation of genes in prokaryotic microorganisms and phages. This course is part of the department's contribution to the UNL Microbiology Program. The third course, Corn Diseases, is a new addition to the department's repertoire of online courses. Taught for the first time in Spring 2021, it brings Tamra Jackson-Ziems' expertise with economically important and emerging diseases of corn to undergraduate and graduate audiences. This year, the CIIC, with Lirong Zeng as chair, will re-examine course offerings and formulate new strategies to deliver plant pathology instruction.



Left: 2020 CIIC Chair, Dr. Gary Yuen. Right: 2021 CIIC Chair, Dr. Lirong Zeng

PLPT 801 "Biology of Plant Pathogens" is a fundamental course in our graduate program and one of the first taken by new students. In the fall of 2020, Hernan Garcia-Ruiz became the lead instructor and restructured the course using principles of scientific teaching. In its new version, PLPT 801 provides the basics of plant pathology and early exposure to necessary skills such as scientific writing and oral presentations. The course is organized in pathogen modules, each led by three professors in our department. It follows an inquiry-based approach and students achieve the learning goals by preparing and presenting a plant disease notebook. This notebook is based on a crop of the student's choice and is prepared as a literature review article according to journal standards. Exams are based on notebooks with the final being a public symposium on plant diseases where students showcase their work.

MAINTAINING A LEGACY AND BUILDING A PLATFORM FOR SUCCESS

PROMOTION & TENURE COMMITTEE

Dr. Tom Powers, Chair, P&T Committee

A CORE COMPONENT OF THE UNIVERSITY is the process of promotion and tenure. Granting tenure to a faculty member is a recognition of excellent performance and an acknowledgment of the likelihood of a future high-level of achievement. Together with tenure, is a set of rights and responsibilities specified in the Bylaws of the Board of Regents of the University of Nebraska that the faculty member is obligated to follow. The Bylaws also ensure the principle of academic freedom, which preserve the "right to search for truth, to support a position the searcher believes is the truth, and to disagree with others whose intellect reaches a different conclusion (BOR Bylaws 4.2)."

"IT MAKES ME EVEN MORE PROUD TO BE PART OF THE UNL FAMILY."

--Dr. Tamra Jackson-Ziems

The promotion and tenure committee performs annual evaluations on all faculty appointment lines, both tenure and non-tenure. These peer evaluations are conducted independent of evaluations conducted by the department head. Over the past year, the department promotion and tenure committee has updated our Guidelines for Promotion and Tenure. Among the notable changes are guidelines for the evaluation of teamwork and an elaboration on indicators of excellence in plant pathology.

This past year several workshops were conducted by IANR administration to discuss changes in IANR guidelines with respect to the promotion and tenure process. A key issue in these discussions was the recognition and examination of bias in the process. The P&T Committee in the department will continue these discussions in 2021. One of our departmental P&T members, Dr. Tamra Jackson-Ziems, served as a member of the College of Education and Human Sciences (CEHS) Promotion and Tenure Committee. As a member of the CEHS committee, Tamra stated that she "had the opportunity to work alongside outstanding colleagues that I had never met. In addition, I have learned so much more about the impactful and inspiring work being done by our colleagues here at UNL. It makes me even more proud to be part of the UNL family."

In 2020, Dr. Hernan Garcia-Ruiz was granted tenure and promoted to Associate Professor. Below are some quick facts about Dr. Garcia-Ruiz:

- He is the Nebraska State Plant Virologist.
- He established a nationally & internationally-recognized plant virology research program.
- He mentors both undergraduate and graduate students and teaches a graduate-level molecular plant virology course.
- He serves on numerous committees.
- His paper "Host Factors Against Plant Viruses" in *Microbiology Plant Pathology* was recognized by Wiley Online Library as a top-downloaded paper in 2018-2019.

The department extends a big congratulations to Dr. Garcia-Ruiz on his tenure and promotion.

WILSON LAB MAKES SIGNIFICANT STRIDES IN UNDERSTANDING AND PREVENTING RICE BLAST

Wilson lab (front row, left to right): undergrad Ngoc Pham, Professor Dr. Richard Wilson, undergrad Jocelyne Horanituze, (Back row, left to right) grad student Michael Richter, Research Assistant Professor Dr. Gang Li, visiting scientist Ziwen Gong, undergrad Tate Bartlett, and grad student Nawaraj Dulal.

Dr. Richard Wilson and his research team recently made several discoveries about the rice blast fungus *Magnaporthe oryzae*. Their work has since been highlighted in **Nebraska Today**, high-impact journals, and international meetings, producing a plethora of research opportunities and igniting hope in combating one of the most devastating plant pathogens.

The fungus *Magnaporthe oryzae* can result in losses of up to 30% of annual rice harvests. Due to a recent host jump, *M. oryzae* is also an emerging threat to global wheat production. The Wilson lab seeks to understand at the molecular level how the fungus gains entry to the host cell and how, once inside, it is able to proliferate from cell-to-cell in a symptomless, biotrophic manner before the onset of disease. Unlike many pathosystems, *M. oryzae* can be cultured away from the host and studied in-depth using a well-developed molecular and cellular tool kit.

In work published in ***Nature Microbiology***, the team discovered an unanticipated determinant of appressorial adhesion involving the polyamine spermine. They found that spermine was precisely required for mitigating endoplasmic reticulation (ER) stress in the developing appressorium in order to facilitate appressorial mucilage production and tight sealing of the *M. oryzae*-rice leaf surface interface. In the absence of endogenous spermine, mucilage secretion is impaired, causing solute leakage from the appressorial pore and reduction in the turgor required for penetration. This work describes a fundamental but previously unknown feature of host penetration and invasion that is also likely applicable to other eukaryotic pathogens with similar infection strategies. They identified several plant pathogenic fungi carrying homologues of the *SPS1* gene required for adhering *M. oryzae* appressoria to the host plant (Rocha et al. in *Nature Microbiology*, 2020). These include a *Fusarium* species causing sudden death syndrome in soybeans.

Dr. Wilson mixing reagents for a PCR reaction to identify *Magnaporthe* genes required for rice blast disease

A second paper Wilson and team published in 2020, in the journal ***New Phytologist*** led by assistant research professor Dr. Gang Li, discovered a previously unknown protein modification-based network controlling redox balance in host cells that is required for suppressing host innate immunity. This work is significant in that it sheds light on the elusive hierarchy of molecular events conditioning fungal responses to the host cell environment. In their third major paper published in ***Molecular Microbiology***, they uncovered a novel and critical molecular feature of the host-pathogen interaction by showing how the maintenance of intracellular nucleotide pools links redox balance with fungal metabolism in order to suppress host innate immunity. Together, these recent breakthroughs have significantly improved their understanding of the molecular determinants of rice and wheat blast disease and might lead to novel, durable, and sustainable intervention strategies.

In addition to publishing, Dr. Wilson was delighted to be able to share the lab's results as an invited speaker at the Current Advances in Rice Blast Research Conference, hosted by the National Institute of Technology in Durgapur, India. He was also a member of the advisory committee along with Dr. Nick Talbot, Executive Director of the Sainsbury Lab, UK.

In 2020, the lab said goodbye to Raquel Rocha, who co-authored several papers on this work, and welcomed PhD student Nawaraj Dulal to the team. Michael Richter also chose to join the lab following his first year rotations as a Complex Biosystems PhD student.

Wilson and his team will continue applying these findings to possible methods for reducing the infection rates of the rice blast fungus. We look forward to seeing the huge impact their work will have on the production of rice crops around the world.

Nawaraj Dulal
PhD student, Wilson lab

In 2020, we were extremely excited to welcome one fresh face and the first student in our independent graduate program, PhD student Nawaraj Dulal. Nawaraj is currently working in Dr. Wilson's lab studying the rice blast fungus *Magnaporthe oryzae*. He is from Kathmandu, Nepal, and received his bachelor's of science in Agriculture from Tribhuvan University in Nepal. He then studied at University of Arkansas, Fayetteville where he received his MS degree in plant pathology and also worked on *Magnaporthe oryzae.*

SERVING CLIENTELE DURING A PANDEMIC:
Update from the Extension Plant Pathology Team

Extension Team Leader, Dr. Tamra Jackson-Ziems

LIKE EVERYTHING OVER THE PAST year, our extension programming efforts and interactions with Nebraska clientele were significantly impacted by the pandemic. COVID-19 restrictions limited in-person interactions during most of 2020 and continue to do so in early 2021. In-person field days, which are among the highlights of extension programming during the growing season, were cancelled in 2020. Statewide wheat disease surveys, which keep clientele informed about the wheat disease condition throughout the growing season, were drastically reduced to two regional one-day trips. Extension faculty across the state adapted remarkably well to the situation and produced numerous new and updated multimedia resources to reach stakeholders in innovative ways.

One way our team adapted its programming was through numerous videos captured and shared in lieu of traditional field days throughout 2020. Several successful video programs were initiated, and plans are underway to continue to offer hybrid learning experiences with a mixture of in-person and video content. In January 2021, team members and affiliated extension educators (and department alumni) presented disease management content statewide during the annual Crop Production Clinics in an exclusively online format for the first time in the 45+ year history of the program.

- One of the more successful products from the past year was the #NField Observations series. These short 2-minute video clips on diseases and other crop-related news and challenges were distributed and viewed widely on Twitter.
- The spin-off program #NField Chats was also introduced to provide the opportunity to interact online with a panel of experts from Nebraska Extension.
- GRO Big Red, a virtual learning series, provided support to both urban and rural clientele by focusing on common problems in home landscapes and gardens.
- Videos from the Midwest Corn and Soybean Production Clinics, Soybean Management Field Days, South Central Ag Lab Field Day, Haskell Ag Lab Family Field Day, and others were provided online to youth and adult clientele.
- CropWatch podcasts of more casual conversations about common crop production challenges were also made available.

Backyard Farmer, a weekly television program on NET, continued with a reduced panel of 3 socially-distanced experts and host Kim Todd.

Field research was also inhibited by COVID-19 restrictions but our team was able to continue to make progress in disease management

research. Our field technologists did an amazing job of increasing their capacity with the limitation of 1 person per vehicle to travel to field research sites. At the same time, their workload was increased as they were limited in capacity to hire hourly workers and had to develop virtual training materials. The time to complete research tasks increased multiple times as a result of social distancing guidelines in our work spaces. In some instances, there were supply issues for critical materials that impacted field research plans. For example, a soil supply issue resulted in the loss of wheat stem rust inoculum that is maintained on live plants. Despite all of these challenges, our teams moved our mission forward and connected with clientele in meaningful ways.

Panhandle Agricultural Research and Technology Tour (PARTT) field day in August was done in person, but presentations were conducted outside under tents. The audience was spaced safely at tables, and the presentations were recorded. Presentations were recorded from the field day and delivered in December (PARTT+) and then placed online on the PHREC website for those that could not or did not want to participate in person.

Bacterial leaf streak of corn

Southern rust of corn

Bacterial wilt of dry beans

DISEASES ACROSS NEBRASKA IN 2020

CORN – Bacterial leaf streak continued to be an important disease in fields planted with susceptible hybrids. Development and rapid spread of southern rust started in mid-July and became the most widespread development of the disease in the last decade, which led to increased fungicide use in the eastern half of Nebraska.
SOYBEAN – Group 11 QoI fungicide resistance was confirmed in *Cercospora sojina* causing frogeye leaf spot in Nebraska.
WHEAT – Barley yellow dwarf was the most common and important disease of wheat statewide.
SPECIALTY CROPS – the most commonly observed diseases for sugar beets continued to be *Rhizoctonia* root rot. A bacterial complex continued to be the most predominate problem for dry beans, while sunflowers were most commonly affected by rust and *Phomopsis* stem canker. Chickpeas (garbanzos) continued to be affected almost exclusively by *Ascochyta* blight.

Foliar damage

Susceptible

Resistant

Ascochyta blight of chickpeas

Right: *Ascochyta* blight can infect all above-ground portions of chickpea plants – leaves, stems or pods. Collaboration with UNL bean breeder, Dr. Carlos Urrea, on developing disease resistant cultivars is ongoing.

Plant & Pest Diagnostic Clinic Update

from Kyle Broderick

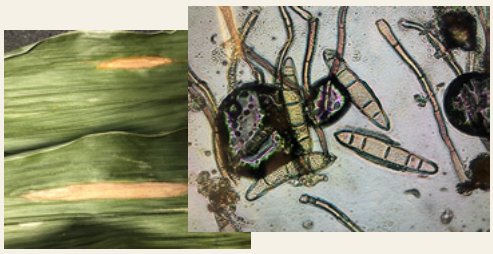
Above: Lilac *Pseudocercospora* leaf spot

2020 was an interesting year in the Plant & Pest Diagnostic Clinic (P&PDC). In late March when the world began shutting down, the P&PDC moved out of Plant Science Hall and into my basement. While this was less than ideal, we were still able to provide diagnostic support for the Nebraska Department of Agriculture (NDA) as they were continuing greenhouse, nursery, and field inspections. Ten percent of all samples received in 2020 were from NDA for phytosanitary certification.

Early on, we discouraged sample submission from growers due to a lack of space and testing capacity but were back offering full services by early June. In order to be a "contactless clinic" a cooler was placed outside to receive samples. While there was a decrease in samples March/April, we still received 1,035 unique samples from seven states. Most samples were submitted for plant disease diagnosis, but mushroom ID, herbicide injury, and nematode analysis were also offered. Roughly 90% of the samples were the common commodity crops in Nebraska. Bacterial leaf streak, southern rust, and northern corn leaf blight were all common in corn; Frogeye leaf spot and bacterial pustule were the most common diseases identified in soybeans; Barley yellow dwarf was widespread in wheat. P&PDC also received samples from homeowners, vineyards, golf courses, vegetable producers, and a lavender farm.

While there was a drop in physical samples received, there was an increase in digital diagnostics receiving over 200 emails asking, "What is this?" Leaf spots on lilac caused by Pseudocercospora sp., Brown patch in turf, and rust on ornamental pears were quite common. The increase in landscape and homeowner questions resulted in greater collaboration with Community Environment Extension Educators, particularly with the GROBigRed Virtual Learning series offered by Community Environment Extension Educators.

Unfortunately, with fewer students on campus there were fewer opportunities to provide direct, one-on-one learning experiences. I worked with two undergraduates who were a part of the CASNR Undergraduate Scholars Program (CUSP) – one focusing on corn diseases and the other on greenhouse and vegetable production. Assistance with disease ID and pathogen isolation techniques were provided to graduate students as needed.



Cigar-shaped lesions of northern corn leaf blight and conidia of the causal agent, *Setosphaeria turcica* (Syn. *Exserohilum turcicum*)

Rhizoctonia sp. on organic radishes. Characteristic symptoms include dark brown, sunken lesions that were slightly spongy. Notice insect feeding on the radish (lighter, small pits) that may have allowed the fungus entry into the radish.

PLANT PATHOLOGY AWARDS

In the Department of Plant Pathology, we have a few department-specific awards that are distributed yearly. These are the Goss Memorial Scholarship and PPGSA Professional Development Award for students and the Lambrecht Award for technologists.

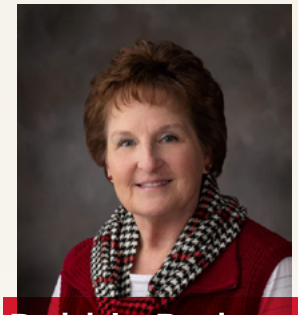
Goss Memorial Scholarship: developed to help defray expenses for students who are presenting research at regional, national/ international meetings, attending and participating in relevant workshops or any other appropriate scholarly activity beyond the normal execution of their research. In 2020, we had 4 recipients of the Goss Memorial Scholarship: Abigail Borgmeier, Katherine LaTourrette, Sourav Pal, and Sergio Gabriel Peralta.

PPGSA Professional Development Award: established in 2020 and is meant to be used as financial assistance to travel to scientific meetings or attend workshops and training events. In 2020, there were 5 recipients of the award: Abigail Borgmeier, Natalie Holste, Katherine LaTourrette, Asha Mane, and Sourav Pal.

Lambrecht Award for Technologists: recognizes the contributions of technologist Patricia Lambrecht to the science of plant pathology, the laboratory of Dr. Anne Vidaver and others, and assistance to the department in mentoring students, technicians, and post-docs in various techniques and practices in plant pathology, especially those connected with bacterial plant pathogens. The award is primarily for the furtherance of the awardee's education, attendance at conferences and meetings, travel to meetings and experimental sites, or other activities. In 2020, the recipient of the Lambrecht Award was Becky Higgins.

Congratulations to all recipients of awards and scholarships in 2020!

RETIREMENTS



Debbie Pederson
Extension Office Associate

Debbie Pederson served as the Extension Office Associate for 28 years, working closely with the Extension team, including the Plant & Pest Diagnostic Clinic. In December of 2020, Debbie retired and is spending time at home with her husband as well as enjoying time with nearby family.

Christy Jochum
Research Technologist

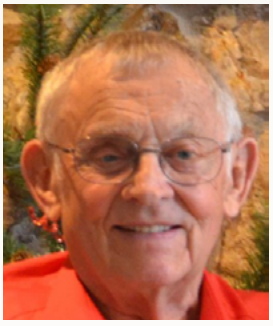
After 22 and a half years of service to our department and the lab of Dr. Gary Yuen, Christy Jochum retired at the end of 2020. Currently, Christy still holds a temporary position to help Dr. Yuen finish his research projects, but once her temporary role comes to an end, Christy plans on spending time with her family and working in her yard and her home.

Congratulations, Debbie and Christy!

In Remembrance

Stan Jensen

September 22, 1934 - September 29, 2020



Stanley George Jensen, 86, of Lincoln, died September 29, 2020 due to heart failure. Stan was born to Edwin and Myrtle (Beardshear) Jensen in Homer, NE on September 22, 1934. He grew up on a small general practice farm in the Missouri bluffs and went to a one room school for his elementary education. His academic work won him a Regents scholarship to the University of Nebraska. He earned a BS in Technical Agriculture and stayed at UNL to earn a PhD in Plant Pathology.

While a student he met and married Janice Swanson a dietetics student from Burwell. Jan and Stan were married for 62 years and were a great outdoor couple, skiing, camping, hunting, and fishing together for nearly all their married life. Their international travels extended over 60 countries.

Survivors include his wife Jan, their three daughters and families, Cindy, Robert, Hunter and Colton Arias; Linda, Steve and Meghan Schellpeper and Angela and Remington Johnson; and Susan and Dale Martin, all of the Lincoln area. His brother Vern and Lucetta of Mission, TX and numerous extended families. Preceded in death by his parents, brother Lynn, and Lynn's wife, Marianna.

FRESH TAKES

IN LATE 2020, our main office in 406 Plant Science Hall received a much-needed makeover! New desks were put in for Amber, Madilyn (their plants), and our shared computer. Our waiting space was outfitted with cushiony couches and chairs, and a large cabinet with a countertop was also installed for convenient storage and a place to (eventually) host some department social events and potlucks. Along with updated furniture, new LED lights and ceiling tiles were installed overhead. Finally, behind the scenes, our outdated HVAC units were replaced, helping to keep 406 comfortable year-round. We hope to host some guests, friends, visitors, and alumni in the coming year.

Above: Amber and Madilyn's desk setup featuring their well-loved "office oasis" Right: The new entrance to 406 PLSH with new furniture and a new digital sign.

To the left is an illustration that was found in the department's history files. The illustration, from 1982, depicts Dr. Anne Vidaver sitting at her desk with a microscope. When asked about what was going on during that time in her life and career, she noted that she had just recently discovered bacterial mosaic, which was a new disease of wheat, that mysteriously disappeared after about 3-5 years. Around that time, her lab also discovered a highly specific antibiotic (bacteriocin) for *Pseudomonas syringae*. Dr. Vidaver also noted that on a personal level, this was a great time in her life.

Following this is an excerpt from Dr. Bob Harveson's book, "A Century of Plant Pathology in Nebraska." In the excerpt you will learn more about Dr. Vidaver, and many other women employed in the Department of Plant Pathology over the years.

Women Employed in Plant Pathology at the University of Nebraska

This chapter focuses on the women who have served the plant pathology department as faculty and provides brief biographical sketches of their lives and careers. The most well-known and celebrated individual included in this section is Anne Vidaver. Her story will be presented in more detail in another chapter of this book pertaining to the heads of the department. However, it will begin with a simple list of Vidaver's most significant accomplishments during the course of her career as a now world-renown phytobacteriologist. The other plant pathologists included follow in chronological order, and presumably, are inclusive of all women hired in faculty roles since the department's beginning.

Anne Vidaver

Figure Credit: Roger Bruhn in "Visons, Research and Creative Activity at the University of Nebraska-Lincoln"

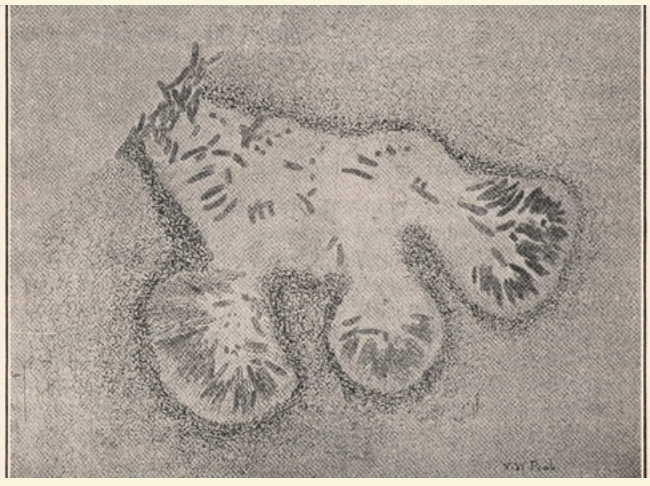
- First woman department head in Institute of Agriculture and Natural Resources (IANR)
- First married woman hired (tenure track) in IANR
- First woman department head in plant pathology in the world
- First (and only) woman director for the Center for Biotechnology (2x)
- First married woman with children to be president of American Phytopathological Society (APS), and the second woman to be elected president
- First woman to receive the APS Distinguished Service Award
- First and only woman (to date) to write a prefatory chapter for the Annual Review of Phytopathology
- First (and only) woman to serve as Chief Scientist, United States Department of Agriculture
- First woman in plant agriculture to receive the American Society for Microbiology Distinguished Service Award

Venus W. Pool

Venus Worrell Pool was born in Table Rock, NE, on May 8, 1882. She attended the University of Nebraska, receiving a B.S. in 1904, and was awarded an M. A. in botany in 1908 with her thesis entitled "Tomato Fruit Rots." Pool was listed as the first assistant in plant pathology on the Experiment Station staff and was employed in this role from 1906 to 1911. During this period she was a research assistant and co-authored several seminal Experiment Station publications with both department chairs, F. D. Heald and E. Mead Wilcox. She was also an accomplished artist and contributed beautiful line drawings of fungal structures and spores for the publications.

In 1911, Pool left UNL and began with the bureau of plant industry (BPI) in Washington D.C. She was hired as assistant pathologist with the Cotton and Truck Crop Disease and Sugar Plant Investigations unit stationed at Rocky Ford, CO, making her the first woman to be given complete charge and responsibility for any field experimental work in the BPI. She worked primarily on foliar diseases of sugar beets, publishing numerous papers with her assistant, Marion Bertice McKay (later her husband), concerning Cercospora and Phoma leaf spots. Pool was highly regarded by her peers and also became a charter member of the APS.

One of these foliar diseases was sugar beet seedling rust. In 1914, she was the first individual to report this disease on sugar beet, where it was found widespread in Colorado over two years (1912-1913), and elucidated its complicated life cycle. The fungus (*Puccinia subnitens*) was previously known by mycologists for its uredinial and telial spore stages



Lobulate cavities in corn tissue from infection by *Diplodia zeae*. (Figure Credit: 22nd Ann. Rept. Nebr. Ag. Exp. Sta. (Drawn by Venus Pool))

with its primary host, inland saltgrass. However, it was not known as a pathogen on an economic crop with the early spore stages (pycnial and aecial).

Due to Pool's one report in 1914, the plant pathology program in Scottsbluff was provided with a reference that aided in the identification of this rare disease of sugar beets and resulted in several published reports on the outbreaks in Nebraska during the 2009-2010 seasons. They represented the first records ever of this disease in Nebraska, and the first reports of the natural occurrence from beet production fields since the original communication by Pool and McKay almost 100 years earlier.

Pool married McKay in 1915 and they relocated to Oregon in 1916 where he was a research assistant in botany with Oregon State College's Agricultural Experiment Station in Corvallis, OR. Ironically, in 1922, McKay assisted H. P. Barss with identifying the same pathogen causing serious losses in spinach (another economic host) in Oregon that he and Venus had reported first from sugar beets in Colorado a decade earlier. They had two children: Muriel (born in 1918) and Maurice (1922). Sadly, Pool must have retired at that point as there is no evidence of further research or publications after 1916.

Aecial stage of *Puccinia subnitens* infecting spinach (Figure Credit: Howard Schwartz and Bugwood)

The Walker Sisters

Elda R. Walker (1877-1971) and Leva Walker (1878-1970) were both born in Forest Grove, OR, to a family of missionaries. Their paternal grandparents were among the first group sent to the Oregon territories by the American Board of Commissioners for Foreign Missions. The Walkers settled near Forest Grove in 1844 with three other couples. The Walkers set aside large pieces of land for the Tualatin Academy, a secondary school that later became Pacific University, and they were major factors in its founding. Leva and Elda's parents (Levi and Belle) were both teachers and ran one of the first off-reservation boarding schools in the U.S. for Native Americans.

Elda Walker was a 1901 Pacific University graduate. She obtained her M.A. in 1904 and a Ph.D. at the University of Nebraska under the supervision of Charles Bessey. She studied algae and the plant species *Equisetum laevigatum*. She was hired as an instructor and associate professor in the botany department, where she stayed for the rest of her career. Walker was instrumental in organizing the Graduate Woman's Scientific Club, which later became the Nebraska Iota chapter of the SDE (Sigma Delta Episilon), an interdisciplinary society for women in science, which first originated at Cornell University. She and her sister Leva were both charter members when it was installed in May 1927.

Leva Walker also was rewarded a bachelor's degree from Pacific University in 1901. After teaching in Washington for five years, she traveled to Nebraska and joined the botany department in 1906, and received an M.A. in 1908. She later obtained a Ph.D. in 1927 working with fleshy basidiomycetes. Her doctoral thesis was entitled "The development of some Basidiomycetous fungi. A. *Pluteus admirablilis, Tubaria furfuracea*. B. *Cyanthus fascicularis, Cyanthus striatus, Crucibulum vulgare*." She also remained at UNL for her career as associate professor, teaching botany and living with her sister in Lincoln before retiring in 1946. She was a charter member of the APS as well as an active member for numerous scientific societies such as the Botanical Society of America, Torrey Botanical Club, American Microscopical Society, and the Nebraska Academy of Science, among several others.

The Walker sisters - Elda (right) and Leva (left) in 1900 (Figure Credit: Pacific University Archives)

Ethel Field

Ethel C. Field was awarded an A.M. in botany in 1909 from UNL. She assisted Venus Pool in 2009 with setting up and running the Potato Disease Laboratory in Alliance that focused on Fusarium dry rot as a storage disease. She left Nebraska in 1911 and moved to the Cotton and Truck Disease and Sugar Plant Investigation with the Bureau of Plant Industry in Washington D.C. as a scientific assistant. In 1912, she co-authored publications on the white pine blister rust with Perley Spaulding, the pathologist with the BPI's Investigations with Forest Pathology, and on the potato wart disease (pathogen now known as *Synchytrium endobioticum*) (USDA Farmer's Bulletin 489). She also assisted the plant physiologist L. L. Harter in conducting investigations on sweet potato diseases and co-authored numerous publications throughout the 1910s.

Florence McCormick

Florence McCormick was born in Shippensburg, PA on December 21, 1875. Her time in Lincoln was short, but she made significant contributions later in her career after leaving UNL.

She received both an A.B. and M.S. from the University of Tennessee in 1897 and 1900, respectively. Her graduate thesis involved a microscopical study of the leaves of *Pinus virginiana*. She taught for six years at Winthrop College in Rock Hill, SC, before being awarded an assistantship in botany at the University of Chicago. She studied there for five years before earning her Ph.D. in plant morphology and physiology in 1914, working on the liverwort *Symphyogina aspera*.

McCormick came to UNL in 1914 where she held a double appointment of assistant professor in the botany department and assistant botanist in the Agricultural Experiment Station. She resigned in 1916 before being appointed botanical assistant to work on pine blister rust with the Connecticut Agricultural Experiment Station in May 1917. She was later promoted to pathologist with the Experiment Station under the supervision of the eminent plant pathologist G. P. Clinton (Botanist in Charge). She and Clinton published additional studies on the Dutch elm disease and several diseases of tobacco, including black root, caused by *Thielaviopsis basicola*.

One of her more significant contributions to plant pathology was developing the method for creating artificial infections on detached leaves in Petri dishes. This kept obligate pathogens alive for weeks as a result of the technique's ability to readily control light and moisture. It was with this method that she and Clinton discovered that the blister rust pathogen entered pine trees through leaf stomata. She stayed at this post until Clinton's death in 1937.

Ellen Moorhead Ball

Figure Credit: UNL Dept. of Plant Pathology

Ellen Ball was born January 8, 1925 in Pittsburgh, PA, and grew up in Indiana, PA, where she graduated from Indiana High School in 1942. She was awarded a Senatorial Scholarship and attended the University of Pittsburgh, where she was a member of Jonas Salk's team and worked on the development of polio vaccines. She was awarded a B.S., M.S., and Ph.D., all from this institution, the latter occurring in 1953. She moved to Lincoln, NE, in 1954 and began her career in plant virus research, first for the USDA, and then for the University of Nebraska-Lincoln. It was in Lincoln where she met Harold J. Ball (1919-1999), an insect physiologist for the Department of Entomology at UNL, and they married in 1960.

Ball was a pioneer in the development and utilization of serological techniques for characterizing plant viruses. She produced antisera derived from rabbits that assisted in identifying additional plant pathogens (bacteria and fungi), as well as other biological structures and substances like cell walls, ribosomes, and enzymes.

She and the USDA-ARS virologist, Myron Brakke, effectively collaborated with department virologist W. B. Allington on the joint USDA-UNL wheat virus project. The Cereal Disease Investigations Lab became an internationally-renowned center for the identification of wheat virus diseases.

One major application from her research was developing virus-free potato plants from meristem tissues by serological methods, which were then used for the commercial certification of seed potatoes in Nebraska. Another ingenious, but likely little-known, contribution of hers was referred to as "leaf dip serology," published in 1968. She and Brakke developed a simple and relatively rapid method for identifying the use of virus-specific antiserum coated on specimen trays with sample plant sap and viewed with electron microscopy.

Deanna Funnell-Harris

Figure Credit: UNL Dept. of Plant Pathology

Deanna Funnell-Harris is a USDA, Agricultural Research Service (USDA-ARS) research plant pathologist and a Department of Plant Pathology adjunct professor at the University of Nebraska-Lincoln. Her Ph.D. was completed at the University of Arizona. After her post-doctoral research (University of British Columbia, University of Kentucky, and USDA-ARS), she was hired in 2002 by USDA-ARS in Lincoln to conduct research on pathogens of sorghum developed for increased usability for food, feed, and bioenergy.

Dr. Funnell-Harris is the team leader formulating and guiding research to identify specific interactions between fungal pathogens and sorghum germplasm, especially those with altered lignin and carbohydrate compositions and concentrations, in order to define specific resistance mechanisms and to identify and help develop resistant germplasm. Although her appointment with USDA-ARS is 100% research, Dr. Funnell-Harris has been actively involved in the department with formal participation on graduate student committees or informally providing research guidance to students, collaborating with UNL faculty, and participating in department or university committees.

Tamra Jackson-Ziems

Figure Credit: UNL Dept. of Plant Pathology

Tamra Jackson-Ziems, extension specialist and professor, joined the faculty of the Department of Plant Pathology at UNL in 2005 after completing her graduate degrees at the University of Arkansas (M.S.) and University of Illinois-Urbana (Ph.D). Her appointment is split between extension (80%), research (10%), and teaching (10%), respectively, with statewide responsibility for diseases of corn and grain sorghum.

Her extension programming activities encompass educating clientele about disease identification, prevention, and management. Her research projects focus on a broad range of topics on important and emerging diseases, including Goss's bacterial wilt and blight, the use of fungicides for fungal disease control, and plant parasitic nematodes of corn. Recently, she and team members have been involved in education and research on bacterial leaf streak (*Xanthomonas vasicola* pv. *vasculorum*) of corn, including biology and management of the pathogen.

Sydney Everhart

Figure Credit: UNL Dept. of Plant Pathology

Sydney Everhart is an associate professor and quantitative ecologist in the Department of Plant Pathology. Dr. Everhart joined UNL in 2014 with a split appointment of research (80%) and teaching (20%), and has established an internationally recognized research program to study disease epidemics and evolution of fungal plant pathogens important in the U.S., including *Sclerotinia sclerotiorum* and *Rhizoctonia solani*. She currently has an active molecular genetics and computational biology lab group. In 2016, she was awarded the American Phytopathological Society (APS) Schroth Faces of the Future Award in Epidemiology.

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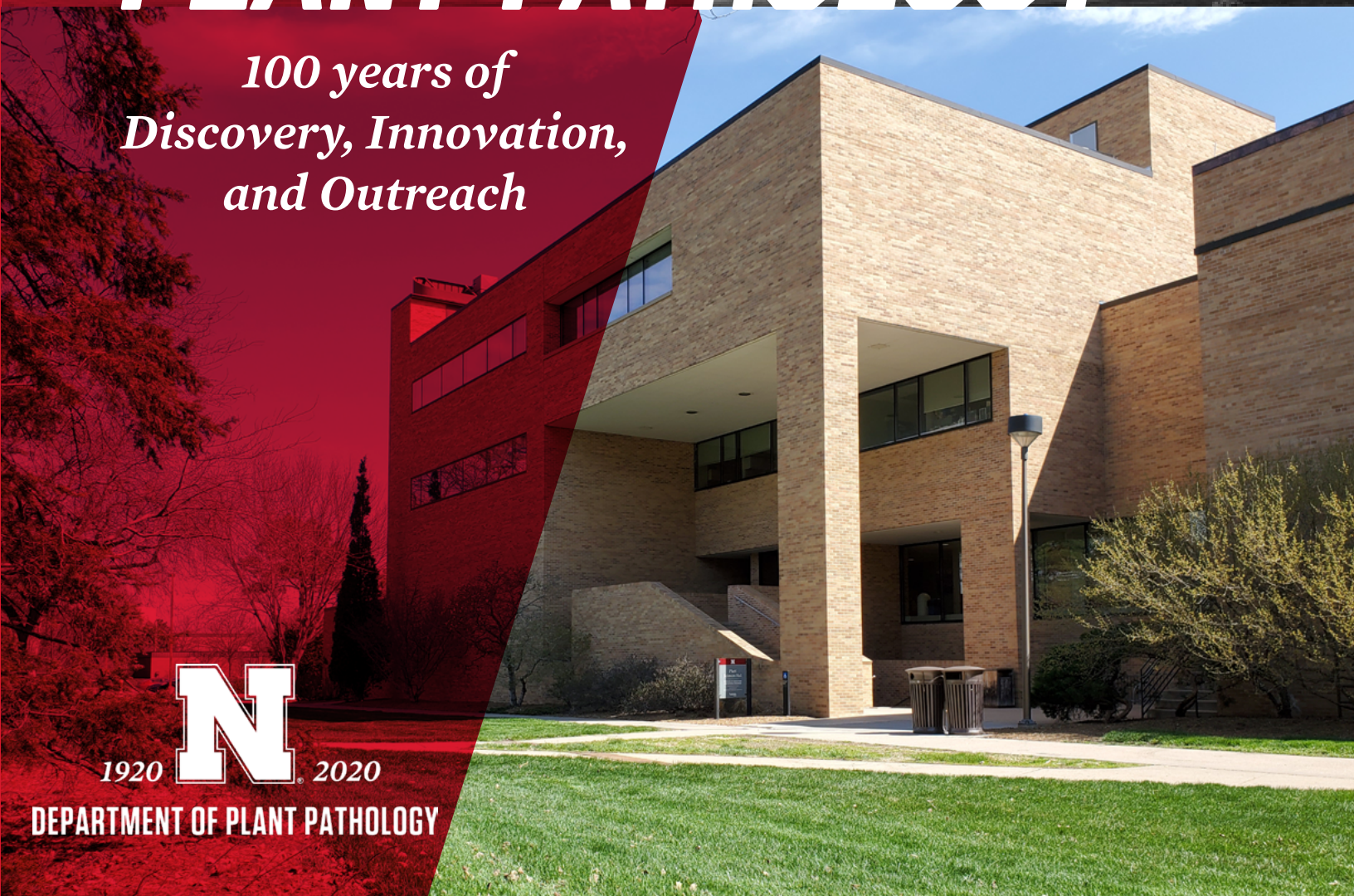
UNL DEPARTMENT OF PLANT PATHOLOGY

100 years of Discovery, Innovation, and Outreach



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DEPARTMENT OF PLANT PATHOLOGY

Our Centennial Year as a Department of Plant Pathology came with the challenges of the pandemic, but our mission continued. Over the past century, many things have changed, but our goal to produce world-changing scientists remains the same. This is our focus as we start our next century of discovery, innovation, and education in the Department of Plant Pathology at the University of Nebraska-Lincoln. The Plant Pathology Department Excellence Fund has been established to provide continued and increased opportunities for future students. Please consider donating to this fund to ensure opportunities for our students and our department continue to grow as we address food production challenges to feed our world's increasing population. All donors who pledge to give $100 or more will receive a copy of "A Century of Plant Pathology in Nebraska" by Dr. Bob Harveson, a publication detailing the history of our 100-year presence at the University of Nebraska-Lincoln published in our centennial year. Thank you for helping us celebrate our Centennial Year and provide a legacy of support for our department and future students.

To make a contribution to this fund, please visit: go.unl.edu/plantpath-excellence

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DEPARTMENT OF PLANT PATHOLOGY
100 Years of Discovery, Innovation, and Outreach

A Century of Plant Pathology in Nebraska

By Robert M. Harveson