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ASPB News

THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

President's Letter

Code Red

BY MAUREEN McCANN
ASPB President, National Renewable Energy Laboratory

United Nations Secretary-General António Guterres called the Sixth Assessment Report, released by the Intergovernmental Panel on Climate Change (IPCC) in August, a "code red for humanity" (IPCC, 2021). With improved knowledge of climate processes, paleoclimate evidence, and increasing radiative forcing (change in the energy flux in the atmosphere caused by climate change), some uncertainties in climate model parameters have been reduced. With greater confidence in the modeling, this report cuts the estimate threshold of crossing 1.5°C of global warming by a decade, to the early 2030s. As carbon dioxide rises, ocean and land carbon sinks will become less effective at slowing the accumulation of carbon dioxide in the atmosphere. Unless we decarbonize to net-zero greenhouse gas emissions (GGEs), global warming of 1.5–2.0°C will be exceeded in the 21st century (IPCC, 2021).

As plant scientists, how can we contribute to mitigating GGEs? We can think of our impact in at least three major arenas—decarbonization of agriculture, decarbonization of materials, and growth of a sustainable bioeconomy.

If there is any good news from the IPCC, it is that scenarios with low or very low GGEs, including reductions in methane and nitrous oxide, would produce discernible differences in trends of global surface temperature, within two decades, above the background of natural variability. The carbon cycle is asymmetric for pulse emissions or removals, which means that carbon dioxide emissions are more

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Katie Dehesh to Lead ASPB in 2021–2022

Katie Dehesh becomes ASPB president on October 1, 2021. She succeeds Maureen McCann, who becomes immediate past president. In the following article, Katie tells us her thoughts for ASPB over the next few years.

From its inception in 1924, ASPB has met daunting challenges but has never ceased to serve the global scientific community, aiding our common scientific quest to explore uncharted waters and providing a vehicle for our shared bond that transcends national, ethnic, gender, and social divides. In the current era of increasingly un-

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Gustavo MacIntosh to Lead ASPB in 2022–2023

Gustavo MacIntosh becomes ASPB president-elect on October 1, 2021, and will assume the office of president in October 2022, succeeding Katie Dehesh.

For the vast majority of my career, I have been a member of ASPB and working in the United States, but the story of how I became a plant scientist began in Argentina. At Universidad Nacional de Mar del Plata, I obtained my *licenciatura* in biology (equivalent to a BS/MS degree) while researching the regulation of a human parasitic protozoan. My research shifted permanently to plants during my PhD in chemical biology at the Universidad de Buenos Aires, where I investigated protein phosphorylation in potato tuberization and published my first first-author paper in *Plant Physiology*. In 1997, right after my PhD defense—with my wife, our newborn daughter, and two pieces of luggage—we moved to East Lansing, Michigan, for my postdoc training in Pam Green's lab at the DOE Plant Research Laboratory at Michigan State University (MSU). There, immersed in molecular biology of Arabidopsis and yeast, I started working on ribonucleases, which remain my main research interest. Later, I helped the lab move from MSU to the Delaware Biotechnology Institute, where I became an associate scientist, expanding my work to functional characterization of Arabidopsis noncoding RNAs. In 2003, I obtained an assistant professor position at Iowa State University, where I have built a laboratory investigating the functional characterization of plant ribonucleases and the mechanisms and regulation of RNA salvage and cellular homeostasis, funded primarily by NSF and the Roy J. Carver Charitable Trust. A few years after moving to Iowa, I expanded the laboratory's focus to include defense mechanisms that protect soybean plants against the soybean aphid—and the counter-strategies used by aphids. This project, funded primarily by the Iowa Soybean Association and USDA, was recognized for its value to Iowa through the 2017 Distinguished Scientist Award from the Iowa Academy of Science.

In ASPB, I have served in all elected positions for the Midwest Section and on many committees of the national Society. Until I start my role as president-elect, I am serving as an elected member of the Board of Directors.

Professional societies are having an identity crisis, and ASPB is no exception. The old model, centered around annual meetings and specialty journals, provided value but placed a limit on ASPB's growth. To keep ASPB relevant, we must acknowledge and adapt to the changing realities of our profession. These realities include society's increasing expectations of equity, diversity, and inclusion (EDI); the need for flexible and accessible ways to communicate and network; and the fact that many recent graduates are building careers outside the traditional academic path. In my new leadership role, I will aim to facilitate ASPB's evolution and continued growth in alignment with these changing realities.

Successful growth means building on solid foundations while dismantling and rebuilding structures when necessary. This is a worthwhile process the Equity, Diversity, and Inclusion Committee (formerly the Minority Affairs Committee) has already begun. As a committee member from 2012 to 2020 and chair the last three years, and with help from many people in and outside the committee, we were able to reinvigorate the Society with EDI values. Although we are still far from achieving true representation and inclusiveness, the foundation has been laid, and now is our opportunity to harness the momentum we have gathered to fuel further growth.

How might we increase the diversity of our members—and consequently, our leadership structures? We must renew what we offer to members. In other words, if we want marginalized groups to join us, we need to make sure we have something of value to offer. One way I propose we add value to our Society is involving and integrating industry partners. Looking at the current realities of plant biology, the most common career target for many students is the private sector; our Society will only become stronger by inviting more industry plant biologists into the conversation.

At the same time, we need to conserve and build on what's already working. For example, the Early Career Plant Scientist Section has already strengthened the Society through the inclusion of early career (EC) representatives on committees. EC members have contributed novel ideas, different perspectives, and enthusiasm as ASPB participants. Continuing to provide EC members a community and mode for input ensures robust and productive membership for years to come. Our expanded virtual presence, necessitated by the pandemic, has also fortified membership by increasing participation and extending the Society's international reach—both positive outcomes I want to capitalize on by continuing to develop and refine more flexible, accessible modes of communication.

Here, I've laid out my proposed focus on evolving and expanding EDI efforts, communications, and membership. I recognize that one person cannot achieve all these goals alone, and I welcome the opportunity to work with the Society's leadership team and all its members. As President, I want to be the catalyst for member-driven, growth-oriented changes; a steward for what's already working; and a plant sciences advocate to policy makers and the public at large. ■

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effective at raising atmospheric carbon dioxide than carbon dioxide removals are at lowering it. Although direct air capture of carbon dioxide by natural or synthetic means is an important goal, we need to offset additions of GGEs to the atmosphere.

A recent report from McKinsey & Company pointed out the surprisingly large contribution that agriculture makes to GGEs: over one-quarter of all GGEs (Ahmed et al., 2020). If cattle were a country, their methane emissions would be higher than those of China. Nitrous oxide from fertilizer use is 264-fold more potent than carbon dioxide as a greenhouse gas. Beyond powering farm equipment and processes with renewable resources, including biofuels, major strategies to reduce the carbon footprint of agriculture could include

- transitioning from meat to plant-based proteins, because production of ruminant animals is almost 30 times more carbon intensive than production of vegetable protein;
- mitigating the one-third of food we produce that is lost in the supply chain or as food waste at the retail and consumption stages; and
- managing forest resources and natural carbon sinks to capture about 7 gigatons of carbon dioxide equivalents from reforestation, avoided deforestation, and natural forest management.

To achieve a pathway that limits warming to 1.5°C will also require next-horizon technologies, such as the ability to modulate plant and soil microbiomes for optimized plant health, perennialization of row crops, and genetic engineering to enhance carbon sequestration in roots (Ahmed et al., 2020). The Plant Science Decadal Vision 2020–2030, spearheaded by ASPB, outlines a comprehensive set of recommendations for research, technology, and human capital (Henkhaus et al., 2020).

Even as climate change affects the global water cycle and arable land diminishes with desertification, global population increase will drive a 70% increase in demand for food production by 2030. The past five years, 2016 to 2020, were the hottest five-year period in the instrumental record (IPCC, 2021), and the National Oceanic and Atmospheric Administration reported that July 2021 was the hottest month recorded to date. The frequency and intensity of extreme weather events have increased relative to the baseline of 1850, and there is compelling evidence for the relationship between anthropogenic climate change and events of extreme precipitation, droughts, tropical storms, and compound extremes, including weather created by wildfires (IPCC, 2021). On less land, with lower inputs of water, fertilizer, and energy, we must increase productivity. To meet future demands for food, feed, fiber, and fuel, all of our crops must be high yielding, growers must benefit from diversification of plant products, and we must utilize every single carbon atom trapped as photosynthate into target molecules—in other words, more acres in production, more plants per acre, higher value per plant, and higher efficiencies of converting photosynthate to useful products.

On its present course, global population increase is expected to triple the demand for materials by 2050. Materials comprise fossil fuels, metal ores, minerals, and biomass and are the raw resources from which we derive our homes, vehicles, and other possessions. For example, plastics currently use 6% of global oil consumption, a proportion that is expected to increase to 20% by 2050. Material use is tightly coupled to energy use, GGEs, land and water use, and waste flows. We will not meet the projected needs in a sustainable manner for quantity and quality of materials if we can't design fit-for-purpose bio-based and bio-hybrid materials that are energy efficient across their entire life cycle. One example is the development of "superwood," a material 10 times stronger than natural wood (Chen et al., 2020). Our challenge is to redesign materials for structure or for novel functions that can displace or improve the properties of the materials we currently use in every aspect of our modern lives.

Historically, a country's economic prosperity, measured as gross domestic product, has been tightly coupled to its consumption of fossil fuels. Decoupling economic growth from fossil fuel consumption can be achieved by growing a sustainable bioeconomy. McKinsey & Company evaluated 400 test cases, products that could be made using existing reaction pathways, and concluded that 60% of physical inputs to the global economy could be produced biologically, even on a timescale of a few decades (Chui et al., 2020). Their report made me think of how we might

- co-opt plants to synthesize homopolymers, heteropolymers, and composite materials;
- displace structural concrete and steel with new materials like superwood or develop novel functionalized materials with biological properties such as self-repair;
- simplify production systems with the components of cells or make biohybrid materials outside an intact organism; and
- design our genetic circuits to adapt to external conditions that plants experience moment by moment and to allow valuable transgenic organisms to be identified and tracked.

The interconnected crises of climate change and increasing demand for food and energy by a growing global population are front and center in the global consciousness. As individuals and as a research community, we need to use our passion and creativity to set a trajectory for the next decades that preserves the biodiversity of plant life, climate proofs our agricultural systems, and delivers sustainable prosperity for all. It's a code red emergency, and we need to respond.

Thanks to Nick Carpita and Crispin Taylor for their insights and edits on this and previous President's Letters. ■

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KATIE DEHESH
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expected political and economic uncertainties, ASPB once again will rise to the occasion in dealing with the unprecedented hurdles that have emerged. These hurdles are likely to disproportionately impact our early career and underrepresented groups. As president, I would like to increase the career-focused opportunities for our students, postdocs, and early career colleagues by amplifying the voice of ASPB in various public and private sectors and by enhancing our engagement in society at large. Toward this goal, I will initially form an advisory council representing educators, government granting agencies, politicians, businesspeople, and farmers to formulate approaches to implementing this endeavor.

I am currently the director of the Institute for Integrative Genome Biology at the University of California, Riverside (UCR), and a distinguished professor in molecular biochemistry. My research focus is on the evolutionarily conserved stress signaling and transduction pathways shared between plants and other organisms, such as eubacteria and Apicomplexa, as a means to providing an integrated view of the origins and patterns of divergence in adaptive networks. Previously, while at UC Davis, I served as chair of the Plant Biology Graduate Program and chair of the Emphasis in Biotechnology Program, where we expanded our educational program to include industrial experience by actively involving various industrial partners in agricultural and medical fields. Prior to joining the academic ranks, I worked for 10 years in the plant biotechnology sector, generating 11 patents.

I obtained my BSc from Pahlavi University in Shiraz, Iran, where I was introduced to salt-loving plants (halophytes) that grow on unimaginably high salt-containing ground. This initiated an interest that led me to continue my higher education at Sussex University, United Kingdom, an institute well known for its work in this area. Upon receiving my PhD, I traveled back to Iran for a visit with the intention of continuing my postdoctoral training in the United States. Upon arrival, however, I applied for and was offered an assistant professorship at the National University, Tehran. I accepted, planning on only a short stay. But soon after that, I was notified that I was banned from travel because of the compulsory military service for all MD or PhD women. In consequence, I remained in Iran, performing my service duties at the military barracks in the mornings and teaching classes at the National University in the evenings. Shortly thereafter, in 1979, I heard the bells of revolution, but did not anticipate the outcome. In 1980, because of my personal beliefs and convictions, I left Iran and went to Germany, where I eventually obtained a Habilitation (German equivalent of tenure track) position at the University of Kiel, working on chlorophyll biosynthesis enzymes. Being the only foreigner and only woman Habilitant in the institute, although intimidating, offered me a unique opportunity to positively impact and empower the female graduate students in the institute. Later, I was granted a sabbatical leave to go to the University of Wisconsin–Madison to learn much-needed molecular techniques. After a year there, I resigned from my position in Germany and continued as a postdoctoral fellow in Madison, and later at the Plant Gene Expression Center in Berkeley/Albany, working on the transcriptional regulation of phytochrome. Upon gaining experience in both molecular and biochemical techniques, I joined Calgene, a small but powerful biotech company in Davis, California, where I began working in the area of lipid biochemistry with the aim of identifying novel enzymes for production of medicinal oils in plants. In 1999, Calgene was acquired by Monsanto, and I continued my research as the lead lipid scientist for three more years before resigning to join UC Davis as a full professor. There, I initiated de novo several funded research programs based on plant general stress responses. In 2016, I moved to UCR as the director of the Institute for Integrative Genome Biology, where I have initiated and established new core facilities focused on metabolomic analyses. It is my intention to expand the core activities to the training of undergraduate students in analytical techniques as a way to educate them and provide a path to employment. In the course of my career I have been honored with various awards, including Monsanto Fellow; several teaching awards at UC Davis; and election to the German National Academy of Sciences Leopoldina in 2017.

I first joined ASPB in 1998, and I am currently serving on the Dennis R. Hoagland Award Committee. I previously (2013–2019) served on the ASPB Publications Committee, which administers the ASPB/AAAS Mass Media Science & Engineering Fellowship.

My mantra is POWER, as my dream is to empower the young and strengthen their belief in the power of determination and positive thinking. And yes we can!

My vision is to embrace and expand the inclusive culture of ASPB. I will broaden the participation of our national and international colleagues and further engage potential collaborators within the private sector, philanthropic organizations, universities and other educational institutions, and the agricultural sector. I will grow recognition of ASPB by soliciting private funding sources while continuing ASPB's efforts toward engaging Capitol Hill.

I respect the technological revolution and its inevitable need for the continuous reskilling and reshaping of our approaches. To better align ASPB with the pace of our Society's future needs, I will actively seek participation from our future generations to develop ASPB as a platform that promotes the enduring yet dynamic power of the plant sciences. ■

Plant Biology 2021 Workshop and Hackathon on Improving Orphan Crops to Foster Bioeconomies

BY SESSEN DANIEL IOHANNES
Cold Spring Harbor Laboratory

Neglected and underutilized crop species, also known as orphan crops, offer promising opportunities to tackle critical challenges of our time, including food insecurity, climate change, and economic instability. Despite their nutritional properties, tolerance to biotic and abiotic stresses, and adherence to local food cultures and low-input production systems, these crops have long been overlooked by researchers, industry, and governments.

Increasing awareness of the unsustainability of our current agricultural systems, which rely on only four crops to provide 60% of the global food supply, has led to a reevaluation of orphan crops. These crops can play important roles in diversifying foods and diets and enhancing food and economic security for rural populations. The Plant Biology 2021 Workshop and Hackathon on Improving Orphan Crops to Foster Bioeconomies, organized by the ASPB African Researchers Network (ARN) in collaboration with OCP North America (OCP-NA), brought the plant science community together to develop ideas and broaden perspectives on orphan crop research, food systems, and agricultural value chains.

The opening workshop featured presentations by scientists who are championing orphan crops research in Africa, including Allen Van Deynze ("The African Orphan Crops Consortium—Empowering African Plant Breeders"), Damaris Achieng Odeny ("Expediting Utilization of African Orphan Crops Through the Development of Genetic and Genomic Resources"), and Michel E. Ghanem ("Beyond the 'Big 4' Crops—Why Do We Rely on a Few Crops? Perception Gaps), as well as entrepreneurs opening new global markets for African orphan crops, such as Chef Pierre Thiam ("Could an African Grain Become a Global Superfood?"). The presentations provided essential insights for the agricultural technology hackathon that followed the workshop.

The hackathon challenges focused on four main areas: genomics and breeding, food security, biodiversity and soil fertility, and empowerment and entrepreneurship. Hackathon participants were arranged in eight teams, each of which had 48 hours to provide solutions to one of a wide variety of challenges: de novo domestication of teff, climatic and soil quality requirements for orphan crop cultivation, phosphorus use efficiency, global cuisines and markets, seed supply systems, citizen science approaches to link research to policy and markets, and women's participation in the value chains of orphan crops. The teams were supported by mentors who guided them through the brainstorming sessions.

An ARN–OCP-NA panel evaluated the solutions teams presented for creativity, technological innovation, interdisciplinarity and collaboration among team members, communication to the public, outcomes, and feasibility. Prizes were awarded as follows: for the grand prize team, $1,000 as seed money to execute their project and the opportunity to pitch the idea to sponsors for additional funding; for the first-place team, $100 for each member; for the second-place team, $75 for each member; and for the third-place team, $65 for each member. Details on the hackathon teams are listed in the table on page 7.

Overall, the hackathon gave participants the opportunity to learn, to network with the international plant science community, and to develop winning ideas to foster bioeconomies leveraging orphan crops. A distinctive feature of the hackathon was the broad representation of career stages and geographic contexts. Participants included students (67%), early career researchers (17%), and faculty members (17%) based in North America (47%), Europe (3%), Africa (37%), and Asia (13%).

The hackathon was kindly supported by ASPB, OCP North America, Grow More Foundation, Bayer Crop Science, University of Georgia, and New Phytologist Foundation.

Hackathon Team Challenges, Members, and Mentors

Team	Challenge	Team members	Mentors
A11	How can we leverage genomics to improve domestication traits in orphan crops so they can be grown at large scales?	Bello Oluwakemi (Covenant University, Nigeria) Justin Shih (Penn State University) Kirsten Hein (Colorado State University) Kweyu Sharon (Makerere University, Uganda)	Kate Creasey-Krainer (Grow More Foundation) Matthew Venezia (Grow More Foundation)
A12 Grand prize winners	How can we leverage genomics to improve domestication traits in orphan crops so they can be grown at large scales?	Ayelet Kurtz-Sohn (Volcani Institute, Israel) Sunil Kenchanmane Raju (Michigan State University) Mary Ranketze (University of Pretoria and Agricultural Research Council, South Africa) Seloame Tatu Nyaku (University of Ghana)	Rajeev Varshney (International Crops Research Institute for the Semi-Arid Tropics, India) Lise Pingault (University of Nebraska–Lincoln)
C	How can we mainstream orphan crops in global cuisines and markets?	Joelle Muhlemann (Wake Forest University) Elisabeth Balzani (University of Nebraska–Lincoln) Ngoc Pham (University of Nebraska–Lincoln) Hesham Abdullah (Michigan State University)	Shailaja Fennell (University of Cambridge, U.K.)
D First prize winners	How can we improve farmers' access to high-quality seeds of orphan crops?	Claudia Castillo-Gonzales (Texas A&M University) Aziza Zerrouk (Mohammed VI Polytechnic University, Morocco) Salma Rouichi (Mohammed VI Polytechnic University, Morocco) Mukamanasasira Godman (Uganda Christian University) Lucy Jepkemoi (Egerton University, Kenya)	Sessen Daniel Iohannes (Cold Spring Harbor Laboratory)
E Second prize winners	How can we monitor and assess climatic and soil quality requirements for orphan crop cultivation?	Elsa Herminia Quezada Rodriguez (National Autonomous University of Mexico) Jackson Tonnies (University of Washington) Idowu Obisesan (Bowen University, Nigeria)	Edward Salakpi (University of Sussex, U.K.)
F Third prize winners	How can we improve phosphorus use efficiency in orphan crops?	Catherine Freed (Virginia Tech) Marwa El Graoui (Mohammed VI Polytechnic University, Morocco) Nicole Wang (University of British Columbia, Canada) Tim Jeffers (University of California, Berkeley) Natsuko Kinoshita (University of Tsukuba, Japan)	Leonardus Vergutz (Mohammed VI Polytechnic University, Morocco) Mattheus Barreto (Mohammed VI Polytechnic University, Morocco)
G	How can we leverage citizen science approaches to link research on orphan crops to policy and markets?	Nabila Riaz (Dartmouth College) Okon Odiong Unung (National Biotechnology Development Agency, Nigeria)	Kalu Osiri (University of Nebraska–Lincoln) Cyril Azubuine (Osiri University)
H	How can we enhance women's participation in orphan crop value chains and the benefits they receive from them?	Francis Wanhoji (Hungarian University of Agriculture and Life Sciences) Izamar Olivas Orduna (King Abdullah University of Science and Technology, Saudi Arabia) Maria Navarrete Rodriguez (King Abdullah University of Science and Technology, Saudi Arabia)	Modesta Abugu (University of Florida) ■

Reimagining the Annual Plant Biology Meeting—A Hundred Years (Almost) in the Making

The most recent Plant Biology conference looked very much like many scientific meetings during 2021: both online and global. Conferences took a novel delivery approach in 2020 and 2021 because of the COVID-19 pandemic, which kept everyone from gathering in large groups. The question now is, What have we learned from the past two years, and how will we use that knowledge to influence the shape of our future conferences? The answers to these questions really need to come from our community. So we need to learn more about what you want and how future Plant Biology conferences can help you advance your research and build your career.

For some historical context, the ASPP/ASPB community has been convening annually since 1924, missing only two years during World War II. It's not hard to imagine that the 1924 meeting looked quite different from more recent conferences in terms of both the people who participated and the amenities provided. Since 1924, Plant Biology conferences have continually adapted to the changing needs of participants and to developments in conference amenities and technologies. However, even though current technology can make conferences more accessible and inclusive, having digital-only events in 2020 and 2021 clearly contributed to the intense Zoom fatigue many of us have felt as our work, study, and daily lives became largely virtual experiences.

Thus, it is unlikely that ASPB will either return to the conventional in-person-only format or continue to convene Plant Biology meetings entirely online. Instead, we have the opportunity to pivot, redesign, and reimagine the Plant Biology conference for the future, or at least for the next few years. With your input and our capacity to innovate and experiment, we hope to build a new conference experience you can enjoy in 2022 and beyond.

We're not starting from scratch, though. Attendees of Plant Biology 2021 gave the following features a thumbs up:

- workshops developed by the plant science community
- broader scope of scientific content
- more time to meet with speakers

Past Meeting Locations

Year	Location
1924	Washington, DC
1925	Kansas City, Missouri
1926	Philadelphia, Pennsylvania
1927	Nashville, Tennessee
1928	New York, New York
1929	Des Moines, Iowa
1930	Cleveland, Ohio
1931	New Orleans, Louisiana
1932	Atlantic City, New Jersey
1933	Boston, Massachusetts
1934	Pittsburgh, Pennsylvania
1935	St. Louis, Missouri
1936	Atlantic City, New Jersey
1937	Indianapolis, Indiana
1938	Richmond, Virginia
1939	Columbus, Ohio
1940	Philadelphia, Pennsylvania
1941	Dallas, Texas
1942	cancelled
1943	cancelled
1944	Cleveland, Ohio
1945	St. Louis, Missouri
1946	Boston, Massachusetts
1947	Chicago, Illinois
1948	Cincinnati, Ohio
1949	New York, New York
1950	Columbus, Ohio
1951	Minneapolis, Minnesota
1952	Ithaca, New York
1953	Madison, Wisconsin
1954	Gainesville, Florida
1955	East Lansing, Michigan
1956	Storrs, Connecticut
1957	Stanford, California
1958	Bloomington, Indiana
1959	State College, Pennsylvania
1960	Stillwater, Oklahoma
1961	Lafayette, Indiana
1962	Corvallis, Oregon
1963	Amherst, Massachusetts
1964	Boulder, Colorado
1965	Urbana, Illinois
1966	College Park, Maryland
1967	College Station, Texas
1968	Amherst, Massachusetts
1969	Seattle, Washington
1970	Bloomington, Indiana
1971	Pacific Grove, California
1972	Minneapolis, Minnesota
1973	Calgary, Alberta
1974	Ithaca, New York
1975	Corvallis, Oregon
1976	New Orleans, Louisiana
1977	Madison, Wisconsin
1978	Blacksburg, Virginia
1979	Columbus, Ohio
1980	Pullman, Washington
1981	Montreal, Quebec
1982	Urbana, Illinois
1983	Fort Collins, Colorado
1984	Davis, California
1985	Providence, Rhode Island
1986	Baton Rouge, Louisiana
1987	St. Louis, Missouri
1988	Reno, Nevada
1989	Toronto, Ontario
1990	Indianapolis, Indiana
1991	Albuquerque, New Mexico
1992	Pittsburgh, Pennsylvania
1993	Minneapolis, Minnesota
1994	Portland, Oregon
1995	Charlotte, North Carolina
1996	San Antonio, Texas
1997	Vancouver, British Columbia
1998	Madison, Wisconsin
1999	Baltimore, Maryland
2000	San Diego, California
2001	Providence, Rhode Island
2002	Denver, Colorado
2003	Honolulu, Hawaii
2004	Lake Buena Vista, Florida
2005	Seattle, Washington
2006	Boston, Massachusetts
2007	Chicago, Illinois
2008	Mérida, Mexico
2009	Honolulu, Hawaii
2010	Montreal, Quebec
2011	Minneapolis, Minnesota
2012	Austin, Texas
2013	Providence, Rhode Island
2014	Portland, Oregon
2015	Minneapolis, Minnesota
2016	Austin, Texas
2017	Honolulu, Hawaii
2018	Montreal, Quebec
2019	San Jose, California
2020	Virtual
2021	Virtual

- group rates and availability of all content for one year
- captioning and American Sign Language interpreters to promote accessibility
- access to sessions made available on demand
- interactive chat feature during sessions

And here's what got a thumbs down:

- challenges in incorporating online posters
- networking around a digital pool
- participation difficulties in some time zones
- infrequent structured networking opportunities
- participants' need to continue working while attending sessions
- Internet connectivity problems

Moving toward 2022 and beyond, what do you expect, and what are your thoughts on making the annual Plant Biology conference an even better experience for you? Share your thoughts with us via #plantbio22 or #ASPBForward or at https://plantae.org/community/groups/plant-biology/, our new plant biology conference network.

Backstage preparations for Teresa Myers and Katie Rogers, ASPB staff, who served as hosts for the virtual Plant Biology 2021 Worldwide Summit.

So far, we have heard the following ideas for improving the conference experience:

- feature more content developed by the community
- include more three- to five-minute talks
- make some portions virtual to lower costs and include more people from more places
- organize networking sessions by career stage
- have more sessions focused on interdisciplinary science

More detailed information on how you can submit a proposal for community-developed sessions will be made available in early October, so keep an eye out for an email from the Plant Biology 2022 Program Committee. You can also post your ideas for sessions on the new Plant Biology conference network on Plantae (https://plantae.org/community/groups/plant-biology). ■

Reimagine the Plant Biology Conference

We welcome additional ideas and input as we plan for the future.

Please send your thoughts and recommendations for 2022 and beyond to

2022 Program Committee Chair Stacey Harmer (slharmer@ucdavis.edu)

Immediate Past Chair Wayne Parrott (wparrott@uga.edu)

ASPB Director of Meetings and Marketing Jean Rosenberg (jean@aspb.org)

#plantbio22, #ASPBForward

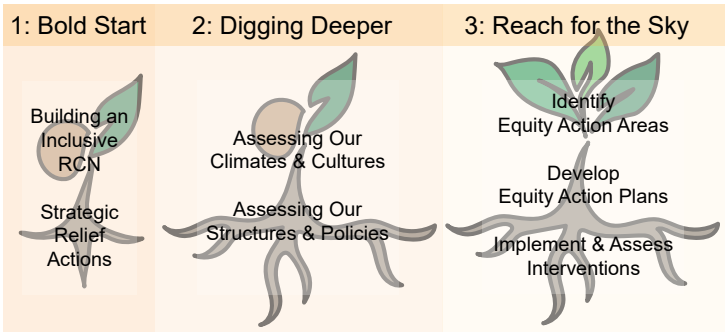
ASPB Awarded NSF Grant to Advance Equity, Diversity, and Inclusion in the Plant Sciences

BY MARY WILLIAMS and CRISPIN TAYLOR

ASPB has been awarded a five-year $2 million grant to develop a Research Coordination Network (RCN) in partnership with other plant science organizations and organizations that serve minoritized and marginalized scientists. The proposal was submitted in response to the NSF LEAding cultural change through Professional Societies (LEAPS) of Biology Dear Colleague Letter.

This award, titled ROOT & SHOOT (Rooting Out Oppression Together and SHaring Our Outcomes Transparently), will be used to build a collaborative network of plant science and partner organizations. The initiative will provide resources, trainings, opportunities, and structures aimed at seeding and cultivating cultural change toward an equitable, diverse, and inclusive scientific future for our discipline.

In addition to ASPB, initial RCN plant science participant organizations include the American Phytopathological Society, the American Society of Plant Taxonomists, the Botanical Society of America, the International Society for Molecular Plant–Microbe Interactions, the Maize Genetics Cooperation, and the North American Arabidopsis Steering Committee. Partner organizations include the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science; Minorities in Agriculture, Natural Resources and Related Sciences; Out in Science, Technology, Engineering, and Mathematics; Corteva Agriscience; Bayer Crop Science; and the Howard Hughes Medical Institute.



Framework for the ROOT & SHOOT Research Coordination Network.
ILLUSTRATION BY SIOBHAN BRAYBROOK

I am ecstatic that ASPB and partner societies and collaborators have received this award! The idea of a community of plant scientists devoted to removing barriers to inclusion and diversity has been in our minds for some time now, and this grant provides the vehicle to achieve this goal. I'm excited to continue supporting ASPB and other societies in making plant biology the most inclusive and equitable discipline out there!

—Miguel Vega-Sanchez, ASPB Equity, Diversity, and Inclusion Committee chair

Collectively, these organizations will develop and propagate tools for cultivating a sustainable sense of shared belonging and for removing oppression from individuals with identities that are historically and currently marginalized (based on gender, gender identity, disability status, sexual orientation, ethnicity, or race). Although each RCN participant organization has begun this work, the award will enable them all to coordinate and develop resources to exert meaningful change and achieve lasting impacts in reshaping the entire plant science community.

This is a fantastic opportunity. The proposal funded by NSF provides a clear road map of activities that will help each participating society self-evaluate and change to become more inclusive. Together, these societies can break barriers and change the makeup of the plant science community. This grant also gives ASPB leadership the resources and support to continue making our Society a more just organization.

—Gustavo MacIntosh, incoming ASPB president-elect

Among other things, the award will fund working groups, drawn from across the RCN participants and partners, to address specific tasks such as identifying and documenting obstacles to full participation and developing strategies for their alleviation. The award also will provide broad training for plant science communities in equitable practices and operations, including inclusive teamwork, climate and culture assessment, and culturally responsive mentoring.

In the fourth quarter, as the award begins, we will begin to ramp up the RCN programs by creating a website, identifying experts and trainers, forming working groups, and preparing webinars and workshops. More information about what opportunities become available and how you can participate will be provided in the coming months.

I am very excited to hear the wonderful news! I am grateful for NSF's acknowledgment of the importance of increasing and supporting equity, diversity, and inclusion, and scientific societies are excellent venues to drive change. ASPB, together with partner organizations and companies, will be more effective and innovative in achieving our goals. Thanks to all for their ideas and effort in putting the proposed ideas to paper. We look forward to working together to support and mentor future generations of plant biologists!

—Judy Callis, ASPB past president ■

More Plant Scientists Elected to the 2021 Class of the National Academy of Sciences

BY YUN-TING KAO
Plantae Fellow, Science Writer

NAS members are elected in recognition of their outstanding contributions to research, and NAS membership is considered to be among the highest honors a scientist can achieve. In the July/August issue, we published profile stories of plant scientists elected to the NAS this year. That article omitted two newly elected plant scientists, whose stories we present here; we apologize for this oversight. Please join us in recognizing these individuals' important contributions to the plant science community.

Jan E. Leach

Jan E. Leach

Jan Leach is a university distinguished professor and the associate research dean in the College of Agricultural Sciences at Colorado State University (CSU). She is also the current president of the International Society for Plant Pathology.

On the day of the NAS election, Jan was reviewing research plans with a graduate student, so she wasn't answering phone calls or checking emails. As she finished up the meeting, her office phone rang. "Congratulations!" said her CSU colleague George Seidel, who is an NAS member. "Thanks—but what for?" Jan replied. "On being elected to the National Academy!" George answered. Jan, still confused, said, "That would be great, but you must be mistaken." Then she noticed all the missed phone calls and congratulatory messages.

Jan described the news as "an amazing surprise!" and thanked all the people in her research journey: "I have been so fortunate in my career. The successes of my program are all due to the exceptional lab associates, students, postdocs, visiting scientists, and collaborators who, over the years, have shared their talents to drive our research agenda forward. Their energy, intellect, and talents made doing the science fun and rewarding."

Jan's curiosity about plants and nature runs in the family. Her maternal grandmother had a knack for making interesting things happen in the flower and vegetable garden. Despite the underlying interest in plants, during her bachelor's and master's programs Jan focused on microbiology and studied bacteriophages of blue-green algae with the idea of using the phage to control algal blooms in lakes.

Yi-Fang Tsay

After her master's studies, working in plant pathology with Jim Steadman and Anne Vidaver brought Jan back to plants and to the very question that has been the driver in Jan's career: How do plants protect themselves from microbial pathogens? This question led her to do a PhD with Luis Sequeira at the University of Wisconsin–Madison. After her NAS election, one of Jan's most memorable moments was to call Dr. Sequeira, who, at 93, was also a NAS member. "He was so thrilled!" recalled Jan. (Dr. Sequeira passed away July 25, 2021.)

Jan's research program aims to develop disease-resistant rice varieties to reduce crop losses to disease. She noted, "Crop improvement programs have long focused on incorporating single disease resistance genes. While initially effective, single resistance genes are frequently short lived because changes in the pathogen or environment render the resistance genes ineffective. Clearly, new strategies are needed to augment the development of resistant crop varieties, particularly in the face of a changing climate."

Jan's research group and her international collaborators have been investigating three core questions: First, why are some resistance genes effective longer in the field than others? Second, what genes contribute to basal or quantitative resistance, and how can we enhance those contributions to promote long-lasting resistance to multiple pathogens? And third, why are plants more susceptible to disease at higher temperatures? "The questions sound simple, but even after a career of asking, there are many facets we still don't understand. It keeps life interesting!" said Jan.

For early career researchers, Jan shared one of the most valuable pieces of advice she received as a young assistant professor: Choose your battles wisely! "Considering carefully what causes or battles you tackle is important, because you need to conserve your limited time and energy for the really important issues," said Jan.

Yi-Fang Tsay
(International Member)

Yi-Fang Tsay is a distinguished research fellow in the Institute of Molecular Biology at the Academia Sinica, Taipei, Taiwan.

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It was love for nature that drove Yi-Fang's curiosity about plants. When she was admitted to a top high school, a friend of her father asked what she wanted for a gift. The gift she chose—a microscope—allowed her to see the beauty of plant tissues, which inspired her to major in botany at the National Taiwan University. Later, attracted by molecular biology, she studied yeast ribosomal proteins in John Woolford's lab at the Carnegie Mellon University, where she learned the importance of critical and creative thinking. By the time she was looking for postdoctoral research topics, the field of plant molecular biology had started to bloom. "It made me excited and brought me back to my love," said Yi-Fang.

During her postdoctoral training, Yi-Fang identified the *CHLORATE RESISTANT 1* (*CHL1*) gene, which encoded the first known nitrate transporter. The discovery stemmed from a long history of plant research and represented a landmark in nitrogen nutrition and plant membrane transport. The *chl1* mutant was originally isolated and characterized in 1971 by W. J. Feenstra's group in the Netherlands when Yi-Fang was only 10 years old. The mutant sat idly for 20 years until K. A. Feldmann developed T-DNA tagging.

Yi-Fang cloned the *CHL1* gene by using the T-DNA-tagged mutant during her postdoctoral training with Nigel M. Crawford at the University of California San Diego. "At the time, Nigel and I knew nothing about membrane transport. Luckily, we learned enough electrophysiology from our neighbor, Julian Schroeder's lab, to demonstrate that CHL1 encoded a nitrate transporter," recalled Yi-Fang. The discovery opened the potential to study nitrate transport at the molecular level and was her ticket to establishing her own lab.

Yi-Fang's group studies the mechanistic action and function of CHL1 (NRT1.1) and many other nitrate transporters. She described her research as follows: "Different from most transporters, CHL1 is a dual-affinity transporter using phosphorylation to switch. Moreover, CHL1 also functions as a sensor (named as transceptor) to monitor nitrate levels in the soil. Despite the long-standing belief that nitrate is mainly transported by xylem, by studying the functions of several transporters in the NRT1 family, we showed that phloem nitrate transport plays a critical role in regulating nitrate distribution and optimizing plant growth. These transporters provide us with new tools to improve nitrogen utilization efficiency in crops and to alleviate the environmental impact of nitrogen fertilizer application. The fun part of studying nitrate transport and signaling is that you can work on molecular mechanisms to satisfy your scientific curiosity, and then extend your research to food security, sustainable agriculture, all the way to environmental issues."

The NAS election announcement and celebratory Zoom call began at 1:30 a.m. Taiwan time. Yi-Fang slept soundly that night because she had finally submitted a book chapter she had been working on for months at 11 p.m. The next day, she was surprised to see an email from NAS. After seeing her name at the bottom of the alphabetically ordered new member list, she shared the news with her students, and many colleagues showed up to say congratulations. "I was completely in shock and overwhelmed by this greatest honor. Later I realized that I am the first female scientist working in Taiwan to receive this prestigious recognition by NAS, which I hope will inspire the plant community and future scientists in Taiwan," said Yi-Fang.

Yi-Fang encourages early career researchers to "find the subject you have a strong passion for, and be aggressive and brave in tackling difficult problems. Think not of how to get a paper published; think of how to move the field forward. However, the most important thing is to enjoy what you are doing." ■

ASPB/AAAS Mass Media Science & Engineering Fellows: Where Are They Now?

BY YUN-TING KAO
Plantae Fellow, Science Writer

The mission of the AAAS Mass Media Science & Engineering Fellows Program is to increase public understanding of science and technology. Over its 45-year history, more than 700 scientists have explored the realm of science journalism over 10 summer weeks. ASPB has been a proud sponsor of the program, fostering members to become engaging science communicators. I interviewed some recent program fellows to learn about their experiences and the impact of the program on their careers and perspectives.

Carolyn Beans (2016)

While working as a science writer at NIH after receiving her PhD, Carolyn wanted to transition from science communications to science journalism, but she wasn't sure how to make the jump. Carolyn recalled, "A number of journalists suggested the fellowship program as an ideal way to launch my journalism career. I was thrilled to be assigned to NPR's science desk, where I covered a wide range of topics—from the science behind Michael Phelps's cupping practice to why some pregnant women 'waddle.'"

Carolyn found a love for food science writing when writing for The Salt, an NPR blog that covers the culture and science of food: "Before writing for The Salt, it had never occurred to me just how much I have to say about food! I found that I could delve into my own personal experiences with food while also drawing on the expertise of food scientists, chefs, and growers." One of her favorite stories was about the culinary applications of *hing,* a popular Indian spice, for which she interviewed her father-in-law, chefs, and food chemists.

After the fellowship, Carolyn was hired as a staff writer for Front Matter, the science news section of *PNAS*. She is now a full-time freelance science journalist covering food, agriculture, and health for many outlets, including *PNAS, Science News, New Scientist,* and *Slate*. Recently she has written about plant breeders' use of artificial intelligence to quickly breed crops that can thrive in the changing climate, for *PNAS,* and recent scientific explorations of *terroir*—the idea that a crop's growing environment can influence flavor—for *Science News*. She noted, "The fellowship gave me the training and confidence to work as a professional journalist. I love that I get to draw on my academic expertise in plant ecology and evolution while covering a topic that interests a broad readership."

Carolyn Beans

Katherine (Katy) Dynarski

Katherine (Katy) Dynarski (2020)

Several years after Katy heard about the fellowship from a seminar on careers in science writing, she became a fellow in 2020 and was placed at *The Wichita Eagle,* a daily print newspaper that serves Wichita and all of south-central Kansas. Because of the COVID-19 pandemic, she worked remotely, hundreds of miles from the Kansas newsroom. "Each day started with a video call with the entire news team, and then I'd get to work! Most of my days were spent researching story leads, conducting interviews, or writing up stories," Katy said. She wrote short- to medium-length (500–1,000 words) news stories about local scientists and environmental and health issues affecting Kansans.

During the summer, some candidate vaccines for COVID-19 were set to be tested in the Wichita area, so Katy wrote an explainer article about vaccine clinical trials so people could make an informed decision about participating. As an ecologist, she knew very little about medical trials before the assignment. She recounted, "I talked to a ton of doctors and nurses over the span of a few days for this story and had an absolute blast learning so much new information so quickly. I got a lot of positive feedback about this story from readers, which was exciting and new for me since I usually don't get any public feedback on my scientific work! It was really rewarding to know that something that I had written was helpful for people. The coronavirus pandemic has made so much of life scary and confusing—having the opportunity to share information that could help people navigate just one small part of our pandemic world felt really special to me."

The fellowship built Katy's confidence in storytelling, which

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applies equally well to journalism and science: "Learning to trust my vision for the shape of those stories made me a more confident writer. When I returned to working as a scientist, I was surprised by how much that trust also helped me to be a more thoughtful and creative scientist. To me, the real guts of science is learning how to ask better questions that let us see the world's stories a little more clearly. It turns out that training as a reporter is a great way to do that!"

Katy is currently a postdoctoral scientist at the University of Montana. She plans to write occasional stories and perhaps a book: "I've always wanted to write a book one day (not a textbook, a real book), and have assumed that that was a ridiculous fantasy. After the fellowship, I feel like it's something that I could actually do."

Katy's fellowship was supported by the Ralph W. F. Hardy endowment to honor Dr. Hardy's contribution in agricultural biotechnology. Dr. Hardy advanced agricultural research through molecular biology and biotechnology and helped increase public understanding of agricultural biotechnology via media and communications.

Nikki Forrester (2019)

One of Nikki's good friends, 2016 fellow Carolyn Beans, introduced her to the fellowship. Nikki spent the summer of 2019 working as a science journalist at the *St. Louis Post-Dispatch,* the largest daily newspaper in the St. Louis metropolitan area. "My goal was to tell science stories that were relevant to everyone in St. Louis," said Nikki.

The thriving scientific community in St. Louis produces no shortage of stories. Nikki covered research on golf grasses, cat allergies, Apollo moon samples, and opiate-producing microbes, as well as businesses going green, Bolivian river dolphins, and urban gardens. One of her favorite stories was about the Tyson Research Center, a 2,000-acre landscape that houses interdisciplinary research and educational programs bringing together scientists, artists, architects, and the public. She recalled, "Through working on these stories, I traveled all around the city to conduct interviews and see science in action. I met people I probably never would have encountered otherwise. Nearly every scientist I talked to in St. Louis described how their research helped address environmental and social injustices in the city. Because of this, I couldn't just write stories about the science—I had to tell stories of people, challenges, wonder, and discovery, all of which occurred in a particular place with its own realities and needs."

The fellowship kicked off Nikki's career as a freelance science journalist covering a wide spectrum of international and local topics. She writes about scientific careers for *Nature;* recent stories have featured academic scientists who started their own brewing and fermentation businesses and ways research group leaders can support diversity in STEM. In addition, she works for the nonprofit organization Science Feedback to fact-check media coverage about climate change and ecology.

Last but not least, she and her fiancé publish an independent

Nikki Forrester

Anna Funk

local outdoor adventure magazine in West Virginia called *Highland Outdoors*. "I absolutely love working with contributors and chatting with readers about their visions for the future of outdoor recreation in West Virginia," she said. "It inspires us to continue growing not only the magazine, but also the community of passionate adventurers in the state."

Nikki recalled, "The mass media fellowship opened a world of possibilities for me in the world of science journalism. The skills I gained working in the newsroom and community of science writers I met through the program continue to shape the work I do and my perspective on science communication." She advised, "If you're interested in science communication, apply!"

Anna Funk (2018)

It seemed as if every time Anna mentioned her interest in science communication, her friends, advisers, and colleagues would say, "Have you heard about that AAAS program?" She became a fellow in 2018 and was stationed at the *Milwaukee Journal Sentinel,* the largest newspaper in Wisconsin. She wrote two or so news stories a week; some she pitched, and some were assigned. "It was always exciting to see my work in print in the newspaper—I even had three front-page stories! I still have a stack of newspapers that I took home as keepsakes," Anna said.

As a scientist, Anna added science elements into stories to "expand people's boundaries just a little further into the world of science." Her all-time favorite was one of her front-page stories, especially because she had pitched it herself. She interviewed a fisheries biologist at the Wisconsin Department of Natural Resources who was dubbed "the Musky Whisperer" because of his hobby as a musky angler. As she described it, "I interviewed him expecting a charming story that hobby anglers would like, but he ended up sharing a ton of awesome insights on how being able to think like a scientist is why he's so good at his job and fishing! I loved it."

Before the fellowship was over, Anna secured a full-time science writer position at *Discover* magazine. She said, "I don't think

Jenna Gallegos

Eric Hamilton

I could have broken into science writing without this fellowship. I'm very happy with where I am now in my career, and I can't imagine being anything other than a science writer and communicator." The fellowship provided a great way for Anna to learn how to be a better writer, how the public experiences science news, and how journalists interact with scientists. "I wish every scientist could pause their scientist life for 10 weeks, just once in their career, and do a fellowship like this," she added.

Jenna Gallegos (2017)

After enough people had recommended the fellowship, Jenna finally applied and became a fellow in 2017. At *The Washington Post,* she learned how to write journalistically, which she applied to almost everything she did afterward. "It was a lot of fun and very independent. My editor taught me what made a good story, and I was able to start pitching my own ideas a little way in," recounted Jenna. For example, her plant biology background inspired a piece to explain myths in agriculture, and her scientific critical thinking helped her dissect ways that news about nutrition science can be misleading. In between identifying a story and writing up an article, she spent a lot of time conducting interviews, which was her favorite part of the experience; talking with authors about just-published papers and people who agreed or disagreed with the results enriched her news articles with depth and perspectives.

After the fellowship and graduate school, Jenna did a nontraditional, writing-heavy postdoc in which she finished up manuscripts presenting results from previously done experiments in addition to doing her own research. Later, connected through the Colorado-based Academic Industry Alliance, she became a writer at Samba Scientific, an ad and media strategy agency with a focus on life sciences. Jenna reported, "I am still using the skills I learned from the fellowship and PhD, including understanding scientific literatures, picking up vocabulary, and telling a compelling story. I used to read a lot of press releases during the fellowship. Now I am in the position of writing press releases, so it really helps to know what the other side sees."

The fellowship helped Jenna develop essential skills and realize that she didn't want to be a science journalist: "Unlike academia, where the writing pace is slow and manuscripts are reviewed by many people, it was exciting, but nerve-racking, to produce a news story within a few days as a journalist. The pace of my current position is a happy medium; we still carefully examine the content we produce, but within a relatively reasonable amount of time." Jenna encourages students to branch out and learn skills that may pave the way for future careers. In her own case, serving as an assistant features editor for *The Plant Cell* and writing for *The Conversation* further strengthened her interest in science communications. "Don't wait until the end of your PhD to think about potential career paths," Jenna advised.

Eric Hamilton (2015)

In graduate school, Eric discovered that he preferred writing about science to doing scientific research: "I like learning a little bit about a lot of different scientific disciplines, and I like the challenge of writing about research in an approachable way." In 2015 he spent the summer at the *Milwaukee Journal Sentinel* covering research at the University of Wisconsin (UW) in Madison, and he kept in touch with the offices at the university while finishing his PhD after the fellowship. He eventually became a science writer on the University Communications team at UW–Madison: "When a position opened up, I applied and was hired. Without the mass media fellowship, that would never have happened. I got the job both because of the experience and because of the personal connections."

Bridging UW–Madison research and a broad audience, Eric writes about just-published papers and features of interesting long-term research projects. The research stories are shared with journalists to encourage independent coverage, as well as on the UW–Madison news site and in the quarterly print alumni magazine, reaching 60,000 UW community members and more than 400,000 alumni.

In addition to writing, Eric helps writers on campus by editing their pieces and ushering them through the University Communications channels. He also helps manage any controversial issues that are tied to scientific research, including funding for fetal tissue research, graduate student workplace grievances, and—of course—pandemics! He has been the primary person updating the COVID-19 information dashboard every day. Eric noted, "During the pandemic, I've been closely involved in various elements of our COVID-19 response. This has included operating within the communications division of the Emergency Operations Center during the initial lockdowns and guiding and assembling communications around the campus's main reopening in September and our ongoing struggles staying open."

Outside UW, Eric is still involved in the plant science community. He has written up public versions of the latest research for the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America. He also has freelanced for Plant

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Editors, a company that edits presubmission manuscripts written by non–native English speakers in the plant sciences. "My background in plant biology specifically has helped me here. The fellowship and ASPB's support were very important to my career," Eric said.

Julie Thole (2008)

While in graduate school, Julie knew she didn't want to be a research professor. As she started to explore alternative career options, she discovered and applied for the mass media fellowship because of her love of writing. She did her fellowship at *Discover* magazine, where she worked with several staff and assisted with magazine production, including following up on interviews, fact-checking, and writing a book review. In the end, the fellowship experience made her realize that being a journalist did not match the lifestyle she wanted.

After the fellowship, she returned to the bench as a postdoc, but she embraced another love of hers—teaching. With support from her postdoctoral adviser, she designated time to teach and held several adjunct teaching positions while doing research.

An opportunity came knocking when Julie wasn't even looking. She was asked whether she was interested in a teaching

Julie Thole

position: "At the time, it didn't seem real, because I had not heard of this type of position." She accepted a position at Saint Louis University in which she spends 80% of her time teaching and 20% in service, which includes mentoring students, helping students choose classes and complete their degrees, and serving on committees. Through collaboration with a colleague in the department, she is involved in some plant science research projects.

When asked about how the mass media fellowship affected her teaching and communication, Julie noted that it was important to "make sure the science is accessible to the audience." She finds that keeping everyone on the same page and extending their knowledge are especially useful in the introductory-level classes she teaches.

Lorena Villanueva-Almanza

Lorena Villanueva-Almanza (2020)

While attending ComSciCon in San Diego in 2018, Ramin Skibba recommended the mass media program to Lorena, and it reminded her that she had heard about the fellowship from Pedro Piqueras, who had been a fellow in 2016. She applied in 2018 but wasn't selected. The next year, she reached out to former fellows to help strengthen her application; it was successful, and she spent 10 weeks reporting for the *Indianapolis Star*. Because of the pandemic, she originally worked remotely, but she decided to fly to Indianapolis even though the newsroom was still closed. Two days after her arrival, she and photojournalist Grace Hollars interviewed a group of researchers who study Indiana bats in one of the longest study sites on bats in the world. The on-site reporting gave Lorena a better sense of the study site, which she had only read about in academic papers, as well as better interactions with the research team.

Another reporting experience revolutionized Lorena's science writing. She interviewed Ximena Bernal, who led studies on how the auditory signals of Panamanian pug-nosed frogs are perceived by a potential mate or predator. "I, being Mexican, admire Bernal, who is Colombian, and her work. During our talk, she mentioned how important it was for her to take students to Panama so they experienced a different culture," recounted Lorena. Bernal's words resonated with her, and she wishes to use her science writing to bridge Latin America and the United States.

The fellowship confirmed Lorena's passion for writing: "With every story, I gained confidence in my skills and experience as a Latina scientist and aspiring writer. I could feel myself grow personally and professionally every week." After the fellowship, she started freelance writing for outlets in the United States and Mexico. She said, "My hope is to make science and science writing a more welcoming space to Spanish-speaking communities, while at the same time highlighting their achievements." ■

As the years churn on, many esteemed members of ASPB have passed the torch to their younger colleagues and stepped out of the limelight to allow others to bask in its glory. Yet, many continue their good works to the benefit of plant biology and the world. Edited by Rebecca Dickstein, University of North Texas, "Where Are They Now?" is part of the *ASPB News* suite of columns focused on the personal and scientific life and insights of ASPB members at all stages of their career. This column offers a look into the current activities of influential members of ASPB who continue to make a positive mark on our Society.

Please feel free to submit your own article to "Luminaries," "Membership Corner," or "Where Are They Now?" For details, contact Ruth Welti at welti@ksu.edu. As always, we are open to suggestions for articles or features of interest to readers of the *ASPB News*.

Richard A. Dixon

Distinguished Research Professor, University of North Texas

Distinguished Lecturer, Hagler Institute for Advanced Study, Texas A&M University

By the time this article is published, I will have officially retired from my tenured faculty position at the University of North Texas (UNT). I will be preparing to return on modified service for two or three years to finish work on two remaining grants, write up the last few papers, and assist the remaining people in my group in moving on to the next stage in their careers.

It has sometimes been hard to convince my research team, and even myself, that I am serious about retiring, but as I near my 70th birthday, I feel more and more certain that it is the right decision. In his "Where Are They Now?" article last year (https://bit.ly/KenKeegstra), my colleague Ken Keegstra explained his adherence to the philosophy of moving on to make way for the next generation of scientists, and I believe he is correct. I have also always felt that it is best to move on when you are still on top and able to tackle new challenges.

The direction of my career was in the balance very early in my life, around the time I completed my ordinary level exams at Ashby de la Zouch Boys' Grammar School in Leicestershire, United Kingdom. I was fascinated by chemistry and biology, but also by the arts and humanities and, in particular, music. I had to decide what subjects I would concentrate on in the last two years of high school, and I still remember the day my headmaster phoned my parents to tell them that I was going to be a scientist, and that I would go into the arts over his dead body! I think I was only 14, and somewhat resented being told this. Looking back, it was probably the most decisive moment in my life. Maybe I could have been a writer, or maybe a music critic, but those are things I can do now; the reverse would not have been true.

Rick in his greenhouse with his large collection of cacti and succulents.

I don't want to take up too much space outlining how the early stages of my career progressed, from undergraduate and PhD work in Oxford, postdoctoral work in Cambridge, and nine years on the faculty at Royal Holloway College, University of London. This has been described in more detail elsewhere (Marino, 2008). During those early years, with my collaborator and close friend Chris Lamb, we built a foundation for studying the biochemistry of inducible plant natural products and associated signaling pathways.

A defining moment came in 1988, when I threw caution to the wind and gave up my tenured position in London to become the founding director of the Plant Biology Division at the Noble Foundation in Ardmore, Oklahoma. My 25 years there were an amazing journey. We assembled a world-class community of scientists in an environment with outstanding resources and few distractions; one lifeline was the Foundation's driver service to the Dallas/Fort Worth airport. My collaborations with Chris Lamb continued (for several years, the Foundation supported a joint postdoctoral program with the Salk Institute), and my work turned from plant

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defense to the science behind agricultural traits such as forage quality and digestibility, focusing on understanding the biosynthesis of lignin and condensed tannins. This work ultimately led us to engineer cell wall composition for the development of bioenergy crops.

Many of these studies continued after my move to join another group of wonderful plant scientists at UNT in 2013. Among the highlights were our discoveries of the biochemical pathways to isoflavones and condensed tannins, the discovery of C-lignin, the development of commercial reduced-lignin alfalfa, and recently the discovery of how cell wall modifications activate signaling pathways for plant defense responses.

Earlier this year, and nine years after I left Ardmore, the Noble Foundation (renamed the Noble Research Institute) announced that it was closing all its plant science–based research. I was shocked and saddened, but at the same time proud of all the wonderful people who had contributed to making Noble's Plant Biology Division a world-class venue for plant biotechnology research for over a quarter of a century. Their accomplishments, being continued now in various laboratories throughout the world, are a true and lasting legacy of something that was unique and, as with all things in life, transient.

As for what I will be doing in the next few years, balancing the dial-down of scientific activities with the expansion of my other interests will be the major challenge. In addition to my modified service at UNT, I will be lecturing in the Hagler Institute at Texas A&M, working informally with students and postdocs at Beijing Forestry University, and serving on international science advisory and editorial boards. My wife Rachel and I still live in Oklahoma, in a lake home in the Arbuckle Mountains that we built while I was at the Noble Foundation. We love the home, particularly the view, but the changing situation will make it rather isolated, so we plan on moving to be nearer our children and grandchildren. That means Tulsa, Oklahoma, and Arvada, Colorado, most likely with a main home at one location and a smaller condo at the other.

This plan is not assisted by my very large collection of cacti and succulents. I have been growing these types of plants since I was 12, and I specialize in propagating highly threatened Brazilian species, especially the genus Melocactus. One of the proudest moments of my career was getting a photo of one of these plants on the cover of *PNAS* to record our paper on the discovery of C-lignin in 2012. A photo is one thing, but nearly 1,000 spiny plants, some over 8 feet tall, are a major impediment to moving!

Once we are living closer to our family, Rachel and I look forward to traveling, both in the United States and abroad. Hiking is a passion, particularly in mountainous areas, and I intend to keep this up as long as my legs will allow; I still have several

Rachel and Rick on the summit of Fragrance Mountain, west of Bejing, October 2019.

mountains in the English Lake District that need to be ticked off my list. A number of my former postdocs now have faculty positions in China, and Rachel and I much enjoyed visiting them before COVID-19. We hope an end to travel restrictions will soon make this possible again.

At home, I will be spending my time tending and showing my plants, studying and occasionally purchasing Greek vases (as a hobby and perhaps a somewhat dubious investment plan), and last but by no means least, listening to and writing about music. I have a very large collection of classical music on both vinyl and CD that I sample from daily, and I've "had a book inside me" for many years now. I am planning a volume on the symphony in the 20th century and also have some ideas about a book on British classical music from the same period. I'm excited to think ahead to all these projects, but also anxious to keep in touch with my colleagues in plant biology, whose work and comradeship have given me so much pleasure over the past 45 years. ■

Reference

Marino, M. (2008). Profile of Richard Dixon. *PNAS* **105(7):** 2263–2265. https://doi.org/10.1073/pnas.0800273105

Welcome to the *ASPB News* "Unsung Heroes of Plant Biology" column! These stories, brought to you by the ASPB Ambassador Program, showcase the vital contributions of non-tenure-track scientists in plant biology. Contact Shawna Rowe, ASPB ambassador and column editor, at roweshaw@gmail.com with questions or comments.

Jyothi Kumar

Michigan State University

BY YASHIKA BOPANNA
ASPB Ambassador

Jyothi Kumar is the program coordinator for the NSF Research Traineeship (NRT) Integrated Training Model in Plant and Computational Sciences (IMPACTS) program at Michigan State University (MSU). She also is the logistics support for the NIH T32 training program.

Before moving to the United States for her PhD, Jyothi Kumar lived in Bangalore, India, home to leading technology and space research companies. In her early years, she was highly inquisitive; she loved her school and teachers so much that she dressed up as a teacher for Fancy Dress Day. She considers her grandfather, aunt, and father her earliest teachers. Jyothi's mother is a homemaker and a brilliant gardener—she's quite proud of her lush rooftop garden!—and her father is an independent building contractor. Her parents did not have the opportunity to graduate from college, and as a result, they always considered her education their first priority.

As a child, Jyothi loved science, and she won third place in a Bangalore science competition. Although she wasn't rebellious as a teenager, Jyothi had a prominent streak of independence. She didn't want to become a doctor or an engineer, the two most popular career options for Indian kids, so at age 18, she considered biotechnology to be the best bet. When asked what she would do with that degree, she always made it clear that she was interested in exploring.

After her M.Sc. in biotechnology, she served as a copyeditor for scientific journals at Macmillan Publishing. She quickly realized that she wanted to do something more. To gain more hands-on lab experience, Jyothi joined a top training program at the University of Agricultural Sciences in Bangalore and began working with molecular markers to assess genotypic variability. For her, it was like opening a new toolbox and getting to try out all the fancy equipment. Her enthusiasm was noticed by the professor running the lab, and she was offered the position of training coordinator when a vacancy opened up. There, she primarily taught and monitored projects for B.Sc. and M.Sc. students. This was her early foray into teaching and showed her that teaching someone else is one of the best learning experiences.

Eventually, Jyothi realized the need to figure out the next step in her career, and a PhD was a natural progression. She moved to the University of Nebraska–Lincoln, where she joined Steven Harris's lab in spring 2013 to do research in fungal biology. During her PhD, she worked with a black yeast, *Exophiala dermatitidis,* that thrives in extreme environments like saunas and terrestrial, rocky habitats. Her dissertation work provided insights into the mechanisms through which these organisms survive in extreme environments.

While doing research, Jyothi also taught. She started as a teaching assistant for a botany lab and learned the ropes from Christian Elowsky. With growing confidence and interest, she taught a graduate-level fungal biology course and facilitated workshops beyond her institution. She realized that "connecting with folks from different backgrounds, talking about favorite topics, helping students through difficult tasks, and sharing interesting tidbits or cool trivia are the best part of a teaching job."

While finishing her doctoral thesis, Jyothi got an opportunity to be a learning assistant for a science literacy course. She described this experience as life changing; as she helped students develop the ability to use science-based decision making in real-world scenarios, she found herself

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UNSUNG HEROES
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inspired to continue facilitating learning for students.

Jyothi shared her interest with Jenny Dauer, the course instructor, who walked her through opportunities in education research. Dr. Dauer introduced her to Tammy Long, an expert at MSU known for her work on how undergraduates learn biology. As a happy coincidence, while Jyothi was preparing for a meeting with Dr. Long, MSU was awarded the NRT grant to implement a potentially transformative model for STEM graduate training in interdisciplinary research. Jyothi got the job and started work immediately.

In her role, Jyothi wears multiple hats. She administers components of the program, which equips trainees with advanced computational and data science approaches. She also manages the program, including setting up fellowships and managing faculty from at least eight engineering and plant biology disciplines. Dr. Long, codirector of the IMPACTS program, said of Jyothi, "Seriously, without her, I can't imagine we would have had the success with our IMPACTS NRT that we have seen. The students love her, the trainers love her, and she has figured out how to keep everything running in a coordinated and functional way. She is the most humble and unassuming person, yet she does the most amazing things."

Jyothi is a believer in diversifying her skill set and finds joy in exploring different avenues. She hopes to contribute to transforming education by studying the process, outcome, and impact of graduate programs and implementing evaluation strategies to improve their effectiveness and, in turn, to inform program decisions.

In her free time, Jyothi loves to read; she has always been interested in stories. During the pandemic, she resumed learning Spanish. Jyothi assures students and colleagues that to make a broader impact, taking detours to identify gaps is not necessarily a bad idea. During graduate education, she advises, one should explore areas not directly related to one's research. As for parting advice, Jyothi says, "Many times, following the crowd is not necessarily a good thing. My love for choosing new paths is part of that. Although there is apprehension, there are also curiosity and excitement about what life holds for us in the next steps." ■

Policy Update

BY VICTORIA HABER
Lewis-Burke Associates, LLC

The information in this article was accurate at the time of writing.

Congressional Updates

House Appropriations Bills Approved Ahead of August Recess

The House passed the majority of its fiscal year (FY) 2022 appropriations bills in anticipation of the August recess. However, the Commerce, Justice, Science (CJS) appropriations bill, which funds NSF, remains in limbo over some policing and immigration provisions and will have to be revisited in September.

Within the House CJS bill, NSF would be funded at $9.63 billion, $1.15 billion or 13.1% above the FY2021 enacted level. This is $535 million or 5.3% below President Biden's FY2022 budget request. NSF's Research and Related Activities (R&RA) account, which includes the Directorate for Biological Sciences, would be funded at $7.696 billion, $786 million or 11.4% above the FY2021 level. The House supports NSF's proposed Directorate for Technology, Innovation, and Partnerships, which is to be funded within the R&RA account and to focus on use-inspired research, including climate change.

The House Energy and Water Development appropriations bill would provide $45.1 billion for DOE, with the largest increase in funding, $906 million or 32%, for energy efficiency and renewable energy projects. The House provided no funding for Biden's proposed Advanced Research Projects Agency (ARPA) for Climate (ARPA-C) but did increase funding for ARPA-Energy (ARPA-E) and directed it to continue to address DOE's environmental missions. Biological and Environmental Research (BER) would be funded at $805 million, an increase of $52 million or 7% over FY2021. The bill would fully fund the Bioenergy Research Centers at $100 million.

Within biological sciences, the bill prioritizes funding for the Designing the Bioeconomy Initiative, which seeks to improve the predictive understanding of gene functions and soil–plant–microbe interactions from molecular to ecosystem scale to apply to solutions for climate change, environmental sustainability, and clean energy. The bill would also increase funding for Basic Energy Sciences (BES) by $48 million or 2.1% above the FY2021 level, for a total of $2.29 billion.

The House provided modest funding increases to USDA's research programs. ARS would receive $1.637 billion for its Salaries and Expenses account, $145.3 million or 9.7% above the FY2021 level. Within the National Institute of Food and Agriculture (NIFA), the Agriculture and Food Research Initiative (AFRI) would receive $450 million, an increase of $15 million over the FY2021 level but much less than the requested $700 million. Funding would also be provided for a strategic plan for the Agriculture Advanced Research and Development Authority, and $2 million would be provided for the Genome to Phenome program.

For NIH, the House bill would provide $49.4 billion, an increase of $6.5 billion above the FY2021 level. Funding of $3 billion would be included to establish the Advanced Research Projects Agency for Health.

Sources and Additional Information

- Lewis-Burke's analysis of the House CJS appropriations bill is available at https://tinyurl.com/yca65pes.
- Lewis-Burke's analysis of the House Energy and Water Development appropriations bill is available at https://tinyurl.com/ystn7ccf.
- Report and bill language for all 12 bills can be found at https://tinyurl.com/tfd6cnd4.

Senate Appropriations Bills Approved for Energy and Water Development and Agriculture

The Senate Appropriations Committee approved the FY2022 Energy and Water Development appropriations bill, which would provide $45.3 billion for DOE, $3.5 billion or 8% above the FY2021 enacted level and $195 million above the House bill. Although there are some slight differences between the Senate and House bills in funding allocations for major programs, both bills advance Biden administration priorities. Of note, BER would be funded at $828 million, an increase of $75 million or 10% over FY2021. Like the House, the Senate bill would fully fund the four Bioenergy Research Centers at $100 million.

Within biological sciences, the bill prioritizes funding for the Designing the Bioeconomy Initiative. The bill would increase funding for BES by $78 million or 3.5% above the FY2021 level, for a total of $2.32 billion. The Senate bill matches the House bill and does not support the creation of ARPA-C. The committee encouraged ARPA-E to consider proposed activities under ARPA-C that are consistent with ARPA-E's mission and authorization. ARPA-E would receive $500 million, an increase of $73 million or 17.1% compared with FY2021, but $100 million below the House mark; the increased funding would support at least 15 new funding opportunity announcements.

The Senate Agriculture, Rural Development, Food and Drug Administration, and Related Agencies appropriations bill would provide ARS with $1.675 billion for its Salaries and Expenses account, $184 million above the FY2021 level. Within NIFA, many of its signature research and extension programs would see modest funding increases. Specifically, AFRI would receive $445 million, an increase of $10 million over the FY2021 level, but much less

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than the requested $700 million, and funding is included for the Genome to Phenome project.

Sources and Additional Information

- Lewis-Burke's full analysis of the Senate Energy and Water Development appropriations bill can be found at https://tinyurl.com/mzft47t5.
- Lewis-Burke's full analysis of the Senate Agriculture appropriations bill can be accessed at https://tinyurl.com/4jrndkhb.

ASPB Participates in Hacking Photosynthesis NC-FAR Briefing

On July 26, the National Coalition for Food and Agricultural Research (NC-FAR) held a briefing titled "Hacking Photosynthesis." ASPB member Lisa Ainsworth participated as an expert panelist with Charlie Messina on redesigning photosynthesis to increase crop yields. The webinar detailed cutting-edge technologies being used to increase the efficiency of photosynthesis in crops and ways to leverage technology to increase harvest indexes with no additional resources. To use this knowledge and accelerate crop improvement, scientists are using artificial intelligence, genomics, gene editing, phenomics, and physiology to enhance predictive breeding. Ainsworth has been working on the Realizing Increased Photosynthetic Efficiency research project, which has had great success testing tobacco plants and is moving to genetically modify crops such as soybeans. These innovations are vital to the sustainability of our environment and food supply.

Source and Additional Information

- A recording of the webinar can be found at https://tinyurl.com/vkrywzu4.

Federal Agency and Administration Updates

Nominees Advance Through the Confirmation Process

The Senate Agriculture Committee held a confirmation hearing in early August for Robert Bonnie, nominee for undersecretary for Farm Production and Conservation, one of the primary positions handling climate issues at USDA, and Xochitl Torres Small, nominee for undersecretary of Rural Development. During the hearing, both nominees voiced their commitment to increasing conservation efforts within USDA and promoting equity. Both nominees were confirmed.

The White House also announced the nomination of Chavonda Jacobs-Young for undersecretary for Research, Education, and Economics (REE) at USDA. Jacobs-Young has extensive familiarity with the agency and currently serves as administrator of ARS and as acting chief scientist and undersecretary for REE.

Source and Additional Information

- The nomination announcement for Chavonda Jacobs-Young can be found at https://tinyurl.com/36unpdhh.

Funding and Engagement Opportunities

Fall Workshop Series on International Biodiversity Research Collaborations

With support from NSF, the American Institute of Biological Sciences and the USA Nagoya Protocol Action Group, in which ASPB participates, are organizing a workshop series this fall that will explore how the international scientific community can study biodiversity in the changing landscape of international policy. The virtual series will consist of six thematic modules featuring presentations from a transboundary team of scientists who have engaged in international research collaborations:

1. phylogenetics, genome evolution, and taxonomy
2. applied ecology and infectious disease
3. crop and livestock research and improvement and vertebrate genetic rescue
4. anthropology, ethnobiology, and paleobiology
5. evolutionary and developmental biology, bioengineering, and synthetic biology
6. macrosystems and international long-term ecological research.

Sources and Additional Information

- More information about the international workshop series is available at https://tinyurl.com/f9h39ysx.
- Information for a scientific audience about the Nagoya Protocol is available at https://tinyurl.com/3dhrmc2b. ■

Marc Alan Cohn

1949–2021

BY CARYL CHLAN, KENT CHAPMAN, BECCA DICKSTEIN, STEVEN FOOTITT, and MEL OLIVER

Marc Alan Cohn, emeritus professor in the Plant Pathology and Crop Science Department at Louisiana State University (LSU) and ASPB Legacy Society founding member, passed away June 19, 2021, from complications associated with pancreatic cancer. Marc "retired" from his position at LSU in 2017 but remained actively engaged there as an emeritus–adjunct professor. He continued to teach his favorite class, Professional Development, and he worked on scientific publications and mentored students. He remained active in many scientific societies, in particular ASPB's Southern Section in his role of financial oversight and accountability officer. In addition, Marc, aka Dr. Jazz, developed and presented a jazz radio podcast, "Gifts and Messages," on WHYR in Baton Rouge until October 10, 2020, when the final podcast, "Last Dance," aired.

Mel Oliver presenting Marc with the Southern Section Distinguished Service Award in 2000.

Marc's development as a scientist began while he was an undergraduate at Northeastern University. Marc, "the man with 1,000 questions" (we might also add, "the man of millions of words"), was called into the office of one of his professors, A. K. Khudairi, who turned the tables and asked Marc what causes a tomato to ripen. That simple question led Marc to work with Khudairi on fruit ripening, and subsequent conversations about career goals led Marc to an assistantship at Cornell and graduate studies, as opposed to his initial plan of becoming a surgeon. Medicine's loss was seed biology's gain.

As a scientist and thinker, Marc was exceptional. His contributions to our understanding of seed dormancy are many and impactful, and all stemmed from his enthusiasm and passion for the topic. He always had something new and exciting to report, which drew his colleagues and those of us on the periphery of the field to his talks. His insights, often delivered with wit and piercing honesty, fueled the research of many, and his scientific integrity created a solid foundation for all to build upon.

Marc's many contributions were recognized by the 2007 Crop Science Society of America Seed Science Award, which, although very prestigious, seems inadequate now in light of his extensive contributions to the field over his long career. A longtime friend and colleague of Marc's wrote in a letter for Marc's retirement in 2017, "Your knowledge of the history and literature in the field, your understanding of how research questions in seed biology have evolved, and your high standards and honesty about what constitutes good science have made you a respected colleague whose advice and opinions are valued greatly."

Marc did not save all his enthusiasm for seed biology and dormancy; he was also passionate about advancing the profession in the broadest terms through his teaching, mentoring, and public outreach and in his service to ASPB at the national and regional levels. As a teacher and mentor, Marc was fiercely committed to training students, who found working with Marc both a challenging and an exciting experience. His encyclopedic knowledge of and passion for seed biology were infectious. He was always asking questions, because he was continually interested in what students and colleagues were doing. He would say, "There are no answers, only better questions to ask." Marc inspired and challenged students; he received many teaching awards at LSU, including the 2015 Tiger Athletic Foundation President's Award for Distinguished Teaching.

Marc was a dedicated officer of ASPB and a central figure in the Southern Section. The Southern Section was formed in the late 1930s, but it was Marc and his colleagues, through their enthusiasm and financial prudence, who made it truly successful and a powerful voice

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Jan E. Graebe

(1930–2021)

VALERIE SPONSEL
The University of Texas at San Antonio

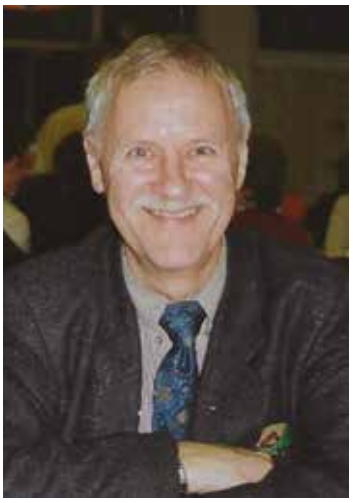
Jan Eiler Graebe passed away on May 3, 2021, in Göttingen, Germany, at the age of 90. Jan was a pioneer in the field of terpenoid biosynthesis, with a focus on the gibberellins. He had an active research laboratory at the University of Göttingen from 1965 until his retirement in 1995.

Jan was born and grew up in Malmö, Sweden, before attending the University of Lund to complete an undergraduate degree in botany and chemistry in 1954. He then moved to the United States to work with Bernard Phinney and Charles West at the University of California, Los Angeles, receiving his PhD in botany in 1961.

At the time, gibberellin research was still in its infancy. Phinney and West had shown that the liquid endosperm in immature seeds of wild cucumber, *Echinocystis macrocarpa* (later renamed *Marah macrocarpus*), was a rich source of gibberellins. In order to study the biosynthesis of these hormones, Jan developed a cell-free system from the endosperm, collecting wild cucumbers from the hills surrounding the campus. Using this system, he demonstrated the conversion of mevalonic acid to the gibberellin precursor *ent*-kaurene and, for the first time, the sequential oxidation of *ent*-kaurene to *ent*-kaurenol, *ent*-kaurenal, and *ent*-kaurenoic acid. This pioneering work proved to be inspirational. It laid the foundation for his subsequent research on gibberellin biosynthesis and metabolism in cell-free systems from *Cucurbita maxima* (pumpkin).

After completing his PhD, Jan received a Damon Runyon Memorial Fund Postdoctoral Fellowship to work at Oak Ridge National Laboratory in Tennessee on amino acid incorporation in cell-free systems of *Zea mays*. Then, in 1965, Jan moved with his wife, Ursula, and growing family to the picturesque and historic town of Göttingen, West Germany. Jan would spend the rest of his professional life at the Institut für Pflanzenphysiologie (now a subdepartment of the Albrecht-von-Haller-Institute for Plant Sciences) of the University of Göttingen. Initially a postdoctoral fellow, he became a professor in 1970.

When establishing his research program in Göttingen, Jan decided to return to gibberellin biosynthesis, but because wild cucumbers were not available, Jan thought to test liquid endosperm from the related genus pumpkin as an alternative source of biosynthetic enzymes. He discovered that pumpkins were growing in abundance on the grounds of a local psychiatric hospital, and as recounted by Peter Hedden, with permission and using a very large knife, he set about cleaving the pumpkins to examine the development stage of their seeds prior to harvest. This attracted considerable interest from the hospital



patients, but visitors stayed well away! The pumpkin endosperm cell-free system proved to be very effective, and pumpkins were then grown in the botanical garden at the institute throughout Jan's career.

The innovative research conducted in his lab in the 1970s using the pumpkin system established a number of firsts for gibberellin biosynthesis and metabolism in a plant-derived system—for example, the conversion of mevalonic acid to gibberellin A_{12}-aldehyde and its subsequent conversion to a bioactive C_{19}-GA, GA_4. Jan and his many students and postdoctoral fellows went on to characterize the enzymes catalyzing specific reactions in gibberellin metabolism, demonstrating, for example, the involvement of 2-oxoglutarate-dependent dioxygenases (2ODDs). This research demonstrated that there were fundamental differences in the metabolism of gibberellins in plants and the fungus *Gibberella fujikuroi,* most notably the importance of monooxygenases in *Gibberella* in contrast to the 2ODDs in plants for the later steps of the biosynthetic pathway. The use of *in vitro* systems to study *ent*-kaurenoid and gibberellin metabolism in the Graebe lab also allowed for mechanistic studies, for example, on the ring-contraction step that converts *ent*-kaurenoic acid to GA_{12}-aldehyde and the loss of carbon-20 in the conversion of C_{20}-GAs to biologically active C_{19}-GAs.

Although the choice of pumpkin endosperm as a source of enzymes for studying gibberellin biosynthesis and metabolism was inspirational, we now know that gibberellin metabolism in pumpkin and other cucurbits is somewhat different from that in other important crop plants, including pea and maize. Concurrent research characterizing the endogenous gibberellins in legumes and cereals in addition to those in pumpkin and other cucurbits showed that in contrast to the cucurbits, pea and maize contain predominantly 13-hydroxylated gibberellins, suggesting the importance of hydroxylation at carbon-13 early in the gibberellin pathway. The Graebe lab was able to demonstrate the entire 13-hydroxylation pathway in a cell-free system from immature pea seeds, underscoring that for both pumpkin and pea, the enzymatic conversions demonstrated *in vitro* replicate the pathways present in intact

plants. Moreover, the innovative use of *in vitro* systems enabled the characterization of individual enzymatic reactions, including the establishment of their subcellular localization.

Jan's work provided one of the first demonstrations that *ent*-kaurene was synthesized in proplastids. It also enabled the cloning and expression of the genes. These important advances provided the groundwork for numerous studies on the regulation of gibberellin metabolism during plant development and in environmental responses. They also facilitated work on the chemical and genetic manipulation of gibberellin metabolism and signaling for the introduction of beneficial traits into crop species, which has had a positive impact on agriculture.

In Jan's early years in Göttingen, the equipment in his lab was quite primitive, consisting mainly of a radio scanner for monitoring ^{14}C in thin-layer chromatograms. However, over time and with support primarily from the German Research Foundation, Jan was able to establish state-of-the-art instrumentation, including combined gas chromatography–mass spectrometry for the analysis of plant hormones and other compounds. Having direct access to such sophisticated equipment was not at all common for plant biologists at that time!

Jan developed research collaborations with members of other institutes at the University of Göttingen, particularly the Faculty of Agriculture. As a result of such interactions, Jan broadened his research scope to include the role of plant hormones, especially auxins, in storage processes in the seeds of cereals and legumes. Jan and colleagues also identified *Sphaceloma manihoticola* (a fungal pathogen causing the superelongation disease of cassava) as the second microorganism after *G. fujikuroi* that produces gibberellins.

Jan was very much appreciated by his many students and research colleagues. Perhaps because of his Scandinavian origin and the years he spent in California, his attitude contrasted with that of "typical" professors at that time. The evening seminars held at his home, some even in English, accompanied by beer and refreshments were real highlights of the time working in his lab. The broadly chosen topics often went far beyond plant biology and regularly led to controversial and heated discussions, which Jan moderated in his incomparably calm manner. Jan was unbiased, open-minded, and above all curious about everything new. All this and his genuine scientific passion inspired generations of students and young scientists. Many of those who spent time in his lab remained colleagues and friends decades later as testament to the enduring community of scholars that Jan established.

Jan's contribution to the field of gibberellin biosynthesis and its control was recognized by the invitation to write a review on the topic in *Annual Review of Plant Physiology* in 1987. In 1995 Jan became an Enid MacRobbie Corresponding Member of ASPB in recognition of his distinguished contributions to gibberellin research. Also in 1995, he was honored for his research achievements by the International Plant Growth Substance Association with its prestigious Silver Medal.

Jan was an avid gardener and spent many hours in his garden at home, where, after his retirement in 1995, he grew everything but pumpkins. He and Ursula also traveled extensively, especially to visit their children and grandchildren in many parts of the world.

Jan is survived by his beloved wife of 64 years, Ursula (Glanz) Graebe. Devoted to his family, Jan was loved and respected by his three children, Andrea, Stefan, and Jan-Sebastian, and by his three grandchildren, Linnéa (named for both her Swedish and botanical heritage), Jan-Henrik, and Juliane. He also leaves behind many former graduate students, postdoctoral fellows, and visiting scientists for whom Jan's lab was an exciting and exhilarating environment in which to unravel the complexities of gibberellin biosynthesis and metabolism.

Several former members of Jan's lab, Peter Hedden (Harpenden, United Kingdom), Wilhelm Rademacher (Limburgerhof, Germany), Theo Lange (Braunschweig, Germany), and Yuji Kamiya (Tokyo, Japan), contributed to this article, together with Stefan Graebe (Cape Town, South Africa). ■

MARC ALAN COHN
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in ASPB. Marc was clearly the financial mastermind and a driving force of the section. When no longer an officer, Marc continued training all incoming secretary–treasurers of the section in careful budget management to keep the Southern Section on strong financial footing. Because of Marc's efforts, the section has been able to help defray costs of student registration fees for the Southern Section meetings and to fund speakers for the annual symposium. At meetings, Marc was always an active participant who asked questions and mentored graduate students and colleagues. In recognition of his tremendous contributions to the Southern Section, Marc was presented the Southern Section Distinguished Service Award in 2000.

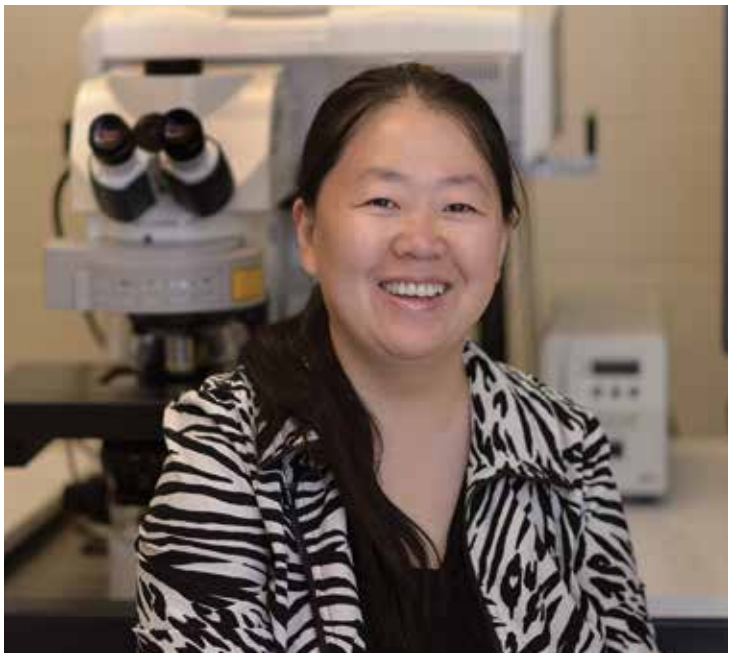
Marc's passing leaves a giant hole in the heart of the Southern Section that will never be filled. For those of us who knew Marc (or Dr. Jazz), our world is a better place because of him. He will no longer go from session to session at meetings in his suit jacket with his pipe in his pocket, inspired to ask just one more question. But he was not only a wonderful colleague, mentor, and passionate scientist of the highest integrity, he was our friend. He was one of the good ones. He will be sorely missed. ■

Chunhua Zhang

1977–2021

BY DAN SZYMANSKI, NATASHA RAIKHEL, and CHRIS STAIGER

ASPB and the international plant biology community have lost one of their brightest and best stars, Chunhua Zhang, assistant professor of botany and plant pathology at Purdue University. Chunhua was diagnosed with late-stage pancreatic cancer in February 2021 shortly after giving birth to her fourth child. She did everything in her power to fight the cancer, but she passed away on May 15, 2021. During her brief illness, she delighted in watching her new baby, Christopher, grow and was surrounded by her three other children, Henchy, Shooyee, and Henry, and her husband, Junli Liu, as well as several other family members and friends.



Chunhua's family and friends and the Purdue University community are trying to cope with this sudden loss. Her graduate students and postdocs are continuing their projects and careers. The 2021 Midwest Plant Cell Dynamics meeting was held in her honor, and the Purdue community was there to support her family and continues to do so through a GoFundMe initiative (https://www.gofundme.com/f/support-chunhuas-family).

Chunhua began her scientific career in 2003 at Purdue University as a graduate student in Dan Szymanski's lab, followed by a brief postdoc. Dan was the lucky one to first see her natural gifts for science and to serve as her PhD adviser. During her lab rotation, it was apparent that Chunhua had a keen eye and a sharp mind. She had the rare combination of creativity, intellect, perseverance, and communication skills. While a PhD student, Chunhua published landmark papers on the biochemical basis of unequal gene importance. She pioneered the first paper on a quantitative time-lapse analysis of pavement cell morphogenesis and established the cotyledon system that has been widely adopted since then. She was the first to link Rho-of-Plants activation signals to the surface of the endoplasmic reticulum. Her research impact is reflected in the constant citation rates for her papers for almost 15 years.

Chunhua was generous with her knowledge and skills. She taught undergraduate students how to conduct research, and those who took full advantage gained authorship on publications. She shared her knowledge and contributed in a meaningful way to her labmates' projects with no concern for credit. She led by example, helped create stronger teams, and had a lasting impact on her colleagues. Her unique combination of empathy and broad scientific interests allowed her to learn from others who didn't necessarily work in her area and broadened her reputation in the research community. The Szymanski lab enjoyed spending time with Chunhua and her love of food and celebration, and when she and Junli started their family, everyone could see how she extended her love and giving to her family.

In 2012, Chunhua joined Natasha Raikhel's lab at the University of California, Riverside, as a postdoc. She wanted to learn chemical biology and did so very quickly. She chose to work on a chemical the Raikhel lab called Endosidin 2 and efficiently identified its target. She published three papers in a relatively short period, including a landmark paper in *PNAS* in 2019. In the Raikhel lab, Chunhua was recognized as an incredibly capable scientist with an inquisitive intellect. She was deeply motivated and extremely curious and had a very quick mind for solving research problems.

Always ready to extend her expertise to help colleagues in their studies, Chunhua had many collaborators from different parts of the world who loved working with her. Current and past Raikhel lab members often commented on Chunhua's smarts and wonderful sense of humor, and many developed collaborations with her. Chunhua was also deeply admired for her energy and devotion to her husband and family in raising their beloved children.

In 2016, Chunhua and her family returned to West Lafayette and Purdue University, and she began her career as a faculty member and independent scientist. She was a part of a cluster hire in basic plant biology and was the inaugural hire in the Center for Plant Biology. Her tenure home was the Department of Botany and Plant Pathology, where she

quickly gained respect from her peers and students for her thoughtfulness, incisive mind, and caring approach to mentoring and training junior scientists. In her short time at Purdue, she developed an independent program, secured funding, and trained a wide range of students. She also served as an assistant features editor for *Plant Physiology* from January 2018 to December 2019.

Many faculty at Purdue were fortunate to collaborate with Chunhua, but perhaps none more than her friend, colleague, and department head Chris Staiger. During her time there, they shared joint group meetings, published several key papers together, coinstructed several courses, and renewed the deep friendship and mutual respect that originated when Chunhua was a PhD student at Purdue.

Chunhua's experiences from her graduate training in the Szymanski lab and postdoctoral work in the Raikhel lab enabled her to combine powerful chemical genetic approaches with high-performance quantitative imaging to dissect complicated vesicle trafficking pathways. In particular, she identified several novel small molecule inhibitors of cellulose biosynthesis using *Arabidopsis thaliana* and discovered their mode of action and cellular targets. Her highly regarded work was published in *The Plant Cell, Plant Physiology,* and *The Plant Journal,* among other journals.

Moreover, this work led to several provisional and approved patents to secure the intellectual property around these discoveries in basic research, and Chunhua was actively pursuing the translation of these discoveries into advances in applied agriculture through development of novel herbicides and transgenic crop plants. During her short time at Purdue, she secured approximately $900,000 in extramural support, primarily through a major award from the competitive NSF Molecular and Cellular Biology program.

Finally, Chunhua gave of her valuable time to early career scientists through numerous teaching and outreach activities. She trained dozens of undergraduates and high school students, as well as high school teachers from minority-serving communities, in summer programs. She mentored several MS students to completion of their graduate degrees and was training a postdoctoral research scientist, Lei Huang, and a PhD student, Xiaohui Li, at the time of her passing. Watching her operate in this forum, it was obvious to all that she cared deeply about her science and was gifted in communicating her knowledge to others.

Chunhua leaves behind a legacy of original research and discoveries, deep friendships and valued collaborations, and a passion for training early career scientists that will serve as a benchmark for future hires in plant biology at Purdue. At the time of her passing, Chunhua was being considered for promotion to associate professor, something she sincerely wished to see happen before she died. The university is currently considering a posthumous promotion for Chunhua, and she certainly deserves this recognition of her contributions to discovery, learning, and engagement.

It is our hope that Chunhua's children will share her love of science and investigation and of learning about the unknown. We hope Chunhua's family and the entire ASPB community know how much she was loved, admired, and respected by her colleagues and students. As a Hebrew proverb says, "Say not in grief 'she is no more' but in thankfulness that she was." Chunhua leaves behind her example of a permanent sense of strength and positive energy that we all aspire to achieve. ■

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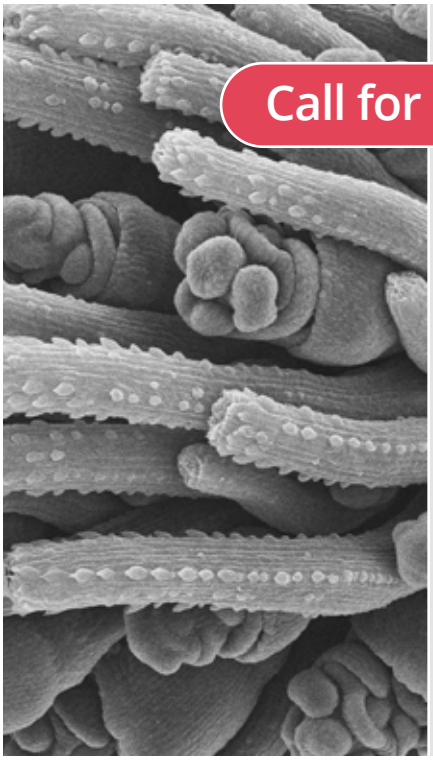

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