



BOTANICAL SOCIETY OF AMERICA

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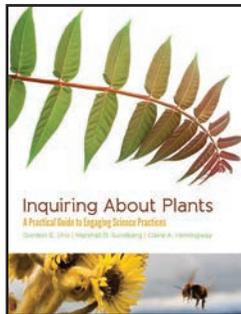
BSA LEGACY SOCIETY CELEBRATES!

DENNIS STEVENSON, FRANCIS HUEBER, ANITRA THORHAUG, KARL NIKLAS,
PAUL BIEBEL, JOHN MIKEL, JUDY SKOG

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FROM THE EDITOR

In a recent commentary in *Nature* (503: 191–192), Georgina Mace noted that the shift to digital publishing is beginning to have a negative effect on scientific societies, such as the 100-year-old British Ecological Society, of which she is Past-President. In great measure, this is because most professional societies derive a significant portion of their budget from subscriptions to their scientific journal and membership is declining. The Botanical Society of America has been proactive in anticipating these changes and increasing the value of membership for several years, and as a result we are in a much better situation than many of our sister scientific societies. It is timely, then, that we begin this issue with the address presented by President Pam Diggle at our annual meeting last summer. Pam presents a brief history of the role of learned societies, their journals, and their meetings and brings this forward to the role of the BSA, our professional journals, and our annual meeting today. I am in full agreement with Pam's prediction for the future, and I think you will be too. Read the article on p. 150.

Then, start planning for our next annual meeting, Botany 2014 in Boise, Idaho. If you're undecided at the moment, I understand that one of the field trips may be to the *Clarkia* fossil beds—check out Plants are Cool, Too! Episode 2: “Fossilized Forests” (<https://www.youtube.com/watch?v=YfRXDbtkEi0>). See you there!



-Marsh

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LEARNED SOCIETIES - PAST, PRESENT AND FUTURE?

ADDRESS OF THE BSA PRESIDENT
FROM BOTANY 2013

PAM DIGGLE
UNIVERSITY OF COLORADO

(The video of this talk is available at the BSA's Botany conference channel at <http://www.youtube.com/watch?v=f-zJmTX9Zp0>.)

Why do we belong to scientific societies? Why do we come to scientific meetings? As I prepared to take on the role of President of BSA, I realized that the answers to these questions were so important that I wanted to devote my presidential address to the answers. In this digital age, with so many different options for sharing information and interacting with colleagues, why do we hold meetings? Why did 1100 of us travel to New Orleans? We could have all put our talks on YouTube and tweeted about our favorites without ever leaving our offices. What is the role of meetings and of scientific societies generally, and the Botanical Society of America specifically, in modern science?

To explore this question of why we belong to societies and why we come to meetings, I began by asking a more general question: What is a scientific society, or more generally, a learned society? Reading through the literature on learned societies, I found a variety of definitions. Learned societies are...

- Knowledge networks...created to provide a forum for learned individuals to share and discuss knowledge and discoveries (McCarthy and Rands, 2013)
- Primarily concerned with the pursuit of knowledge and its dissemination to a wider audience (Hopkins, 2011)
- Organizations that promote interaction between scholars (*Encyclopedia of Higher Education*)
- Publish the proceedings of their meetings, journals, reports and outstanding investigations by their members. They also award prizes, encourage or subsidize research and maintain libraries (*Columbia Encyclopedia*)
- A means through which interested parties are

able to access the combined expertise of many universities and individuals in one space or for experts to gather to have impact by collectively expressing opinion on a particular topic

- Voluntary organizations of individuals dedicated to scholarship and research, often focused on a particular subject or method.

Common themes of these definitions include the focus on the intake, exchange and dissemination of knowledge, and interaction among individuals and professional recognition. This is a good description of the BSA as a modern Society, but how have learned societies come to embody these properties; how did these networks of knowledge and personal interactions come about? What is the history of learned societies?

Most historiographies trace the origins of modern learned societies back to the *Accademia Secretorum Naturae*, founded in Naples in 1560 by Giambattista della Porta. The society met in della Porta's home and membership was open to all who could "present a new fact in natural science." This was a group who cared about knowledge and came together to discuss and share knowledge widely. The society's activities became the subject of an ecclesiastical investigation and della Porta was ordered by Pope Paul V to close his Academy in 1578 under suspicion of sorcery.



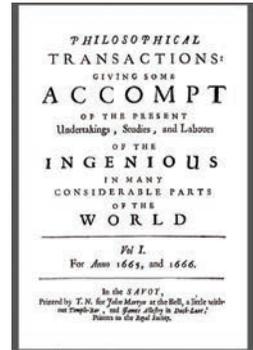
Giambattista della Porta, founder of the Accademia Secretorum Naturae in 1560. Membership was open to all who could present "a new fact in natural science."

Some 50 years later, Federico Cesi, who was passionately interested in natural history, particularly botany, founded another academy, the *Accademia dei Lincei*, in Rome. The academy was named after the lynx, an animal whose sharp vision symbolizes the observational prowess that science requires. The society's purpose was the "acquisition of wisdom and knowledge of things... and the announcement of these to men by both word and voice." They undertook individual projects and investigations, kept members informed about what happened in meetings, and established a library. Perhaps most importantly, they established an ideal to be emulated, that of a community of scholars in constant free and open contact. Galileo Galilei was a prominent member. The society did not long survive the death of its founder Cesi, but was resurrected in modern times, and you can read more about it at www.linacei.it.



The emblem of the Accademia dei Lincei, founded in 1603, by Federico Cesi. The academy was named after the lynx, an animal whose sharp vision symbolizes the observational prowess that science requires.

The *Accademia dei Lincei* inspired the establishment of multiple learned societies across Europe. Groups of people everywhere gathered to discuss science and new knowledge. In England, 1660 saw the establishment of a society that persists to this day: the Royal Society of London for Improving of Natural Knowledge. The society was founded by a small number of men (alas, this history is mostly about men), including physicians and natural philosophers, who began meeting in a variety of localities around London and Oxford. The society was granted a royal charter by King Charles II, but the government did not support the Society. In fact, to this day most learned societies are not supported by any governmental entity; they are volunteer organizations and sustained by members. The members of the nascent Royal Society met weekly to discuss science and they

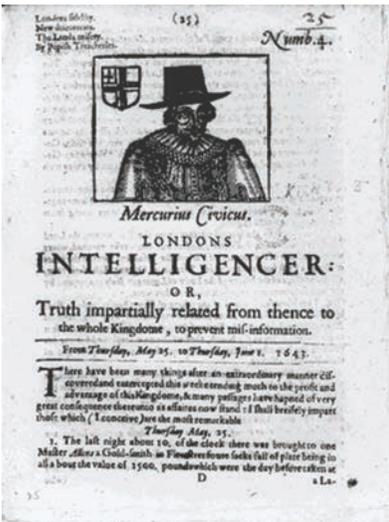


The first issue of the Philosophical Transactions of the Royal Society of London. Journals were created by societies to share information with members and to make their collective findings generally available to other interested groups. Journals became important permanent repositories of information.

even demonstrated new scientific devices and ran experiments at these meetings. They read their own papers, which described new discoveries, to each other and presented papers that they received from scientists on the continent. The Society's motto, *Nullius in verba*, is Latin for "Take nobody's word for it" and signifies the Fellows' determination to establish facts via experiments. This early genesis of the Royal Society occurred within the context of the Enlightenment. The members understood that they could create new knowledge, that they could discover new things about the natural world.

The scientific journal originated with the scientific societies of the seventeenth century. Journals as we know them today were created by these societies as a means of rapid communication among members, to make their collective findings generally available to other interested groups, and to provide a venue to inform members about activities and findings of other societies. Journals also became important repositories of scientific information, providing a dependable and permanent record. The close relationship between societies and journals has been critical to the stability of journals over the long run. Societies are sustained by groups of people that care very deeply about science, and for that reason, they are committed to the journals that communicate their science.

In the middle of the seventeenth century, however, it was not at all obvious that journals would become the appropriate place for scientific



Newspaper from 1643. In the seventeenth century periodical publications were primarily newspapers and broadsides. They were not considered reliable and permanent repositories of information. Image from The British Library, E.104.(3.) Copyright ©1999, The British Library Board

publication. At that time, scholars wrote books and treatises—big fat tomes of information that were published and circulated among the learned. Publishing books was the accepted means to establish a reputation as a scholar and for communication of knowledge. There was no precedent for the publication of credible knowledge in periodical form. In fact, “periodical” and “journal” did not exist as nouns to describe a type of publication! A modern scholar who studied the practice of publication in the seventeenth century (Johns, 2000) raised the question: in this period, why should anyone interested in producing secure knowledge ever think to do so by means of transient publication such as this? Most of what was printed in a journal-type format was intended as ephemera. They included broadsheets that carried gossip and news, and these publications weren’t thought of as a means of communicating dependable information.

Establishment of the scientific journal in its modern form is the result of a synergy between two needs. On the one hand, the members of the Royal Society (and other societies) were very much in need of rapid communication with one another and exchange of information internationally. On the other hand, the printers really needed a dependable income. The printing field was rife with plagiarism

and there was no copyright. Printers would go to all of the trouble and expense of creating scholarly books and the minute they were for sale, another printer would typeset them, print them, and sell them in competition with the original printer. The pace at which journals were published meant that there was always fresh material to print. This mutual need of societies and printers for regular publication created the scientific journal as we know it today.

By the mid 1700s, there were many different learned societies across England and Europe, and there were many journals. Mail was dependable, and distribution of journals to members within societies and exchange of journals among societies kept members informed about new developments in science. The system of exchange of information was so well established that you could sit in your armchair in front of the fire, read your journals, learn about the exploration going on all over the globe about new experiments and discoveries, and you could carry on a correspondence with people of like mind. You did not have to go to meetings. But that’s not what happened.

People continued to form both formal and informal learned societies and to meet to advance science. I’ll give two examples of informal societies that had a significant impact on science. The first is the Lunar Society, a group of men who met in the British midlands around Birmingham in the late eighteenth century. It was an informal society of prominent men, including industrialists, natural philosophers, and intellectuals. They were interested in basic science and natural history, but they were also businessmen and they had a practical focus. Their goals included improving manufacturing machinery and building canals so that they could distribute their products more efficiently. In some histories, the origin of the industrial revolution is traced to these men. They called themselves the Lunar Society (and cheerfully referred to themselves as “lunatics”) because they met during the full moon; the extra light made the journey home safer in the absence of street lighting. These people all had day jobs, yet meeting with one another was so important that they ventured out at night by horseback or carriage and had to travel back home by moonlight. The Lunar Society included Matthew Boulton, who, along with James Watt, invented the steam engine; Joseph Priestley who experimented with electricity and oxygen and was also a clergyman; and Erasmus Darwin, a

natural philosopher and a physician (and Charles Darwin's grandfather). Despite, or perhaps because of, their diverse interests and professions, these men very much valued each other's company and traveled long distances to meet and discuss science.

and free, untrammelled by religious dogmas." In addition to discussion of science, a key aim was to make the practice of science professional. At that time, the word "scientists" had just been coined and there was no such profession as scientist. The X



"A Philosopher giving a Lecture on the Orrery in which a lamp is put in place of the Sun," a painting by Joseph Wright of Derby. This portrays a key idea of the Age of Enlightenment: science grounded in empiricism and reason.

Skipping ahead 100 years to mid-nineteenth century, and going back to central London, my second example of an informal society is the X Club. By this time, the Royal Society and other prestigious societies such as the Linnean Society of London had been well established for over 200 years and their meetings and journals functioned as dependable sources of information about science. Yet, informal clubs and societies continued to form in London to facilitate more intimate discussions and interactions. In 1864, a group of nine men, calling themselves the X Club, began to gather over dinner once a month. All were members of other learned societies, but still felt the need to gather together in an informal setting. The X Club began to meet soon after the publication of Charles Darwin's *On the Origin of Species by Means of Natural Selection*, and in the midst of the debates between the clergy and the scientists over Darwin's ideas. The members of the X Club described themselves as "united by a devotion to science, pure

Club was instrumental in creating paid professional positions for scientists. You'll recognize many of the members: Thomas Huxley, Joseph Hooker, Herbert Spencer, John Lubbock, and John Tyndall.

The word "scientist" was coined in the 1840s (the date is uncertain) by William Whewell at a meeting of the British Association for the Advancement of Science. Before then, people who did science were referred to as "natural philosophers" or "men of science." The very word we use to describe what we are (scientists) was born at scientific meetings, and science as a profession owes much to the activities of scientific societies such as the X Club. Moreover, I would argue, the genesis of science as we know it today occurred in the academies and societies that originated in the middle of the seventeenth century. Modern science did not originate in universities. The universities of the time were fairly moribund. To learn in a university was to study the classics and to master received wisdom. Creation of new knowledge was not a goal of university education.

Modern science originated with the enquiries and activities of scientific societies. The very notion of faculty as members of the “academy” and the words “academic” and “academician” derive from the association of new knowledge with learned academies and societies.



Asa Gray, botanist and early supporter of Darwin's evolutionary theory was elected president of AAAS in 1872. He planned to travel 3,000 from Massachusetts to California on the newly completed transcontinental railroad to attend that year's meeting.

Turning from England to the other side of the pond, we were not dozing. In the colonies, even before the United States became a country, the thirst for knowledge and curiosity about the natural world was satisfied by the formation of learned societies. As early as 1739, the botanist John Bartram made the first proposal to form a general scientific society, but it took Benjamin Franklin to accomplish this goal. Franklin wrote, “The first drudgery of settling new colonies is now pretty well over, and there are many in every province in circumstances that set them at ease, and afford leisure to cultivate the finer arts, and improve the common stock of knowledge.” He volunteered his services as secretary and the American Philosophical Society was established in Philadelphia in 1743. The members were diverse, including doctors, lawyers, clergymen, artisans

and tradesmen and included many founders of the republic: George Washington, John Adams, Thomas Jefferson, Alexander Hamilton, Thomas Paine, Benjamin Rush, James Madison, and John Marshall. Not to be outdone by Philadelphia, John Adams wanted a learned society for Boston and convinced the Boston legislature to establish the American Academy of Arts and Sciences in 1780. The purpose of the society was “to cultivate every art and science which may tend to advance the interest, honor, dignity, and happiness of a free, independent, and virtuous people.” The American Academy, like the American Philosophical Society, had a diverse membership including scientists, writers, and artists, and many founding fathers were members.



In the early history of the United States, learned societies were general societies and members were elected; they were fairly exclusive. Only in the mid-1800s did more focused societies develop with a more egalitarian approach and more inclusive membership. In 1848 the American Association for the Advancement of Science (AAAS) was established to focus more specifically on science and was open to all. The constitution states that “the objects of the Association are, by periodical and migratory meetings, to promote intercourse between those who are cultivating science in different parts of the United States; to give a stronger and more general impulse, and a more systematic direction to scientific research in our country; and to procure for the labours of scientific men, increased facilities and a wider usefulness.” At its very inception, the AAAS focused on the critical role of meetings as a means of advancing science. They also clearly understood the importance of holding meetings in different locations to serve members from across the country. AAAS took the idea of moving the meetings around very seriously. For example, in 1872, Asa Gray of Harvard University was president of the AAAS. Although Gray lived and worked in Cambridge, Massachusetts, the meeting was planned for San Francisco, California. The transcontinental railroad

had only been completed three years earlier, in 1869. Yet, Gray and presumably many other members of the AAAS, planed to travel 3,000 miles on a newly completed rail line to go to a meeting! In the end, the society was unable to negotiate reasonable train fares from the east and they split the difference and met in Dubuque, Iowa. This is a tale of true dedication to scientific meetings.

The Botanical Society of America grew out of AAAS. During the 1883 meeting in Minneapolis, members formed the Botanical Club as a section of the AAAS. It functioned within the AAAS for about 10 years, but at their 1892 meeting, Liberty Hyde Bailey of Cornell University suggested forming a new society of botanists to “unify and subserve the botanical interests of the country.” Bailey chaired a committee to investigate formation of an American Botanical Society and they carefully weighed all of the issues. At the next meeting of the Botanical Club, Bailey presented the committee report: by a vote of 8 to 2 the committee recommended *against* establishment of a separate American Botanical Society. But, one of the two committee members who were in favor of forming a separate society gave his opinion, and he must have been very persuasive because two thirds of the members voted to form a society! The Botanical Society of America was established in 1895, with the aim of promoting botanical research. Interestingly, in the original charter the society moved away from the egalitarian approach of the AAAS, and membership was by election and restricted to active researchers. This troubled some botanists, and in 1897 members of the American Society of Naturalists organized a different botanical society: the Society for Plant Morphology and Physiology. Fractionation was also troubling, and the 1906 meeting in New Orleans, Louisiana saw a union of three societies. The Botanical Society of America, the Society for Plant Morphology and Physiology, and the Mycological Society gathered forces and became the Botanical Society of America. William Trelease and Charles Bessey were the first two presidents of the new BSA. L.H. Bailey was elected president in 1926; they must have eventually forgiven him for recommending against formation of the BSA in the first place.

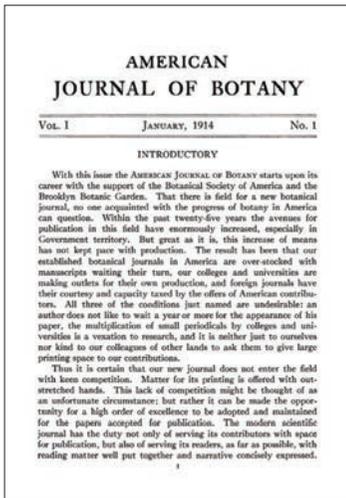
At the very first meeting of the BSA in 1906, members appointed a publications committee and began to discuss the critical need for a journal to publish the results of BSA members and to disseminate them widely. Volume 1 of the *American Journal of Botany* was published in January of 1914.



At an 1892 AAAS/Botanical Club meeting Professor L. H. Bailey suggested that a new society of botanists be established to “unify and subserve the botanical interests of the country.” He ultimately voted against forming the Botanical Society of America.

In 2014 we will celebrate the centennial of the *AJB*; watch the journal for exciting developments as the year unfolds.

Since its birth in the learned societies of the enlightenment, science has changed and grown. Science is an enormous engine of our modern economy and holds a central place in higher education. Importantly, science increasingly bears great responsibility to share its knowledge and values with the public. As science has grown and become more complex, scientific societies have also grown and matured and continue to foster and support science in multiple ways. The BSA is now a thriving and complex organization of 3000 members that support each other in multiple ways. The BSA includes members from around the world, from multiple career stages and multiple professions within the botanical sciences. The BSA is egalitarian; all botanists are welcome as members and anyone can present at the annual meetings. In this age of horizontally organized academic departments, we are a vertically integrated society and our journal and meetings provide an important opportunity to read broadly and to interact with colleagues who work at very different scales, from molecules to ecosystems. In addition to the *American Journal of Botany*, the society publishes the *Plant Science Bulletin* for informal communication, with information on upcoming



Volume 1 of the American Journal of Botany appeared in 1914. We will celebrate our journal's centennial next year!

meetings, courses, field trips, news of colleagues, new books, and professional opportunities, and the brand new, online, open access journal, *Applications in Plant Sciences* (APPS), for communication of innovative tools and protocols. The BSA fosters the careers of our members with multiple awards and recognition, and supports travel and research for our graduate students. The society is active in development of programs that will enhance botanical education at the K-12 level (Planting Science) and undergraduate level (PlantED) and is increasingly involved in providing a collective voice concerning policy issues. The BSA website (www.botany.org) records 250,000 hits per month, and reaches others via e-news and social media. The Society has over 6,300 Facebook and 1,800 Twitter followers. By the second day of the 2013 meeting, over 1000 Tweets carried #Botany2013.

But everything on this list can be done online. So, I come back to the question that I started with: Why do we come to meetings? 1100 people came to the meeting in New Orleans; botanists came from 49 states of the US and from 35 other countries. Why?

From the Royal Society, to the Lunar Society, to the X Club, to the BSA, we come to meetings. Certainly, we all want to share information and research with scientists and educators from around the world. But the heart and soul of a society, what makes us attend meetings, is shared fellowship. We

want to make personal contacts, we come to share ideas and information, we come to experience that completely unexpected and unsought insight that comes from serendipitous interactions, for the intense sustained conversations that occur in the hallways. We come to work through experiments over a beer, to better understand our own data, to figure out how someone else did that, how someone else taught that. Over 450 years after the initial gatherings at the home of della Porta in Naples, gatherings are still part of the essence of science and of being a scientist. The same impulse that drew the lunar men out into the dark night, or Asa Gray to contemplate a 3,000-mile journey at the dawn of the transcontinental railroad, draws us to meetings all over North America.

I sent out a query during the 2013 New Orleans meeting to all of the users of the new mobile meeting app asking “Why are you here?” Almost every response included “make new connections” and “reconnect with friends and colleagues.” Sure, we can interact and collaborate online, and we do. But, we are not avatars. And so we come to meetings. This was true in 1560, it’s true today, and I am confident that it will be true into the future. While innovative technology and the digital world are clearly critical to science, it is societies and meetings that make us complete as scientists.

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Botanical Society of America
Legacy Society

THE BSA LEGACY SOCIETY CELEBRATED THE NORTHEAST

A beautiful October evening at the New York Botanical Garden was the setting for a heartwarming commemoration dinner for some life-long BSA members from the Northeast region. This long-overdue and very special celebration honored the outstanding contributions to science, education, and the Society on the part of these members. Legacy Society member and Vice President for Laboratory Research of the New York Botanical Garden, Dr. Dennis Stevenson, graciously hosted the evening of commemorations, and the private tours of the Pfizer Laboratory and the New York Botanical Garden the following day.

Members from all parts of the Northeast region came together for the event in order to take part in honoring these very special members.

If you are not familiar with the BSA's Legacy Society, it is a growing group of members from all generations who are committed to sustaining the century-old Society in perpetuity. The Legacy Society has held commemoration events in the Midwest and Northeast regions over the past two years, and plans to hold additional events in more regions throughout the country in the near future.



Legacy Society member Dennis Stevenson thanks Anitra Thorhaug for her service and presents her with her commemorative plaque.

CAN BSA'S LEGACY SOCIETY INCLUDE YOU?

The founders of BSA's Legacy Society have a vision for putting together a financial platform that would take the organization into fiscal security for the foreseeable future. And beyond.

Between them, there was a firm sense that their combined voices would convince others in the botanical sciences that they could, and should, bequeath that sound future. Everyone. Not just the gray hairs, as they call themselves, and most senior of the scientists. Everyone has something to gain in this precious legacy, and therefore they struggle to show that the Legacy Society is for everyone. Relevant could be the key word they choose.

Dr. Jim Seago of State University of Oswego, NY, said it was just "natural" to want to give back to the Society that had given him so much opportunity. What he hopes is that he can influence others to have that same thought.

As part of the Legacy team in BSA that has brought giving from 30 individuals up to 151 people in just a few years, they believe they are getting their message out. The Legacy Society is about being responsible and planning for the future of the Society.

Dr. Joe Armstrong of Illinois State University at Normal, IL, and his wife Nancy are strong supporters of the Legacy Society and combine their ideas of professionalism and support in their reasoning for putting their financial backing there. "It's just part of being professional and being active in the Society," says Dr. Armstrong. And Mrs. Armstrong adds, "It's about support for me. I see what the profession has done for my husband and the other people I know, and it's the right thing to do."

Dr. Ann Sakai of the University of California Irvine echoes those sentiments, saying, "I've gained a tremendous amount from botany and the Society from the time I started my career to now and this is one way of giving back."

Her husband, Dr. Steve Weller, also with the University of California Irvine and Past President of BSA, said that he would like to see the Legacy Society expand its reach to include a broader group in BSA. "We've become a broader group demographically and I'd like to include more people in our work. It's not just about fairness, but also about our work and getting it done," he said.

And Dr. Weller went on to issue a challenge to every BSA member, "If you think the work we do as botanists is important, step up and be sure it has sound financial footing."

Dr. Anitra Thorhaug of Miami, now retired, calls the Botanical Society her "intellectual botanical home," and is far from shy about her opinions on giving. "It's already in my will," she says. "It's not too early to start thinking about what your legacy is going to be. Do it when you are young enough and have energy enough," she said.

Dr. Dennis Stevenson of New York is part of the team working to build the Legacy Society for the next generation. "As you become a senior person, it's your turn," he says, talking about the connections made through a career in botany and the need to support the generations of incoming botanists with a strong organization.

"BSA has been such an important part of my development, it's important to give back," says Dr. David Spooner of the University of Wisconsin at Madison. "The Legacy Society is important to highlight the contributions and pave the way for younger members.

"The future is in the students," says Dr. Janice Coons of Eastern Illinois University in Charleston, IL. "If we don't involve them in the Legacy Society, we won't have it." What that means, she explains, is that all botanists learn that there is a need to give. Giving can be through annual donations of any size and through an estate gift. For Dr. Coons, the gifts would mean a future where the Society could expand without financial constraints to put its ideas in motion.

A key when the discussion of younger member participation comes up is how to get them involved, or how much to ask. "Any level of participation is appreciated," said Dr. Judy Jernstedt of the University of California at Davis. "A small donation is still representative of a tradition of philanthropy, and it will grow along with a career," she said. "And, it's a satisfying trajectory to be on."

Point being, there is something for everyone.

Dr. Calvin Clyde and Dr. Carol Wilson, both of Rancho Santa Ana Botanic Garden in Claremont, CA, talk about their decision as a couple to become involved in the Legacy Society. "Money talks and

the larger the endowment of the BSA, the bigger impact it can have,” Dr. Clyde said. “BSA should have a larger endowment to create more focus on the economic importance of plants.”

Dr. Wilson, admittedly shy, said botany and particularly the Botanical Society “has always been there for me. I want botany to be there always for others too.”

The couple thinks the Legacy Society creates a culture of giving where it becomes a habit to give regularly. “The thought of not giving regularly to BSA is foreign,” Dr. Clyde said, with Dr. Wilson chiming in that “we not only get a lot out of it, but also learn to be generous.”

Dr. David Lee of Florida International University in Miami said it succinctly. “Your loyalty should be to your discipline, even more than to your institution,” he said, comparing giving to BSA to alumni associations.

It’s a valid comparison, says Dr. Ed Schneider of the University of Minnesota, who would love to see many of the professors begin to talk to their students about giving to the Society as an important thing to do. “The BSA voice is not enough,” he explained. “But when your mentor talks about it, that’s different. The universities do it, they need to do it, and so do we. We plant and germinate a seed, and when that student is in a position to give, they will.”

Dr. Scott Russell of the University of Oklahoma in Norman added that both the continuity of continued gifts and new gifts will be important to the growth of the Legacy Society. And those are mostly likely to come from the young botanical scientists. So what do the young scientists think?

Dr. Mackenzie Taylor of Creighton University in Nebraska, who just received her post-doctoral degree and was a former student representative on the BSA Board, said she sees the Legacy Society as something for people on the edge of retirement. With head cocked, waiting to hear if there was something more, she said she would definitely listen if there was some way to participate.

Dr. Chris Martine of Bucknell University in Lewisburg, PA, an active volunteer and strong supporter of the Society, said his impression was that the Legacy Society was for the older members. Even the word “legacy” might send the wrong message, he thought, but his interest was piqued. The ability to be welcomed among and supportive of the Society’s most elite and to know they would be building the future is a message Dr. Martine believed would reverberate.

So, for the Legacy Society, a platform of growth means broader participation, inclusive messaging and, as Chris Martine would say, “botanical giving is cool!”

Is Legacy Membership for You?

Being a Legacy Member is easy.

Just list the Botanical Society of America as a component in your legacy gifts. It’s that simple—no minimum amount, just a simple promise to remember the Society.

Giving a legacy gift to the BSA is simple. You include a bequest to the BSA in your estate plan and/or sign up to give an annual gift and notify us by filling out a short form found at www.botany.org/legacy/BSALegacyForm.pdf.

All levels of gifts made to the Botanical Society of America are significant, and help us continue and further our mission.



BSA Science Education News and Notes is a quarterly update about the BSA's education efforts and the broader education scene. We invite you to submit news items or ideas for future features. Contact: Catrina Adams, Acting Director of Education, at CAAdams@botany.org or Marshall Sundberg, PSB Editor, at psb@botany.org.

NEW AND ONGOING SOCIETY EFFORTS

PLANTED DIGITAL LIBRARY

Call for botany teaching and learning resources: Resource Editors **J. Phil Gibson** and **Stokes Baker** look forward to your submissions to the digital library. Inquiry activities, data sets, syllabi, images: these are only a few of the materials welcome. If you have resource to contribute, we're here to help you share it. Below we highlight an active learning lab.

Roots as Foragers by Stan Rice helps students experience plants as responsive rather than passive organisms. Roots forage through heterogeneous media and proliferate in portions of the soil that have abundant nutrients. Students can see and measure this growth. Students also get to address issues of experimental design such as the sequence effect. This lab is highly adaptable to address the broad question of how plants actively respond to the environment—phytoremediation and climate change are just some of the possible real-world issues of spatial and temporal heterogeneity of the environment can be connected to student investigation of root growth. Download the lab activity with discussion of student data and ideas at PlantED, <http://planted.botany.org>.



PlantED, the BSA's new resource portal, is run in conjunction with companion portals of the Ecological Society of America (ESA), the Society for Economic Botany, and the Society for the Study of Evolution. Peer-reviewed resources in PlantED will be searchable across these four portals and included in the National Digital Science Library. Your resource supporting botanical education could reach a wide audience.

Resources across the collaborative effort will be showcased on a quarterly basis in Jigsaw, which is produced by the ESA monthly. Jigsaw was a joint issue this past October and contained a special feature on Climate Change. Profiled resources in addition to Roots as Foragers include: Leaves as Thermometers, What Does Agriculture Have to do with Climate Change?, and What NOT to Read: A Lesson in Reviewing and Critiquing Scientific Literature Using a Junk Science Article on Climate Change. To access all resources, reports, and announcements in the October issue and archives of Jigsaw, please visit http://www.esa.org/esa/?page_id=7656.

PLANTINGSCIENCE FALL SESSION GOING STRONG - NEW RESOURCES, PARTNERS PROFILED

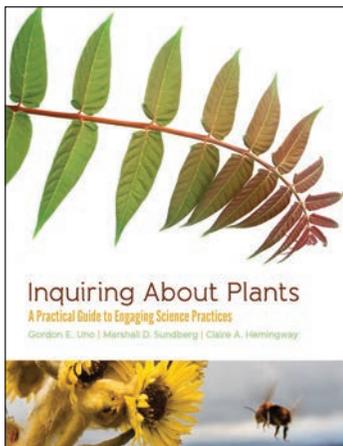
Over 200 teams were online this fall, working on plant investigations with their scientist mentors. This year the Ecological Society of America joined the American Society of Plant Biologists and Botanical Society of America in sponsoring graduate students/post-doctoral researchers to make yearlong commitments as members of the Master Plant Science Team. Mentors of all stripes often wonder about the impact of their online conversations with student teams. Participating teachers, who witness first-hand the learning benefits for students, can assure mentors they are making a difference:

- “Thanks for all you do. My kids are growing alongside their plants :)”
- “My 9th/10th graders thought it was the best thing they had ever done in a science class ever!”

BROAD AND DIVERSE PARTICIPATION IN BOTANY

We are excited to announce some new resources on www.plantingscience.org. We have added extensive “Roadmap through an Investigation” for students, teachers, and scientist mentors that covers diverse aspects of doing and communicating science from exploring initial ideas to making final presentations. Also available is a downloadable “Plant Investigation Toolkit” with help on topics ranging from “Using Math” to “Plant Care” to “Imaging Technology.” You’ll also see a “Partners’ Links” section featuring resources for teaching and learning about plants, and information about science careers. A new “About” section describes partners and society liaison contacts.

If you haven’t visited www.plantingscience.org lately, please stop by! Take a look at the project gallery to see how students are progressing with their projects, or browse the new resources.



An additional resource, which is an outcome of the National Science Foundation grant that supported the project from 2007-2013, will be available this winter. *Inquiring About Plants: A Practical Guide to Engaging Science Practices* by Gordon Uno, Marshall Sundberg, and Claire Hemingway complements PlantingScience but is a stand-alone resource for high school and college science educators. The book offers classroom-tested tricks of the trade for drawing students into practice of science, focusing courses on the big ideas of biology and student understanding of these ideas, and creating your own inquiry-based activities. It is due out by December 20132013, and proceeds of the \$10.95 book will go to support PlantingScience.

In line with the mission and objectives of the Society, the BSA was awarded the PLANTS grant (2011-2015, A. Sakai and A. Hirsch, co-PIs) by the National Science Foundation to bring undergraduates from a diversity of backgrounds to the annual Botany meetings. The goal of this grant is to increase the number of undergraduates from underrepresented groups who attend these meetings, and to increase their level of academic excellence and motivation to pursue advanced degrees in the plant sciences. Thus far, 37 students have participated in the PLANTS programs, and the great majority of these students who have graduated are now in graduate school or botanically related professions. The success of this program is largely due to the generous commitment of volunteer graduate students, postdocs, and professional mentors at the meetings. We encourage members to publicize this program to interested undergraduates and to consider becoming a mentor for this program for BOTANY 2014. Applications for the 2014 meeting in Boise, Idaho, will be accepted beginning February 1 and due by March 15, 2014. For details, please see http://www.botany.org/awards_grants/detail/PLANTS.php.

At BOTANY 2013, the “Broadening Participation- Recruiting and Retaining Outstanding Scientists in the Botanical Sciences” symposium (A. Monfils, A. Sakai, organizers) explored some of the best practices to encourage recruitment and retention of all students, and particularly URM (underrepresented minority) students. Speakers discussed successful teaching approaches in the introductory core biology courses, mentoring strategies for students and academics, recruitment of a diverse community of scientists, overcoming the dual hurdles of science and technology as it relates to current digitization initiatives, and curricular and institutional programs to promote diversity in the sciences. This symposium was sponsored by the BSA Ecology, Teaching, and Systematics/ASPT sections as well as by iDigBio. The BSA Human Diversity Committee invited Muriel Poston as the featured speaker for the Enhancing Scientist Diversity in Plant Biology Luncheon, who spoke on ‘Cultivating the next generation of plant biologists: Opportunities and challenges’. Presentations from the symposium by Judith Skog, Henry Bart, Mary McKenna, Jose Herrera, David Haak, and Chris

O'Neal, along with the talk by Muriel Poston, are available online. In addition, you'll find resources on understanding and overcoming implicit bias at <http://www.botany.org/diversity/>.

In early October 2013, the BSA and the American Society of Plant Biologists shared sponsorship of a booth and symposium at the annual SACNAS meeting (The Society for the Advancement of Chicanos and Native Americans in Science). The Symposium, "Living with Neighbors: How plants cope with other organisms" was well attended. BSA also sponsored two undergraduate poster awards at the meeting. The winners of our awards also received a complimentary one-year BSA membership. Thanks to volunteers Ann Sakai, Brenda Molano-Flores, Diane Marshall, and Monica Mendez for working at the booth, judging poster presentations, and highlighting careers in botany at this important meeting.

FROM AROUND THE NATION PERSISTENCE OF COLLEGE STUDENTS IN STEM FIELDS

Fewer than half of the students who arrive at college intending to major in science, technology, engineering or math fulfill those intentions. What are attributes and experiences that influence an individuals' persistence in a field? Mark Graham and colleagues recently reviewed the research and present a new framework for persistence of STEM majors. This new framework integrates the mutually reinforcing elements of learning and identifying as a scientist as determinants of persistence with student confidence in their ability and motivation to engage. Programs that are successful in retaining STEM majors, including those from underrepresented groups, commonly include: (1) early research experiences, (2) active learning in introductory courses, and (3) membership in learning communities. See the 27 September Science Education Forum:

<http://www.sciencemag.org/content/341/6153/1455.short>

VISION AND CHANGE 2013: CHRONICLING CHANGE, INSPIRING THE FUTURE

Following the 2011 Call to Action Report, the American Association for the Advancement of Science (AAAS) with support from the National Science Foundation has continued to promote a transformation of undergraduate biology education. The August 2013 Conference focused on capturing and sharing exemplars of how change is being accomplished across a variety of institutions. Working groups at the conference discussed: How to Lead Change, How to Help Faculty Act as Agents of Change, How to Change the Student Experience, How to Build Networks for Change, and How to Amass Evidence of Change. Presentations by the Working Groups and Plenary Speakers are available online: <http://visionandchange.org/2013-conference-materials/>

SUSTAINABILITY IMPROVES STUDENT LEARNING

"How can we better prepare students for the 21st Century 'Big Questions' that relate to real-world issues of energy, air and water quality, climate change?" That is one driving question underlying a collaboration of Project Kaleidoscope at the AAC&U, the Disciplinary Association Network for Sustainability, and Mobilizing STEM Education for a Sustainable Future. A convocation this September brought together disciplinary society, faculty, and student perspectives to discuss how learning in the context of sustainability contributes to student learning outcomes and how priority issues across disciplines connect with sustainability. The SISL collaboration provides resources for Empowering Students to Engage in Solution Building for Society and Teaching Activities for a wide array of sustainability issues, such as Food Systems and Agriculture and Ecosystem Health:

<http://serc.carleton.edu/sisl/index.html>



Deciphering how cells make energy: an acid test.

Allchin, Douglas. 2013. *The American Biology Teacher* 75:598-601.

Peter Mitchell proposed the chemiosmotic theory of ATP production in 1961, but it was nearly 20 years before it was well-enough accepted to make it into biology textbooks (e.g., Arms and Camp, 1979; Keeton's 3rd ed., 1980). Part of that acceptance was due to André Jagendorf's acid-bath experiments with chloroplasts—the focus of this article. Allchin clearly describes why chloroplasts were the preferred organelle to test this theory and how the experiment worked. In modern textbooks, of course, the frame of reference is always the electron transport chain of mitochondria, so this historical example is useful to demonstrate that not only does it also occur in plants, but that it was first experimentally demonstrated in chloroplasts. Oh yes, the second diagram used by Keeton to illustrate how this works in his 1980 text was Jagendorf's acid-bath experiment!

<http://www.jstor.org/discover/10.1525/abt.2013.75.8.15?uid=3739744&uid=2129&uid=2134&uid=2&uid=70&uid=4&uid=3739256&sid=21102925418261>

Unity and disunity in biology. BioScience 63:811-816.

Niklas, Karl J., Thomas G. Owens, and Randy O. Wayne. 2013.

There is no doubt that biological knowledge is growing exponentially and subfields are becoming more and more specialized and conceptually isolated from other subfields. To some, success is defined by specialization and there is certainly a trend to train students in an ever more narrowly defined field. Niklas et al. argue that as a consequence of this specialization, it is even more important that we consider laying a broad conceptual base for students at the undergraduate level. Such integration, early in their academic experience, will reinforce the importance of this perspective as they move on to graduate work and specialization. "We must train our students to be enthusiastic generalists first and specialists second, so that they can achieve a new (and truly all-inclusive) modern synthesis."

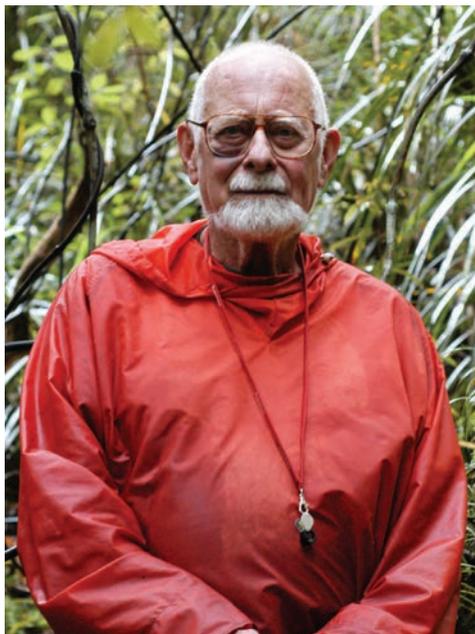
<http://www.bioone.org/doi/abs/10.1525/bio.2013.63.10.8>



ANNOUNCEMENTS



IN MEMORIAM



RUDOLF MATHIAS SCHUSTER

1921–2012

Rudolf M. Schuster, an eminent botanist, hepaticologist, scholar, and world explorer, passed away on Friday, November 16, 2012, in Stanwood, Washington.

Dr. Schuster was born on April 8, one thousand nine hundred twenty-one (as he would have pronounced it in the German way) in Altmühldorf, Bavaria, southern Germany. His father was Mathias Schuster, a cabinet maker, and his mother was Maria Schuster. He had a younger brother, by four years, with whom he had a lot in common.

Rudy, as he was known to many in botanical circles, came to the United States at the age of nine and lived in New York City for his first 11 years in the United States. He finished high school in 1939. It was the time of the Great Depression, which helped shape Rudy's frugal lifestyle. For his college education, Rudy first attended City College of New York. One day while he was washing chemical vials with a colleague who had attended New York University (NYU), he was introduced to

this colleague's friend who was a student at NYU. This NYU student had a friend in the entomology department at Cornell. When they were visiting this entomologist, he asked Rudy whether he would like to study at Cornell. Rudy immediately said "yes," the entomologist had Rudy complete all the paperwork, and he became a student there. Cornell's liberal arts college was very expensive but the agricultural college was almost free, with no tuition and only a nominal fee. That was how Rudy got his education there! He finished his bachelor of science degree in three years.

At Cornell, Rudy met his first wife, Olga, who was born in New York City into a Serbian immigrant family. They were married in 1943, by the mayor of Ithaca. At that time in the United States, there was a tradition that the presider of the wedding ceremony would ask the bride, "Do you accept and obey Mr. so and so?" As the mayor knew Rudy's character, he asked Olga whether she wanted the word "obey" used at the wedding ceremony. Olga replied "no." Yet, she "obeyed" Rudy throughout her entire life to assist him in all aspects of his science, traveled all over the world on collecting trips, and tended to all of Rudy's needs in his home office and laboratory.

Rudy certainly was a worldly figure in botany, but his worldly character was manifested before he became a botanist. He and Olga were both ex-Catholics, and therefore were not married in a Catholic church. Two experiences influenced his departure from the church. One was that he saw how in Spain the Catholic Church allied itself with the fascist government. The other was that he saw the church as being very intolerant. For example, when he was between 11 and 13 years old, he had a Jewish friend, but a young minister told him not to play with any Jew. At Rudy and Olga's wedding, the best man was a Hindu.

In Cornell, Rudy was studying insect taxonomy, but the department was oriented toward application (insect control). In the 1940s, DDT was used to control pests and house flies. He saw that 99% of the houseflies were killed but 1% remained. He suggested to the people who were studying insect control that this surviving 1% would be a big problem for the future. Thus, he saw chemical control as no solution to the problem, and decided not to pursue a career in that field.

At that time, bryology was a relatively small field. Rudy thought that pursuing a discipline such as

bryology, a pure science that nobody would care much about, would allow him complete freedom to do whatever he wanted (which was absolutely important for a man like Rudy!). His interest in bryology actually started before his years at Cornell. As a teenager in New York City, he often visited the New York Botanical Garden, which had an exhibit of bryophytes. This experience obviously had an influence on him. He started collecting bryophytes at the age of 18 or 19, around the time he finished high school and started college. His love of nature, however, went back much further. One of his earliest memories was chasing butterflies on a walk with his father when the family lived in Germany.

While Rudy was a student, Olga was working at Cornell University Press. One time, she told her boss that her husband was going to publish books on hepatics; he did not think she was serious. Later, when they both went back to visit Cornell, they saw Olga's former boss and told him that Columbia University Press had published two of Rudy's volumes on North American hepatics and hornworts—a statement that elicited a funny expression from him. Those books, of course, became affectionately known as “the Big Green” due to their large size and eventually became a multi-volume treatise.^{1,2} The spores of the Big Green obviously germinated during the time of Rudy's Cornell years as an entomology undergrad, and this can also be seen from Rudy's first major publication, “The Ecology and Distribution of Hepaticae in Central and Western New York,” which was published in *The American Midland Naturalist* in 1949 (42: 513–712).

Rudy's study of entomology continued after Cornell, into graduate school. Surprisingly to many in the bryology world, Rudy actually obtained his PhD in entomology from the University of Minnesota in 1948. However, he had assistantships in botany and was a frequent visitor to the University herbarium.³ His study of the hepatics of Minnesota and adjacent regions in those years resulted in the three papers^{4–6} that greatly enhanced our understanding of the hepatic flora of the Upper Mississippi valley.³

After leaving the University of Minnesota, Rudy traveled down the river to the University of Mississippi and worked there as an assistant professor. It was there, in 1950, that he received a National Science Foundation grant to write the Big Green. After three years in Mississippi, he took a visiting assistant professorship at Duke University.

Louis Anderson, a renowned bryologist at Duke and a Mississippi native, once visited Rudy and told him that he should go somewhere else for a better career. He then worked to get Rudy out of Mississippi. However, with Anderson as a moss expert and H. L. Blomquist as a liverwort expert on Duke's faculty, there was not a permanent position there for Rudy. Thus, Rudy went to the University of Michigan and was there for a year as an assistant professor.

In 1957, when an opportunity came up at the University of Massachusetts, Amherst, Rudy moved there. He was first appointed as an associate professor and a year later was promoted to a full professor. He remained at UMass until his retirement in 1983. Rudy and Olga loved picturesque western Massachusetts, and the rich bryophyte flora there made their life and work even more enjoyable. In addition to their home in Hadley, a small town next to Amherst, they also owned a piece of property (60 acres) in Conway, a low mountain town northwest of Hadley. Rudy, Olga, and their two daughters spent a lot of weekends in the wood cabin that Rudy built himself on the Conway property. The hepatic diversity on that property was, of course, thoroughly surveyed by Rudy and often mentioned in the Big Green. Back in Hadley, the garden surrounding their house was filled with plants Rudy brought home from his collecting trips in the southern Appalachian Mountains. The physical labor required to maintain the garden and the Conway property obviously helped to keep Rudy's sanity after long hours of work in the basement laboratory, which later officially acquired the name of Hadley Cryptogamic Laboratory. In their later years, Rudy and Olga also owned a home in Arizona, and the two would migrate to the south in winter and come back to the north in summer. In the winter of 2004, however, the two stayed in Massachusetts, and Olga passed away on February 23, 2005, in their home. After Olga passed away, Rudy was lonely but continued to work on the last major project in his life, the *Austral Hepaticae*. On November 16, 2005, he married his second wife, Marlene, who became Rudy's new companion and assistant in all of his work and travel.

Rudy's major contribution to botany and hepaticology lies in the astounding new diversity of liverworts he added to our knowledge. Mostly by himself or through collaboration with a small number of colleagues, he described 463 species, 83 genera, and 15 families new to science. These taxa account for 6%, 22%, and 18%, respectively,

of the taxa at these ranks for liverworts. It is difficult to name another contemporary botanist who discovered so much new diversity of a major clade of land plants. These discoveries were made in his land-combing floristic surveys of hepatics in eastern North America, Greenland, New Zealand, and other parts of the world (in total he did fieldwork in over 25 countries!). Over the decades, Rudy collected in the order of 50,000 specimens. This extremely valuable and now historical collection resides at the Field Museum of Natural History, Chicago, along with his microscopic slide collection. Much of his extensive library was also kindly donated to the Museum by his wife, Marlene Schuster.

Two significant and ever-lasting results of his surveys were published in two multi-volume works: *The Hepaticae and Anthocerotae of North America, East of the Hundredth Meridian* (the Big Green), consisting of six volumes, and *Austral Hepaticae*, consisting of two volumes. These floras are not mere conventional compilations of taxonomic diversity; they are encyclopedic treatments of liverworts and hornworts as well as their biology. The first volume of the Big Green in particular contains rich information about the history of studies of hepatics (which historically included hornworts!), morphology, anatomy, development, and cytology of liverworts. Naturally, Rudy published his own system of classification of liverworts. Blocks of families that appeared in his system corresponded to clades and grades identified in later molecular systematic analyses, which reflected the power of his sharp insights and critical thinking based on both field observation and laboratory examination under microscopes. It is noteworthy that Rudy was also an excellent illustrator, having drawn and inked the majority of the illustrations in his books and papers. He spent countless hours painstakingly preparing these fine illustrative plates—totaling over 1000 throughout his career. These plates always received outstanding comments in book reviews, and were extraordinarily precise and detailed. At the time of publication (before cladistics and molecular systematics), his classification system represented a truly outstanding summary of the knowledge of liverworts.

Rudy's contributions to botany went beyond hepatics. He was one of the first botanists to recognize the importance of Wallace's Line in plant biogeography, separating Australia of Gondwanaland from Southeast Asia of Laurasia.⁷

He astutely recognized that the rich diversity of angiosperms and other plant groups in the general area between Assam and Fiji and between Japan and Tasmania–New Zealand was not necessarily the result of the origin of angiosperms or any other group in the area, but to the juxtaposition of elements of two rich biotas—Laurasia-derived and Gondwanaland-derived.⁸ This historical biogeographic analysis directly resulted in the rejection of Australasia as the cradle of the angiosperm hypothesis proposed by A. C. Smith and A. Takhtajan. Moreover, Rudy also provided botanical evidence supporting the continental drift theory at a time when it was still controversial.^{8,9}

Rudy is one of the foremost classical scholars of our time in botany. His rigorous scholarship is clearly reflected in his books and literally hundreds of published papers. One of the best examples demonstrating his relentless pursuit of the truth is his tracing of ideas that contributed to the recognition of hornworts as a distinct lineage of bryophytes that is at the level of liverworts or mosses. Until the late 1800s, hornworts were always thought to be included in hepatics. Howe¹⁰ is usually credited with formally elevating the Anthocerotales to the rank of a separate class (Anthocerotales), together with the class Hepaticae. In the first volume of the Big Green (p. 369), Rudy provided a long footnote discussing the ideas of three bryologists, Janczewski,¹¹ Hy,¹² and Underwood,¹³ that eventually resulted in Howe's nomenclatural treatment. These authors emphasized several features that set hornworts apart from liverworts and thus warranted their placement in a separate higher-rank taxon equivalent to liverworts and mosses: the embedded archegonium (with no differentiated archegonial wall), the single chloroplast in the cell, and the basipetal development of the sporangium with basipetal sequence in spore formation. These features have figured prominently in recent discussion on the phylogenetic position of hornworts.

Rudy was a generous and hospitable man, even though he had a strong personality. His Bavarian stubbornness and diligence undoubtedly played a role in shaping his career of studying one of the most recalcitrant survivors of plants on earth. He will be greatly missed by botanists all over the world.

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-Yin-Long Qiu, Department of Ecology and Evolutionary Biology, University of Michigan, Ann Arbor, Michigan, USA; and Matt von Konrat and John J. Engel, The Field Museum, Chicago, Illinois, USA.

PERSONALIA

CLAIRE HEMINGWAY

Claire Hemingway, the Botanical Society of America's first Education Director, has taken a new position as Science Advisor with the Division of Environmental Biology at the National Science Foundation (NSF). She says that she's looking forward to advancing science and broader impacts.



Claire was a BSA staff member for the past nine years, first as Managing Editor of the *American Journal of Botany* and more recently as Education Director working on behalf of the Society's education and outreach mission. She was principal investigator of two successful NSF-funded education projects for the Society and was instrumental in directing the evolution of PlantingScience from its origin as SciPi and SIP³ to what it is today—a world-class team including professional scientists from the BSA, American Society of Plant Biologists, and Biological Sciences Curriculum Study and outstanding middle and high school teachers from throughout the country and around the world. Being able to ride herd on a group of independently minded academics while bridging the gap between schools and professional scientists is a testament to her leadership and inspirational skills. Through her efforts, the participants in the summer institutes for teachers and the Master Plant Science Mentors have blossomed into a model of synergistic positive impact on student learning about plants. Before leaving she oversaw revision of a new NSF proposal, which will be submitted in December to support PlantingScience into the future.

We wish her the best in her new position at NSF.

GETTY RESEARCH INSTITUTE
ANNOUNCES
GIFT OF RARE BOTANICAL BOOKS

THE 41 BOOKS IN THE TANIA NORRIS
COLLECTION OF RARE BOTANICAL
BOOKS SPAN THE 16TH TO 19TH
CENTURIES

LOS ANGELES—The Getty Research Institute (GRI) announced today the acquisition of The Tania Norris Collection of Rare Botanical Books, a gift from collector Tania Norris. Assembled over the last 30 years by Ms. Norris through individual acquisitions from booksellers in the U.S., Europe, and Australia, the collection consists of 41 rare books that provide unparalleled insight into the contributions of natural science to visual culture in Europe from the sixteenth through the nineteenth centuries.

Highlights of the collection include Crispin Van de Passe's *Hortus Floridus* (1614), apparently the first illustrated book to apply the microscopy of magnifying lenses to botanical illustration; and Johann Christoph Volkamer's *Nürnbergische Hesperides* (1708), documenting both the introduction of Italian citrus culture to Germany, and the revolution in urban planning that ensued from the parks designed for their cultivation and irrigation. Also found in the collection is a copy of Maria Sibylla Merian's *Derde en laatste deel der Rupsen Begin* (1717), the first book to depict insect metamorphosis, reputedly hand-colored by her daughter.

"The Getty Research Institute is deeply honored to receive the donation of the Tania Norris Collection of Rare Botanical Books from one of the founding members of our GRI Council. This gift promises to open novel paths to explore the complex historical intersections between science and art," said Marcia Reed chief curator at the Getty Research Institute. "Tania's passionate interests and her collecting instincts have created a very generous gift which has also served to raise the profile of an important subject with strong relevance for researchers who use our special collections."

David Brafman, curator of rare books at the GRI, said, "The Norris Collection offers inestimable rewards for scholars researching global botanical trade and the ensuing stimulus of cultural exchange to the trend of collecting curiosities spawned in



Limon Salerno da Genova (detail) from Nürnbergische Hesperides, Nuremberg, 1708. Johann Christoph Volkamer. The Getty Research Institute, 2885-927. Donated by Tania Norris

Renaissance and Baroque European culture. Other books in the collection document the codependent progress of technologies in the history of medicine, pharmacology, and the color and textile industries from the sixteenth to nineteenth centuries. No less important are the opportunities to study the complex artistic relationship between physiognomy and 'naturalism' in visual representation, as well as developments in urban planning and landscape architecture. Ms. Norris' generous donation enhances significantly GRI's existing collections in such subjects and promises to transform the way art historians examine the past in the future."

In particular, the unique hand-colored copy of Maria Sibylla Merian's *Der Rupsen Begin* (*Birth of the Butterfly*) from the Norris Collection will find a companion in the GRI vaults: Merian's stunning *Metamorphosis of the Insects of Surinam* (1719), the self-published book that documented the watercolors, drawings, and scientific studies she executed and conducted while exploring the wildlife of the South American jungles. The

**MISSOURI BOTANICAL
GARDEN ANNOUNCES GRANT
AWARD**
PROJECT AIMS TO IMPROVE ACCESS
TO DIGITAL TEXTS THROUGH ONLINE
GAMING

GRI copy was featured prominently in the Getty Museum's exhibition, "Merian and Daughters," which celebrated the extraordinary pioneering contributions of the artist-naturalist, the first European woman to travel to America expressly for artistic purposes.

The Norris Collection will also prove an invaluable complement for research in landscape and still-life painting, as well as mention the insights it will provide to conservators and conservation scientists about recipes and global trade in color pigments and other preparations in the decorative arts.

In addition to being a founding member of the Getty Research Institute Collections Council, Ms. Norris also serves on the J. Paul Getty Museum Disegno Drawing Council and Paintings Conservation Council.

"It was one of the proudest moments of my life when the Getty Research Institute accepted my books for their library. I never collected expecting anyone else to think my books of interest," said Ms. Norris. "But now at the GRI, anyone can view them; some have been or will soon be in exhibitions and programs. More importantly, they will be preserved for generations to come."

"You don't need much money, just passion to collect and you just never know what treasures you may have," she added.

Much of the collection has been on deposit at the GRI and available to researchers; the remaining materials will be cataloged and available by the end of year. For more information about The Tania Norris Collection of Rare Botanical Books, visit: www.getty.edu/research/special_collections/notable/norris.html.

Additional information is available at www.getty.edu.

(ST. LOUIS)—The Missouri Botanical Garden was recently awarded a \$449,641 grant by the Institute of Museum and Library Services (IMLS) to test new means of using crowdsourcing and gaming to support the enhancement of texts from the Biodiversity Heritage Library (BHL). Grant funding begins in December 2013 and ends in December 2015. The Garden will partner with Harvard University, Cornell University and the New York Botanical Garden on the project.

The BHL is an international consortium of the leading natural history libraries that have collaborated to digitize records of the world's biological diversity. It is the single largest open-licensed source of biodiversity literature in the world with more than 40 million pages of scanned texts available online at www.biodiversitylibrary.org.

Digital libraries such as the BHL are hampered by poor output from Optical Character Recognition (OCR) software that makes it difficult for users to easily search texts. The BHL contains a variety of literature including books and journals dating back to the 1400s. Historic literature is particularly problematic for OCR software because of the variation in fonts, typesetting and layouts. There is currently no OCR engine to accurately recognize most types from the 15th to mid-19th centuries included in the collection. BHL's horticultural catalogs and field notebooks also present challenges to OCR software because of their multi-columned layouts and use of handwritten notes. Garden staffers saw a pressing need to identify possible solutions for this problem.

The project, "Purposeful Gaming and BHL," will demonstrate whether or not online games are a successful tool for analyzing and improving digital outputs. Users will be presented words that are difficult for software to recognize as tasks in a game.

"Digital gaming as entertainment has been around for several decades but only recently has it been used for more practical purposes," said Trish Rose-Sandler, data project coordinator in the Center for Biodiversity Informatics at the Missouri Botanical Garden and data analyst for the BHL.

“Combined with crowdsourcing, it can be a very efficient way to harness large numbers of users to complete a task.”

Benefits from the project include both improved access to content in the largest open-access repository in biodiversity, the BHL, and the demonstration of novel and more cost-effective approaches to generating searchable texts within the broader digital library community.

Teams from all four institutions will work with a professional software developer to design the gaming application needed for the project. Rose-Sandler will be responsible for the overall coordination of the project.

PLANT HEALTH SCIENTISTS REITERATE SUPPORT OF BIOTECHNOLOGY ON WORLD FOOD DAY

October 18, 2013 (St. Paul, MN)—Given the continuing debate about biotechnology, the Council of the American Phytopathological Society (APS) refined its position on the topic this week, as three pioneers of agricultural biotechnology received the World Food Prize. APS, the world’s largest organization of plant health scientists, represents nearly 5000 members in 90 different countries. Citing enormous potential benefits for management of plant diseases offered by this technology, APS reiterated its support and opposed mandatory labeling of food derived from genetically modified (GM) plants.

“Biotechnology today is a valuable tool for improving plant health, food and feed safety, and sustainable gains in plant productivity,” stated APS President George Abawi. “As has been discussed this week during the Borlaug Summit and the World Food Prize, biotechnology will continue to be an extremely important part of the toolbox for managing plant health.”

While strongly supporting transparent science-based regulation of agricultural products, APS has long opposed regulating food, feed, and fiber products solely on the basis of the particular technology used to create these products.

“Current scientific evidence supports the conclusion that GM plants pose no greater safety risk than traditionally bred plants. Labeling GM could be very confusing to consumers,” suggested

Abawi, “and could reduce the availability and use of this technology for the management of plant diseases.”

For a copy of the complete APS Position Statement on the Compulsory Labeling of Plants and Plant Products Derived from Biotechnology, visit www.apsnet.org/members/outreach/ppb/positionstatements/Pages/BiotechnologyPositionStatement.aspx.

THE SECOND INTERNATIONAL CONFERENCE ON DUCKWEED RESEARCH AND APPLICATIONS

RUTGERS, THE STATE UNIVERSITY OF
NEW JERSEY, USA

AUGUST 21–24, 2013

Professor Dr. Eric Lam (Rutgers University and Conference Chair) and PD Dr. Klaus-J. Appenroth (University of Jena and Head of the International Duckweed Steering Committee) report about the meeting.

Why was a meeting organized for the relatively small community of duckweed researchers and developers?

The international duckweed community organized a meeting because the members strongly feel that this family of plants has a great potential for practical applications as well as basic research. There is a very good chance to use duckweed for cleaning wastewater, as has been demonstrated in the past. Also, several species of duckweed have been reported to be the fastest-growing angiosperms and they can be grown in places that cannot be used for agriculture. The biomass can be used for producing energy—via starch fermentation, biogas production, or by other conversion methods. Thus, duckweed can help solve urgent problems facing mankind: availability of clean water and sustainable energy production.

What are the highlights of results presented at this meeting?

A key development for basic research involving duckweed will be the availability of genomic tools. Some important progress in this regard is several reports in the Conference that described sequencing and transcriptome studies that have been submitted for publication or are nearing

completion. The genomic sequence of clone 7498 of *Spirodela polyrhiza* was selected in 2009 for sequencing by the DOE-JGI as a reference genome for duckweed. This work is now in review for publication and some of the characterization of the assembled genome scaffolds was reported by Wenq in Wang (group of Joachim Messing) from Rutgers University (New Brunswick, New Jersey, USA). Doug Bryant (from the Danforth Center in St. Louis, Missouri, USA) also reported results for 92 other clones of the same duckweed species that are being completed soon by a consortium of researchers from Rutgers and the Danforth Center.

By 2014, these efforts should make available a rich set of genomic resource for the duckweed community that will enable many advanced molecular approaches in this system. Almudena Molla-Morales from the group of Robert Martienssen (Cold Spring Harbor, New York, USA) presented results about the genetic studies for biofuel production using *Lemna gibba*. In addition to reporting their progress in sequencing a reference genome for *L. gibba*, she also presented an update on their progress to optimize stable gene transfer protocols in duckweed. The efficiency of genetic transformation was enhanced from 10% callus transformation (Yamamoto et al., 2001) to 40% and the time for selection and regeneration was shortened from 7 to 5 weeks. This improvement should overcome a key bottleneck for research with duckweed in the near future, especially with the wealth of genomic information resulting from the various sequencing projects. In several reports from Japan the first results concerning the interaction of bacteria with the root system of duckweed were presented. The reported results now clearly demonstrated growth promotion and metabolic enhancement of duckweed upon co-culture with specific species of bacteria. In one case, the signaling compound has been identified to be a carbohydrate (Masaaki Morikawa, Hokkaido University, Sapporo, Japan) and it can stimulate growth of different duckweed species as well as other model land plants. These exciting findings suggest the first example of duckweed-related research that may result in significant benefits to traditional agriculture.

After the genome of *S. polyrhiza* is known, how to proceed with research?

The completed sequences for multiple *S. polyrhiza* strains should pave the way for some key advances in duckweed research and applications.

These include the following areas: (1) Mapping the sequence variation landscape in the duckweed genome should facilitate better understanding of the adaptation mechanisms for this family of aquatic plants; (2) creating better molecular techniques for rapid genotyping of closely related strains and species of duckweed; (3) determining the set of genes and enzymes present in the three genomes of these plants will provide the foundation for detailed analysis of its metabolic pathways as well as their regulatory pathways through enabling system biology approaches; (4) a well-annotated reference genome will enable rigorous transcriptomic approaches, such as RNA-seq, for gene discovery and functional genomic studies; (5) the genome sequence, together with a transcriptome database, should provide immediate access to various duckweed promoters and coding sequences for basic research as well as commercial applications.

Which types of practical application will be most important in the next years?

Some of the key applications/products from duckweed will be: (1) systematic deployment of the duckweed platform to remediate wastewater from municipal and agricultural sources; (2) reliable production of feed and fuel products at different scales (from tons to thousands of tons per year); (3) development of duckweed-based biorefineries that can maximize use of the biomass for various renewable bioproducts such as bioplastics and high-value oils.

What is it about social networking and duckweed?

As a new technology that is seeking to develop into a novel industry, it is essential at this juncture that we promote the system's unique qualities and benefits to the public-at-large, as well as to unite the nascent community's efforts in raising funds to support centralized, shared resources that will be critical for accelerated and sustainable development of research and applications. To help achieve these goals, adopting modern social media tools and channels as well as organizing the worldwide duckweed community through the International Duckweed Steering Committee are some of the efforts that are beginning to be implemented.

BSA SEEKS EDITOR FOR
PLANT SCIENCE BULLETIN

DEADLINE FOR NOMINATIONS EXTENDED

The Botanical Society of America (BSA) is soliciting nominations for the position of Editor of the *Plant Science Bulletin (PSB)* to serve a five-year term, beginning January 2015. Both self-nominations and nominations of others are welcomed.

This is a rare leadership opportunity to contribute to the Society and the continued evolution of the *PSB*. We seek someone with the desire to pursue innovation and explore new ways to serve the Society.

Duties of the Editor include both aspirational responsibility (helping shape a strategic vision for the *PSB* along with the *PSB* Editorial Committee and BSA Publications Committee) and operational responsibilities (soliciting contributions, coordinating reviews, working with Society office staff to produce copy, and recruiting new Editorial Committee members). Qualities of candidates should include a broad familiarity with different botanical specializations and especially botanical education, excellent communication skills, and a strong commitment to the *PSB*.

Review of nominations will begin March 1, 2014. For the first stage of the review process, please submit a brief letter of nomination and a detailed vita of the nominated individual to Dr. Sean Graham, Search Committee Chair at the following email address: swgraham@mail.ubc.ca.

The Committee may request additional information from candidates as the search process progresses. If you have questions or comments, please contact Dr. Graham.

–*PSB* Editor Search Committee



Use of pollen to identify cattail (*Typha* spp., Typhaceae) taxa in Indiana

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ABSTRACT

Cattail (*Typha* spp.) hybridization in the U.S. has resulted in their large-scale proliferation in wetlands. Even though recent DNA fingerprinting methods have been developed to identify the taxa, the cost and time to identify them using microsatellite analysis has restricted widespread application of the technique. Pollen morphology can be used as a tool to identify cattail hybrids and the putative parents since the pollen forms are distinct for the species and hybrids. Monads are singular pollen shed during anthesis by *T. angustifolia*; *T. latifolia* sheds pollen in tetrads, which are units of four pollen.

Pollen from a hybrid plant can also have combinations of dyads and triads, in addition to monads and tetrads. This paper describes a microscopic technique based on presence or absence of various pollen types in each of 70 plants sampled in northern Indiana. Only one plant (1.4%) had typical *T. latifolia* tetrad pollen. *Typha angustifolia* monad pollen type was much more prevalent, representing 34.3% of the samples. Mixed pollen types predominated, occurring in 64.3% of the samples. This cost-effective method could be

used by restoration managers to determine if *Typha* populations contain native *T. latifolia*, which is at risk of being extirpated due to hybridization.

Keywords: *Typha latifolia*, *T. angustifolia*, *T. xglauca*, cattail, hybrids, pollen

INTRODUCTION

Cattails (*Typha* spp.) are reed-like wetland graminoids that have undergone a massive invasion of North American wetlands over the past 80 years. Historically, cattails coexisted with other native wetland species, but recently have begun to form aggressive monocultures, with severe impacts to biodiversity, particularly in the Great Lakes region. Ecologists have hypothesized that *T. angustifolia* L. was introduced from Europe along the east coast in the mid-1800s (Galatowitsch et al., 1999; Grace and Harrison, 1986). The superior competitive ability of *Typha* in North American wetlands has been attributed to hybridization between *T. latifolia* L. and *T. angustifolia*, with resulting plants showing hybrid vigor (Smith, 1967; Stuckey and Salamon, 1987). *Typha* hybrids in the Upper Midwest have developed from interbreeding of *Typha latifolia*, broad-leaf cattail, and *Typha angustifolia*, narrow-leaf cattail, as indicated by molecular genetic analysis (Marburger et al., 2005; Travis et al., 2010, 2011) and evidence of synchronous flowering of the two species (Ball and Freeland, 2013). The hybrid, referred to as *T. xglauca* Godr., is highly variable in its morphology depending on its location, and thus difficult to identify. Its invasive properties stem from its capacity for rapid clonal spread and biomass production, which allows it to readily supplant other native wetland species. Genetic analyses have so far identified invasive stands of *T. xglauca* in at least six Great Lakes National Parks (Travis et al., 2010 and unpublished data), which has raised serious resource management concerns among wetland managers whose goal is to preserve native plant biodiversity.

Uncertainties exist in identifying *Typha* species and hybrids based on gross morphological features, such as leaf width, gap between male and female inflorescences, plant height, and stem diameter (Snow et al., 2010). However, pollen morphology has been identified as a tool to identify cattail hybrids and the putative parents (Smith, 1967; Dugle and Coppins, 1972; Finkelstein, 2003). Although highly



Figure 1. Map showing *Typha* pollen collection sites (yellow points) in northern Indiana counties (Porter, Elkhart, and Steuben; map insert). Light purple polygons are urban areas.

specific, the use of molecular analyses based on microsatellite signatures to identify cattail taxa is somewhat costly and time consuming. Therefore, simple and inexpensive methods are needed to assist managers in identifying whether hybrids, the invasive *T. angustifolia*, or the native *T. latifolia* are present in a population. Smith (1967) and Finkelstein (2003) indicated that pollen grains of *T. latifolia* occur in tetrads, while those of *T. angustifolia* occur as monads (Fig. 2 a, d). They noted that hybrids show a combination of these as well as other types including dyads, triads, tetrads, and abnormal tetrads (Fig. 2 b, c, e, f, g, h). Here I describe a simple method to identify the species and hybrids based on a rapid assessment of mature pollen grains at anthesis.

METHODS

A scope of procedure (SOP) for pollen collection was developed through consultation with the USGS National Wetlands Research Center in Lafayette, Louisiana (B. Middleton, USGS National Wetlands Research Center, personal communication). With the assistance of volunteers, I collected pollen from 70 different plants in wetlands in Porter, Elkhart, and Steuben counties of Indiana (Fig. 1; latitude= 41.61 to 41.72; longitude = -84.90 to -87.15 decimal degrees). Sites were located in

Indiana Dunes National Lakeshore (IDNL), other areas along roads near the national park in Porter County, two sites in Elkhart County, and sites in Lime Lake and Pokagon State Park. The latter two are part of the Indiana Department of Natural Resources State Nature Preserves. Collection sites in IDNL were located in the Cowles Bog Unit and in the Great Marsh Restoration Area near the town of Beverly Shores. Collections were done from June 13 to 29 in 2008, 2009, and 2010.

Pollen from individual plants was collected during anthesis. Pollen was shaken from male inflorescences into plastic Ziploc bags labeled by collector, GPS coordinates, site, and date. Care was taken to prevent any cross-contamination in collecting pollen from one plant to another. Bags were stored in a cooler and transported to a -20°C freezer until analysis could be conducted. Pollen from each bag was removed using the tip of a small paint brush and placed on a microscope slide. The acetocarmine pollen staining method was used (Ruzin, 1999). A drop of 1% acetocarmine solution was placed on the pollen, which was then covered with a glass coverslip. After 2-3 minutes in the stain the pollen grain cytoplasm became pale pink, and the nucleus became a darker pink. Pollen was evaluated using 4X, 10X, and 40X power with a

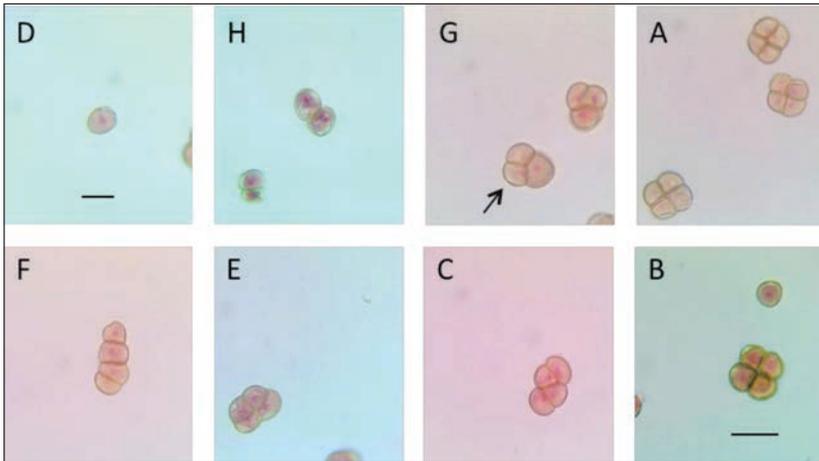


Figure 2. *Typha* pollen types: A = monad; B = dyad; C = triad (arrow); D = tetrad; E, F, G = abnormal Tetrad; H = hybrid sample with both monad and tetrad pollen. Bar in A = 25 μm ; bar in H = 40 μm .

compound light microscope. The pollen dispersed when the coverslip was placed on the sample. A digital camera attached to a compound microscope was used to photograph the pollen (Fig. 2, a-h). Prior to pollen removal from each bag, the brush was cleaned with 70% alcohol and distilled water to prevent cross-contamination. Each sample was analyzed three times to confirm the presence or absence of pollen types. Three slides per samples were evaluated using a light microscope at 400X magnification for the presence of monad, dyad, triad, abnormal tetrad, and normal tetrad pollen. Presence (1) or absence (0) of the pollen types was recorded during visual scanning of each slide. Photographs were taken with a digital camera mounted on the microscope. Final images were modified by lightening them using Microsoft™ Powerpoint Picture Tools Corrections. Descriptive statistical analysis (SAS version 9.3.1, 2011) was conducted to determine the distribution of the various pollen combinations per sample.

RESULTS AND DISCUSSION

Tables 1 and Figure 3 show the results of the 70 cattail plants evaluated for presence or absence of the various pollen types. A binary code was used to show presence (1) or absence (0) of the various pollen types in a sample, rather than counting the numbers of each type, to facilitate use of the method by resource managers conducting wetland restoration. The sequence of pollen distribution described for each sample was monad, dyad, triad, tetrad, and abnormal tetrads. Several types of abnormal tetrads were observed: linear and butterfly shaped (Fig. 2, e-g). Hybrids included

any mixtures of pollen type from a single plant (Fig. 2, a-h). Note that only one plant (1.4% of samples) had typical *T. latifolia* tetrad pollen. *Typha angustifolia* pollen type (monad only) was much more prevalent, representing 34.3% of the samples. These could also reflect backcrossed generations to *T. angustifolia*, but previous work using molecular methods indicated that plants in IDNL (Travis et al., 2010) were first-generation hybrids. Hybrid pollen types occurred in 64.3% of the samples. Two samples (2.9%) had both normal and abnormal tetrads in each sample, which were included in the hybrid category to avoid labeling them as pure *T. latifolia*, identified here as having normal tetrads only.

Pollen morphological analysis may be useful for determining cattail taxa in a site undergoing restoration, since *T. latifolia* is becoming rarer due to hybridization and dominance of hybrid taxa in the Midwest. Both molecular identification (Travis et al., 2010) and pollen analysis (Marburger, unpublished data) at IDNL, particularly in the Cowles Bog Wetland Complex, support the evidence that first-generation hybrid cattail was the dominant taxon at this site in 2008 when pollen was first sampled. This information was conveyed to managers who then developed a plan to remove the cattail from the bog using glyphosate herbicide and an overland vehicle that applied the herbicide to the site in 2010. Restoration currently consists of herbicide suppression of any new cattail plants emerging from seed or rhizomes, reliance on the native plant seed bank, and intensive planting of species such as *Carex* spp. that do not persist in the seed bank, as well as planting rare species.

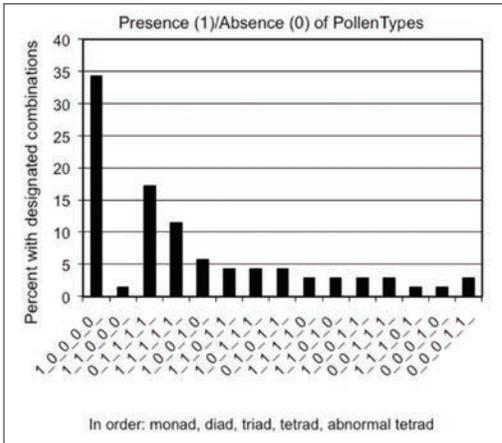


Figure 3. Percentage of *Typha* pollen types (monad, dyad, triad, tetrad, abnormal tetrad) from 70 plants.

Pollen analysis using a compound microscope is a simple and cost-effective method that can be done quickly to evaluate the presence of cattail hybrids or parent species. DNA microsatellite preparation and analysis cost approximately \$20 per sample, with existing equipment and excluding staff training (S. Travis, personal communication). Pollen analysis costs would be approximately \$1.00 a sample, excluding a one-time purchase of a compound microscope and staff training. Thus the cost savings would be 20 times less using the pollen analysis method. A field microscope kit is being developed to evaluate cattail taxa on site during the flowering period. This would reduce the time necessary to process samples in the laboratory and hasten a decision to remove cattail populations for restoration purposes.

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DEVELOPMENT AND STRUCTURAL

Forensic Botany: A Practical Guide

David W. Hall and Jason H. Byrd (eds.)

2012. ISBN-13: 978-0-470-66123-9

Paperback, US\$79.95. 195 pp.

Wiley-Blackwell, Hoboken, New Jersey, USA

This is not a “how to” guide for becoming a forensic botanist, in part because there is no formal certification and no standards for training or expertise exist. It is, however, part of the Essentials of Forensic Science series sponsored by the Forensic Science Society, and it does provide an interesting introduction to all phases of applying botanical expertise to a crime scene. It is quickly apparent that no one person will be competent to consult in all relevant areas, but the editors brought together experts in each area to provide an overview of how knowledge in that area is useful and essential in an investigation.

The first two chapters give a general overview of basic botany and its application under a variety of legal definitions. They, along with Chapter 4 on “Expert Evidence,” provide essential background for understanding the detailed explanations for evidence collection and analysis presented in Chapter 3. The next five chapters, which comprise half the book, will be of most interest to teaching botanists. Chapter 5 (“Use and Guidelines for Plant DNA Analysis in Forensics”) is a general overview of molecular biology techniques and presents several case studies using different techniques. Chapters 6, 7, and 8 focus on various applications of anatomical data. In addition to a primer on microscopy, Chapter 6 provides guidelines for

making reference collections and preparing and documenting specimens. Chapter 7 details the famous Lindbergh case, while Chapter 8 focuses on palynology, pollen, and spores—presenting basic palynology and collecting, storing, and preparing samples, as well as several case studies. The focus of Chapter 9 is algal evidence, and seven case studies are presented. The final chapter contains nine case studies that use botanical evidence to place people or objects at the scene of a crime and six case studies that use botanical evidence to determine time of death.

Who will use this book? It’s too technical for a non-majors botany elective, although a course of that title would probably draw students. For that cohort, I’d consider upgrading the exercises in Glenco Science’s *Forensic Botany Investigations* (New York Botanical Garden, 2007). I’m considering renaming our Plant Anatomy course (which seldom “makes” given the small number of biology students in our department following the botany emphasis track) to Forensic Botany and using this as the primary text supplemented by a traditional plant anatomy text. For the instructor, it provides plenty of ideas that could be incorporated as individual activities in a variety of botany or biology labs.

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ECONOMIC BOTANY

***The Hunter-Gatherer Within:
Health and the Natural Human Diet***

Kerry G. Brock and George M. Diggs Jr.

2013. ISBN-13: 978-1889878-40-9

Paperback, US\$19.95. xi + 260 pp.

Botanical Research Institute of Texas Press,
Fort Worth, Texas, USA

Put simply, this book is a must-take course for anyone who eats. Having heard from my older son about the concepts of the “caveman diet” (aka: “natural” diet, ancestral diet, evolutionary diet, paleo diet, Paleolithic diet, primal diet, Neanderthal diet, anti-inflammatory diet, etc.) and having read some of Mark Sisson’s work on the “Primal Blueprint,” I basically had a good idea of what this small, well-prepared volume would contain. But I was ready to read and review the volume to see how the information was presented and how it compared to what I had already heard and read. Wow, am I glad to have read this book! First, the authors allude to the courses that they teach and the material in the book, to which my reaction was: this book *is* a course on the topic and each chapter is a lecture. My bias as a retired professor who taught for many years may get in the way of objectivity, but I loved the presentation. There is an adage about telling students what you are going to tell them, then telling them, and then telling them what you told them. Well, triple redundancy probably has a place in education (as well as national security, etc.), and this book does repeat a lot of information (just as a professor would refer back to information presented in previous lectures). Although, once in a while, the redundancy may be more distracting than useful, overall it is effective—especially in view of how much fascinating information is provided.

Like good teachers, the authors include many insets that provide “Overviews,” “Key Concepts,” and 19 or so “Success Stories.” The latter describe real people who have benefited from changing their diets; these add a certain level “proof” that the book’s basic message is on track. The readability of the book is enhanced by numerous photographs and diagrams, all of which are useful in making each lecture—that is, chapter—work. Similarly, the addition of one or more appropriate quotes at the beginning of each chapter adds interest for readers. The authors do an outstanding job of presenting information for possible lay readers who may

have a limited or nonexistent science background. They gently explain everything one needs to know about nutritional factors including proteins, carbohydrates, and lipids, and they do it in such a way that it is not “obnoxious” for readers who do have a science background. My wife, who is, like me, a scientist, thought the book was fairly technical in places for a lay reader, but not too much so. Finally, there are short (or sometimes long) footnotes providing additional detailed information that enhance the book’s content without interrupting the flow of the main text.

Enough about why this is an enjoyable book to read (or an enjoyable course to take). What about “the message”? As I mentioned at the start of this review, I knew something about this type of diet before picking up the book. But I was taken aback by how well the authors develop the case against the “standard American diet” and against conventional wisdom in respect to what is good and what is bad for us to eat. In fact, as a scientist, I cringed at their rather scathing criticism of science and scientists in Appendix 1 (“Why Do the Experts Often Get It Wrong?”); however, I am prepared to accept that the overall premise of this appendix is sound and that some of the data presented both support that premise and make me, as a scientist, blush with a bit of shame. A list of the section titles for this appendix may be enough to whet one’s appetite to read the book: “Measuring the Wrong Thing,” “Confounding Variables,” “Data Cleansings Including the ‘File Drawer’ Problem,” “Small Study Size,” “The Numbers Problem: Small Effect Sizes,” “Juggling the Numbers,” “Cherry-Picking Data and Other Intellectual Dishonesty,” “Being Paid To Get It Wrong—Scientific Prostitutes and Conflicts of Interest,” and “Bias for Other Reasons.” No matter how a professional scientist might react to this exposé, the main point—*viz.*, that a healthy dose of skepticism can be critically important—is certainly a concept both scientists and lay readers can embrace. And, one hopes no reader will read Appendix 1 and believe that all research is inaccurate, fatally flawed, and/or corrupted by outside influences! After reading this book, I was convinced that getting away from the standard American diet is absolutely logical and, as the authors point out, a relatively simple, “nothing to lose” proposition. Cutting back on sugars, starches, all forms of artificial sweeteners, and additives is not new advice. The argument against eating gluten even if you are not technically gluten-intolerant and the logic behind eating more meat and animal fats

is proffered by many “caveman diet” proponents, but this wonderful little book/course builds the case so well that I and my wife were convinced that the standard American diet is not good and have begun moving toward a more natural diet. As a lover of pasta (etc., etc., etc.), my change of heart comes only after a convincing and enjoyable “course” contained in a great little book that is a must-read for anyone who eats, that is, everyone.

–Russell L. Chapman, Professor Emeritus and Founding Dean, School of the Coast and Environment, Louisiana State University, Baton Rouge, Louisiana, USA

MYCOLOGY

The Kingdom of Fungi

Jens J. Petersen

2013. ISBN-13: 978-0-691-15754-2

Cloth, US\$29.95. 265 pp.

Princeton University Press, Princeton, New Jersey, USA

Faced with the alarming pace of environmental destruction and the increasing disconnect between science and the general public, a number of natural scientists are directing their attention to the non-specialist, making the case for the importance, value, and beauty of the organisms they study. *The Kingdom of Fungi*, a visually spectacular book by Danish mycologist Jens Petersen, is an example of this welcome trend. The book is quite sparing with text—no more than a couple of sentences per page on average—while giving center stage to the author’s (and colleagues’) impressive color photographs. By highlighting basic features of fungal structure, development, and function, many of these images distinguish themselves from those chosen for mere aesthetic appeal by authors of large-format nature books destined for the non-scientific coffee table. The photos are so effective that even the experienced mycologist will linger over them, finding many that stimulate thinking about some aspect of fungal biology and many more that would be very useful in the classroom. As one would expect, there are plenty of excellent images of fruit bodies in their natural habitat, including quite a few that the average mycologist is not likely to have seen before. Particularly impressive here is the depth of field achieved with close-up photography, and the contrast compression that conserves detail even where very white fruit bodies are shown against

very dark backgrounds. Also featured are a number of excellent images of those less photogenic but all-important fungal structures such as mycorrhizae, hyphal cords, and rhizomorphs. There are pedagogically useful diagrams where convergent and divergent structures are mapped onto biosystematic pie charts serving as highly pruned phylogenetic trees. The diversity of lamellar (gill) morphology is beautifully and usefully compared among mushrooms, likewise the pore structures found among polypores. Clouds of ejected spores are shown hovering about several fruit bodies. And great use is made of high-magnification dissecting microscope images where, for example, one can distinguish basidiospores and asci in context on the surfaces of their respective fruit bodies. Others show the surfaces of developing fruit bodies with sufficient magnification to reveal their fundamentally hyphal construction. Compound microscope images are fewer but also used effectively, for example, the micrographs of the different kinds of “heterobasidia” that are so challenging to prepare from their gelatinous fruit bodies.

Only a couple of possible inaccuracies are apparent, and they are minor. A transmission electron microscopy (TEM) image purported to depict “vacuoles” filled with enzymes for digesting food seems instead to show vesicles of the Spitzenkörper complex involved in wall synthesis at the hyphal apex. In an image of the lichen *Cladonia ramulosa*, structures located at the tips of podetia that are identified as fruit bodies appear instead to be the presumed gametangia (pycnidia/spermogonia).

While ostensibly addressing the uninitiated, the sparse text is in fact fairly dense in information, and the reader will need some basic understanding of biology to fully make sense of it. At times the text may presume much of the amateur audience; for example, the term “agaric” is used from the outset without explanation. In the absence of clarification, even biology students will mistakenly assume that “sexual spores” means gametes, and that “sterile hyphae” must refer to those not contaminated with bacteria. On the other hand, the text repeats its explanation of the very basic terms “hyphae” and “mycelium” on pages 6 and 12 in an apparent oversight. There are some spelling mistakes (e.g., mosaik, significant, including, chaterelle) that the editors could have easily located with word processing software.

Considering finally the modest price of \$29.95

in hardcover, it is not easy to see how any mycologist, broadly interested botanist, naturalist, or mushroom enthusiast could resist owning this magnificently illustrated work.

–William B. Sanders, Department of Biological Sciences, Florida Gulf Coast University, Fort Myers, Florida, USA

SYSTEMATICS

Manual of Montana Vascular Plants

Peter Lesica

2012. ISBN-13: 978-1889878-39-3

Paperback, US\$50.00. viii + 771 pp.

Botanical Research Institute of Texas Press, Fort Worth, Texas, USA

The history of Montana floristics is given a chapter of its own. The story begins with the Lewis & Clark expedition, and “ends” with the present volume. Properly, as Peter Lesica would be the first to acknowledge, the next chapter really *begins* with the publication of this book. Heretofore, there has been nothing so detailed and extensive for the state. Its predecessor was Robert Dorn’s *Vascular Plants of Montana* (Dorn, 1984), which is still available as a new copy (though no longer in print, I believe) for \$125–\$537, with used copies a great deal less. In that work, Dorn acknowledges the assistance of Peter Lesica.

The present manual is a very different work, with full keys, ample descriptions, a great many illustrations, and a Montana distribution map for nearly every recognized species. The range statements use the official post office abbreviations for the states and provinces of the United States and Canada; these are given on p. 40, alphabetized by the abbreviation, which is very helpful.

The arrangement of families is by the Cronquist system, with some families reconfigured to reflect modern phylogenetic thinking; hence, Chenopodiaceae are merged with Amaranthaceae, and traditional genera of Scrophulariaceae are mostly segregated into Phrymaceae, Plantaginaceae, and Orobanchaceae, such that there are now only four species of scrophs in the Montana flora. It appears that some of the plates were prepared before this drastic segregation occurred, so that the fine drawing of *Penstemon ellipticus* (Plantaginaceae, p. 438) ends up in Plate 81 (p. 454)

with members of the Orobanchaceae. It’s clearly indicated on p. 438 where the figure is to be found, so there’s no real harm done. The genera within each family, and the species within each genus, are given alphabetically—a most useful arrangement. I tried some of the keys, and they worked.

The nomenclatural apparatus is minimized. Synonyms appear to be given only in cases where they have appeared in other recent treatments for Montana. Therefore, the basionyms of binomials with parenthetical authors are not routinely given. When type specimens came originally from today’s Montana, the author notes it—a welcome nod to history. The author is entirely aware of the taxonomic decisions taken in *Flora of North America*, but has avoided the temptation of merely copying that masterly work; his treatment of *Cirsium canovirens* (p. 515) is an excellent example of how close attention to local circumstances can lend new insights.

The work ends with an ample index. The Literature Cited is not given just before the index, as one might expect, but occupies pp. 19–32. The entries are alphabetical by author, but are preceded by a number in parentheses, and it is these numbers which are used throughout the book. This is a useful device, not unique to this work, which deserves to be more widely copied.

LITERATURE CITED

DORN, R. D. 1984. *Vascular Plants of Montana*. Mountain West Publishing, Missoula, Montana, USA.

–Neil A. Harriman, Biology Department, University of Wisconsin–Oshkosh, Oshkosh, Wisconsin, USA

Wildflowers & Grasses of Virginia’s Coastal Plain

Helen Hamilton and Gustavus Hall

2013. ISBN-13: 978-1-889878-41-6

Flex-binding, US\$24.95. 276 pp.

Botanical Research Institute of Texas Press, Fort Worth, Texas, USA

Wildflowers & Grasses of Virginia’s Coastal Plain begins with the Acknowledgments, which are more usually put at the end of a volume. It’s easy to see why this arrangement was adopted, though, because there is a formidable array of botanical and editorial expertise at play here, and it shows. The full-color photos and text are models of how books

of this sort should be done.

The book is divided into sections according to the predominant color of the flower, with a tan sector for the grasses and grass-like plants at the end of the volume. How to distinguish grasses from sedges and rushes is not mentioned, but a few sedges are included, along with a few Juncaceae. Each species is presented with a common name first, always felicitously chosen, followed by its Latin binomial, without author(s). In many instances, the common names are explained, and in some instances the Latin names are translated or otherwise explained. The photographs were chosen with the greatest care, and one can only marvel at how the structure of flowers is shown. Every photograph is credited, and one concludes that Virginia harbors a great many skilled photographers. For each species, there is a full-page treatment; the names follow the treatments in the just-published *Flora of Virginia* (Weakley et al., 2012).

Another useful feature of this book is a prominent indication of whether the species is native or introduced, and occasionally, in bright red, whether it is introduced and invasive. Poisonous species are also mentioned, with prominent warnings. The text states that Water Hemlock, *Cicuta maculata* L., is so exceptionally poisonous that merely a bite can be fatal. This is not a book with footnotes or endnotes, so I don't know the origin of this claim, but it may well have come from the website of the Centers for Disease Control and Prevention (CDC). On page 220, there is a statement made in passing that *Urtica dioica* L., Stinging Nettle, is introduced from Europe. However, it is generally agreed that there are two varieties in the United States—one native, the other introduced.

An amenity of the book is the occasional mention that a given species is the host plant for the caterpillar of this or that butterfly or moth. Wildflower enthusiasts are often interested in such associations, and I feel sure these tidbits will be welcome. Brief biographies of both authors, with color photos, are given at the end of the volume, after a well-done index.

LITERATURE CITED

WEAKLEY, A. S., J. C. LUDWIG, AND J. F. TOWNSEND.
2012. *Flora of Virginia*. Botanical Research
Institute of Texas Press, Fort Worth, Texas,
USA.

– Neil A. Harriman, *Biology Department, University of Wisconsin–Oshkosh, Oshkosh, Wisconsin, USA*

Wildflowers of the Mountain West

Richard M. Anderson, JayDee Gunnell, and
Jerry L. Goodspeed

2012. ISBN-13: 978-0-87421-895-4

Spiralbound, US\$26.95. 302 pp.

University Press of Colorado, Boulder, Colorado, USA

This is a guide to 130 of the most common wildflowers in the Mountain West. Like most guidebooks for novices, it is organized by flower color. It includes the typical information for a species, such as common name, habitat, elevation, bloom time, distribution, and plant size. Although the authors do not state this in the introduction, all of the wildflowers covered are native plants. With nonnative plants becoming an increasing problem, this should be stated. The book presents pictures of basic flower shapes that are too simplified. Although it is admittedly challenging to communicate exactly what a plant in the Compositae family is, they do not shed any light on the basic flower structure of a composite species. The reader is left not knowing that there are composites with all disc flowers or all ray flowers. It is not clear that each ray/disc is actually a flower and hence the name “composite.” Also overlooked is the difference between radial and bilateral symmetry, a characteristic of a flower that is easy to pick up on once the terminology is introduced, and which aids tremendously with identification. While the book does include a nice glossary in the back that includes the more common botanical terms, many of these terms (sessile, petiole) would be well-served with a diagram or other visual representation as they are frequently used in the descriptions of the plants represented in the guide book.

The authors did their readers many favors by including pictures of the leaves as well as photographs of the flowers' habitat. Too often, wildflower enthusiasts key in on the flowers, only to realize that they do not recognize the foliage of common plants without the flowers. The majority of the pictures in the guidebook are very good. However, some are out of focus, which presents difficulty for the reader and undermines the professionalism of the authors. Also of great help to the reader is the inclusion of the growth form of the plant under the heading “Form/Foliage.” Each plant is accompanied by a range distribution map, which, though helpful, would have provided more ease in identifying location if the states were labeled.

The size and binding make this book an extremely portable, field-ready companion, and interesting vignettes often provide occasional humor. Under whorled buckwheat look-alikes, the authors wish the readers, “Good luck! There are over 220 different buckweats (*Eriogonum* spp.) in North America.” Unfortunately, look-alikes were not as distinct as they could have been. In the case of Canada Goldenrod, Baby Goldenrod is listed as a look-alike. While the astute wildflower enthusiast would certainly recognize it as a goldenrod, other species of goldenrod look much more similar to Canada Goldenrod than Baby Goldenrod does. And in yet other cases, such as arrowleaf groundsel, the authors state that other groundsel species are look-alikes when really arrowleaf groundsel is the only plant with the distinctive triangular leaf; therefore, this might have been a more appropriate commentary for the “look-alike” category. Seep monkeyflower, a yellow monkeyflower, is thought to look similar to Lewis’s monkeyflower, a purple monkeyflower, when another yellow monkeyflower, muskflower (*Mimulus moschatus*), occurs in the area covered. The book also includes a wildflower

quick search key that is based on flower color and a few other characteristics.

While this book will be appealing to a new wildflower enthusiast, it could be a source of frustration for the more sophisticated botanist. Instead, expert botanists might refer to *Plants of the Rocky Mountains* (Kershaw et al., 1998), a local favorite covering many more wildflowers, trees, shrubs, and even a few mosses and lichens. It also offers characteristics for plant families and is the best bang for your buck if you are serious about wildflower identification. While not spiralbound, it is compact and field-worthy.

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- KERSHAW, L. J., J. POJAR, AND P. ALABACK. 1998. *Plants of the Rocky Mountains*. Lone Pine Publishing, Vancouver, British Columbia, Canada.
- Heidi Anderson, *Yellowstone Center for Resources, Yellowstone National Park, Mammoth, Wyoming, USA*



BOOKS RECEIVED



[Catalogue of the]14th International Exhibition of Botanical Art & Illustration. Eugene B. Bruni and Carolina L. Roy. 2013. ISBN-13: 978-0-913196-86-1 (Paperback US\$28.00) 108 pp. Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, Pennsylvania, USA.

Colorado Rocky Mountain Wildflowers—App for Apple and Android. Al Schneider and Whitney Tilt. 2012. (US\$9.99). High Country Apps, <http://www.highcountryapps.com/>

Flora of the Four Corners Region, Vascular Plants of the San Juan River Drainage: Arizona, Colorado, New Mexico, and Utah. Kenneth D. Heil, Steve L. O’Kane Jr., Linda Mary Reeves, and Arnold Clifford. 2013. ISBN-13: 978-1-930723-84-9 (Cloth US\$72.00) 1098 pp. Missouri Botanical Garden Press, St. Louis, Missouri, USA.

Illustrated Genera of Smut Fungi, 3rd Edition. Kálmán Vánky. 2013. ISBN-13: 978-0-89054-428-0 (Cloth \$139.00) 238 pp. American Phytopathological Society, St. Paul, Minnesota, USA.

Mineral Nutrition of Rice. Nand Kumar Fageria. 2013. ISBN-13: 978-1-4665-5806-9 (Cloth US\$149.95) 552 pp. CRC Press, Taylor and Francis Group, Boca Raton, Florida, USA.

The Plant Hunters: The Adventures of the World’s Greatest Botanical Explorers. Carolyn Fry. 2013. ISBN-13: 978-0-226-09331-4 (Cloth US\$30.00) 63 pp. University of Chicago Press, Chicago, Illinois, USA.

Steyrmark’s Flora of Missouri, Volume 3, Dicots (Part 2): Fabaceae (Second Part) through Zygophyllaceae. George Yatskievych. 2013. ISBN-13: 978-0-915-27913-5 (Cloth US\$65.00). Missouri Botanical Garden Press, St. Louis, Missouri, USA.

Woody Plants of Kentucky and Tennessee: The Complete Winter Guide to Their Identification and Use. Ronald L. Jones and B. Eugene Wofford. 2013. ISBN-13: 978-0-8131-4250-0 (Cloth US\$45.00) 143 pp. University Press of Kentucky, Lexington, Kentucky, USA.

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