

The Bryological Times

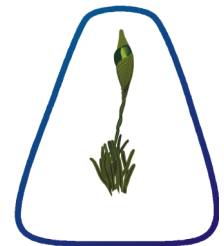
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OCTOBER 2010

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IAB



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Editor Note

In today's world, things are always changing rapidly. In order to keep up with all of these changes, staying connected to each other is crucial. In this issue of *The Bryological Times*, we have tried to keep you connected to some old, new, and exciting worlds.

This issue contains the second half of "Mossin' Annie's" Moss Garden article (see Vol 130 for part I). It also has another exciting and informative "tips" piece from David Wagner. Both of these articles help us learn about new realms for bryophyte use and marketability while remaining connected

to some tried and true techniques to study them.

However, IAB has some exciting news about bryophytes embracing the technological world! IAB will have a smart phone app that will help keep members linked in! Check out all of these special features in this issue!

SPECIAL POINTS OF INTEREST:

- *Check out the latest from Mossin' Annie*
- *Don't forget to learn a few new tips, tools, and techniques*
- *There's an App for Bryophytes!*
- *News from around the world*

Special Article: Enter the Magical World of Moss Gardens (Part II)

By Annie Martin

Emerging Perspectives on Moss Gardening

It would simplify matters for aspiring moss gardeners if we all agreed about one right method, but that is not necessarily the case. We do all agree that mosses are stress-tolerant and offer new solutions in landscaping. A variety of recommended strategies are emerging in this arena. Some recommendations are in direct conflict with each other. For instance, there is the philosophy of moss gardening that Mother Nature will take care of all moss needs. Proponents of this perspective rely on rainfall for nurturing mosses and this philosophy makes sense since that is how bryophytes survive in nature. However, I

advocate a proactive gardener's approach and recommend supplementing natural rainfall with a watering regime of either harvested rainwater or traditional urban water sources. While I do support water conservation methods and believe the use of rainwater harvesting is the best choice, I can testify that over ten years of frequent watering with my garden hose from the neighborhood water system (despite the inherent chemical additives) has only kept my moss garden lush and green. This success directly contradicts the warning by some that city water will kill mosses. I advocate walking on mosses, particularly in the establishment phase. "Water and Walk on your mosses" is my

mantra. I am a firm believer that walking (or sitting) on mosses is critical in establishing the rhizoid connection, especially in the first few weeks. So, I digest bryological research; faithfully use my invaluable reference source, *Mosses of Eastern North America* by Crum and Anderson; absorb advice; observe growth patterns; network with moss gardeners, and then strike out on my own in new directions to discover what works.

Aesthetic Appeal and Environmental Reasons for Choosing Mosses

Initially, my motivation for a moss garden was intrinsic. The intangible qualities of these miniature plants captured my heart years ago.(p9)

2010 National Symposium of the Bryological Society of China

Successfully Held at Guizhou Normal University by Zhang Zhaohui and Pan Shan

The National Symposium of the Bryological Society of China was successfully held from 23 to 27 August 2010 at Guizhou Normal University in Guiyang city, Guizhou Province, P.R.China. It was organized by the Bryological Society of China and Guizhou Normal University, with Prof. Zhang Zhaohui as the main organizer. More than 80 participants from 17 provinces (Beijing, Shanghai, Guangdong, Shandong, Heilongjiang, Xinjiang, etc.) and 38 universities/research institutes (Chinese Academy of Sciences, East China Normal University, Shanghai Normal University, Shandong University, etc.) attended the Symposium. The topic of the meeting was "Bryophytes, Biodiversity, Ecology and Society".

The National Symposium of the Bryological Society of China consists of four components, namely, the opening programs, session discussions, closing programs and field excursion. The plenary session was held in the morning of Aug 24 in the lecture hall of the institute. The vice president of the Bryological Society of China, Prof. Zhang Zhaohui organized the opening program, the opening address given by the president of the Bryological Society of China, Prof. Zhu Ruiliang after the brief welcome speech delivered by the vice President of Guizhou Normal University, Prof. Xie Xiaoyao, who cordially provided us with a lively pictorial overview of the university, and followed by encouraging words from the deputy director of Guizhou Technology Department, Prof. Chen Xun.

There were 31 lecturers in the Sym-

posium, includes ten key lecturers were invited, namely, Prof. Zhu Ruiliang from East China Normal University, Prof. Zhang Zhaohui from Guizhou Normal University, Prof. Zhao Zuntian from Shandong Normal University, Prof. Zhang Yuanming from Xinjiang Institute of Ecology and Geography, Chinese Academic of Science, Prof. Zhao Jiancheng from Hebei Normal University, Prof. Xiong Yuanxin from Guizhou University, PhD. Zhangli from Shenzhen Fairy Lake Botanical Garden, PhD. Chen Aixia from Shandong University. The lectures covered Field Bryology and Systematics, Physiological and Molecular Biology of Bryophytes, Population and Community of Bryo-

Landscape Bryophytes and Gardening Bryological Arts, Karst bryology and Bryokarst, Bryology Education for Graduate Students and Bryology Science Popularizing in China, etc. After the closing programs, most participants visited Leigongshan Nature Reserve, which provide the participants with opportunities for collaboration and networking among Chinese Universities and other scientific institutions to promote research and developing technologies in bryology, and play an important role in protecting bryophytes diversity of Guizhou.

During the National Symposium



Fifth Row: Bing Li, Lingyan Zhou, Wenyun Wang, Fei Xie, Qimei Wu, Sha Pan
 Forth Row: Rongxiang Liu, Zhihui Wang, Xuelan Liu, Dengfu Wang, Qiyu Kuang, Siyi Zuo, Rula Sa, Dongmei Ren, Hong Jiang, Xiaopeng Chen, Zaichao Yang, Jinchuan Zhou, Aixia Cheng, Yu Zhao, Tao Peng
 Third Row: Mingkai Wu, Lan Fu, Lei Shi, Peng Jia, Wenzhang Ma, Jianyou Li, Chao Feng, Yuan Mo, Yan Cui, Hong Luo, Jianping Liu, Bing Liu, Chenying Wang, Min Li, Qiong He, Yumei Wei, Yusong Huang, Jie Xu
 Second Row: Qiang Xie, Yunfeng Deng, Wen Zhang, Axi Liang, Tan Deng, Shouqin Sun, Shanshan Song, Zuhuang Li, Junhe Chen, Guoyan Zhou, Wei Li, Guoying Han, Pengbo Li, Zhaoyang Li, Shuangjiao Gong, Lihui Mao, Hongmei Liu, Kaiwei Zhang, Yun Yan, Yue Sun, Lina Zhang, Qiying Cai, Guiquan Tian
 First Row: Shan Jiang, Maimin Sulayman, Yuanxin Xiong, Chengying Yan, Shouzhong Jiang, Tong Cao, Bengu Zhong, Xiaoyao Xie, Xun Chen, Ruiliang Zhu, Zuntian Zhao, Jiancheng Zhao, Li Zhang, Wei Sha, Yanming Fang, Zhaohui Zhang

phytes, Small Animal-Bryophyte interactions and Evolution Ecology, Urban Bryology and Environmental Monitoring, Industrial Bryological Ecology and Mine Bryological Ecology, Biodiversity and conservation of bryophytes in Chinese National Reserve, Bryochemistry and Medicine Bryophyte Resources,

of the Bryological Society of China, many of the participants crowded the lobby for group discussions, which present a timely opportunity to stimulate and universalize the scientific studies on modern branches of bryological sciences, and also promote the biodiversity research and conservation of bryophytes in China.

Moss 2011: September 11th to 16th

SAVE THE DATE!!

The next MOSS meeting will take place September 11-16, 2011, close to one of the highest mountains in Black Forest, the "Herzogenhorn."

Details for this meeting have not been finalized, and therefore, you should continue to check *The Bryological Times* for more information or you can contact Stefan Rensing.

Stephan is a Lecturer of Bioinformatics and Systems Biology FRI-

SYS, and is Faculty of Biology at the University of Freiburg Hauptstr. 1, D-79104 Freiburg. You can contact him by phone at +49 761 203-6974. Check out his webpage at: <http://plantco.de/stefan.rensing@biologie.uni-freiburg.de>

Happy 3rd Birthday to the IABlog!

The IAB blog site is very much alive, as it starts its third year. Please visit this link to see visitor stats and map for the last twelve months.

<http://internationalassociationofbryologists.blogspot.com/2010/08/iab-blog-second-year.html>

The IAB blog has become a very dynamic complement to the old IAB web site. Due to the blog open collaboration structure, it is easier for anyone to post

content online, in comparison to the necessarily restricted access to update content the static IAB website at www.bryology.org. The IAB blog is the place for news, commentaries on recent papers, spark discussions, share your pictures of bryologists in action, etc.

There is a special series of posts to share bryophyte photos: "Bryophyte photo of the week". Which photo do you like most? Post your comments!

<http://internationalassociationofbryologists.blogspot.com/search/label/Bryophyte%20photo%20of%20the%20week>

Want to register? Send an email to the blog editor Efrain De Luna at efrain.deluna@inecol.edu.mx



News From Norway: Flatberg honour symposium

An honour symposium for Kjell Ivar Flatberg will be arranged in Trondheim, Norway for November 19th 2010.

The subject of the "Flatberg honour symposium" will be *Sphagnum* s.l. We are pleased to invite you to give an oral presentation, poster or solely attend the symposium. There will be a dinner in the evening.

Invited speakers participating in the symposium are:

Håkan Rydin, Uppsala University
Jonathan Shaw, Duke University
Nils Cronberg, Lund University
Peter Szoevenyi, University of Freiburg

If you would like to join the symposium with a talk, poster or just attend, please register your interest by October 8th 2010 with an e-mail to:

Hans.Stenoien@ntnu.no

or

Kristian.Hassel@vm.ntnu.no

Details about the program, location and accommodation will be sent to you shortly after October 8th.

We look forward to seeing you in Trondheim!

Best regards,
Hans and Kristian

For more information, contact Kristian Hassel at

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Curator of Bryophyte and Algae herbarium TRH

SMUTS MEMORIAL BOTANICAL FELLOWSHIP: 2010/11

VALUE UP TO R120 000 PA

Applications are invited from suitably qualified persons for this prestigious Fellowship which commemorates General Smuts' interest in South African Botany.

The object of the Fellowship is to enable a person who has exhibited proficiency in independent research to undertake study and research in systematic botany and geographical distribution of South African flora, these being the branches of Botany in which General Smuts was most keenly interested. The possibility of work on other aspects of the South African flora is not excluded.

The fellowship is open to any person, South African or otherwise, who is capable of carrying out its objective and materially advancing the knowledge of the South African flora. Possession of a PhD degree is a minimum requirement.

The work of the Fellow will be under the general supervision of the Director of Research, South African National Botanical Institute, Kirstenbosch, and the Head of Botany at the University of Cape Town. The Fellow will also be offered the opportunity to participate in the teaching and supervision of senior students in the Botany Department.

The Fellowship will be awarded for one year in the first instance and may be renewed for an additional year subject to satisfactory progress. An extension for a third year will be considered only in exceptional cases.

Applications must include the following:

- Research Proposal.
- The applicant's full curriculum vitae and list of publications.
- Three reports from referees, which must be submitted in sealed envelopes.
- Certified copies of all academic transcripts and degree certificates.

Applications must be submitted to the Head of Department. Information on faculty structure and academic departments may be found on the UCT website at <http://www.uct.ac.za>

All applicants are subject to the policies surrounding the postdoctoral sector at the University of Cape Town.

The closing date for receipt of applications is **29 October 2010**. Please note that late and/or incomplete applications will not be accepted.

The University of Cape Town reserves the right to make no awards at all; to cancel the award if the conditions are not met, and to effect changes to the conditions of award.

Further information is obtainable from: Ms Sandra Smuts, Botany Department, University of Cape Town, Private Bag X3, Rondebosch 7701, South Africa. Email: sandy.smuts@uct.ac.za. Telephone number +27 21 6502438 Fax Number +27 21 6504041.

BRYOLOGY IN NORMANDY (France) – Information requested

Bryological activity has been rather active in Normandy these past years (*see below*: recent literature on Upper Normandy). An important step will be now to establish an up-to-date and verified check-list of Lower Normandy, the richest part of this former French province (diversified geology and some hyper-oceanic spots !), where the late bryologist Alain Lecointe lived until his death in 1998.

■ If you have any relevant new information, or material on uncommon species concerning the French Départements Calvados (14), Manche (50) or Orne (61), please contact Séverine Stauth or Jean Werner.

■ Another smaller project is the mapping of *Sciuro-hypnum flotowianum* (Sendt.) Ignatov & Huttunen in France (including foreign territories closest to France). If you have precise verified data on this continental European moss, at UTM-level, please contact Jean Werner.

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Séverine Stauth
CPIE Cotentin/B. P. 452
F-50430 Lessay
Severine.stauth@cpiecotentin.com

Recent Bryological Literature on Upper Normandy

PREY T. (2010) – Inventaire bryologique de deux marais de la Seine inférieure (Haute-Normandie) : Saint-Sulpice de Grimbouville / Foulbec (27) et le Trait (76). *Bulletin Sciences et Géologie Normandes* (Le Havre) 1: 1-91.

WERNER J. (2006) – La flore bryologique de la région d'Étretat (Pays de Caux, Haute-Normandie). *Bulletin de la Société Géologique de Normandie et des Amis du Muséum du Havre* 93/1 : 15-37.

WERNER J., BARDAT J., VANOT M. et PREY T. (2009) – Check-list des bryophytes (Anthocerotae, Hepaticae, Musci) de Haute-Normandie (France), *Cryptogamie, Bryologie* 30/4 : 457-475.

WERNER J., MAHÉVAS T., PREY T. et VANOT M. (2009) – Les Bryophytes du « Val Églantier » ou « vallon du Vivier » près de Tancarville (Seine-Maritime, Haute-Normandie, France). *Bulletin de la Société Géologique de Normandie et des Amis du Muséum du Havre*. 96 /1 : 149-166.

Free IAB-membership for students

This is just a reminder that students can join the International Association of Bryologists (IAB) free for one year. Full information is on the website <http://www.bryology.org/> under the How to Join button. The new treasurer is Jim Shevock. Send your information to:

Jim Shevock, Research Associate & Fellow, California Academy of Sciences, Botany, 55 Music Concourse Dr., Golden Gate Park, San Francisco, California 94118 USA or email him at jshevock@calacademy.org



Eco-tourism with a Hand Lens in the Miniature Forests of Cape Horn, Chile and The Inauguration of the Cape Horn Field Station, whose research initiatives include priority lines in bryology and lichenology

The **Cape Horn Biosphere Reserve** in southern Chile is home to approximately 5% of the world's bryophyte species, while only composing 0.01% of the earth's land surface. Floristic inventories continue to reveal vast bryophyte and lichen diversity in the region. As a means of communicating this extraordinary biological heritage to the local and global community, the Omora Ethnobotanical Park, as scientific research center for the Cape Horn Biosphere Reserve, has developed an innovative form of eco-tourism guided by the principles of field environmental ethics. This new activity has been dubbed "Eco-tourism with a Hand Lens in the Miniature Forests of Cape Horn". The Omora Park is proud to announce the publication of the first brochure to the Miniature Forests of Cape Horn Interpretive Trail. This brochure will be used to allow visitors to the Miniature Forests to have the opportunity to become acquainted with the great beauty, ecological significance, biocultural value, and diversity of the region's bryophytes and lichens in a fun and approachable way.

For more information or a copy of the brochure please contact: Dr. Francisca Massardo, Director (massardorozzi@yahoo.com), or Yanet Medina, Vice-Director (yanet.a.medina@gmail.com), of the "Ecotourism with a Hand Lens" Project, INNOVA-CORFO-Chile.



Figure 1. The sub-Antarctic (or sub-polar) Magellanic ecoregion, showing the full extent of evergreen rainforests (green) and Magellanic moorland (gray) from Cape Horn to Penas Gulf in Chile. Located on Navarino Island, south of Tierra del Fuego, Omora Ethnobotanical Park launched a bryoflora conservation program with international collaboration in 2000. As the research, education, and conservation center for the Cape Horn Biosphere Reserve, Omora Park serves as a long-term ecological research site of a nascent Chilean Long Term Ecological Research network, supported by the Chilean Institute of Ecology and Biodiversity (IEB; www.ieb-chile.cl; see Rozzi et al. [2006a]).

The Sub-Antarctic Biocultural Conservation Program, led in the

U.S. by the University of North Texas (UNT) and in Chile by the Universidad de Magallanes (UMAG) and the Institute of Ecology and Biodiversity (IEB), in association with the Center for Environmental Philosophy, the Omora Foundation, and the Omora Sub-Antarctic Research Alliance (OSARA), will inaugurate the Cape Horn Field Station, the world's first field research facility dedicated to both ecological sciences and environmental ethics. This alliance has worked for 10 years to create a long-term research, education and conservation program based at the Omora Ethnobotanical Park. The new two and a half-story field station will provide much needed research and educational space that is currently lacking in the Cape Horn Archipelago. Furthermore, bryology and lichenology will be two of the station's priority research areas, including the novel conservation efforts associated with "Eco-tourism with a Hand Lens." This facility will enhance the program's efforts to link the sciences and humanities for interdisciplinary research and to integrate long-term academic efforts with social outcomes.

To allow friends, colleagues and donors the opportunity to see firsthand this innovative program, UNT has organized a

10-day tour of southern Chile preceding the inauguration that will offer a unique opportunity to participate and be guided by the leading researchers working in sub-Antarctic ecosystems. To learn more, visit: <http://call.unt.edu/tourlist> or www.chile.unt.edu, or contact: Dr. Christopher Anderson, Coordinator (christopher.anderson@unt.edu), Sub-Antarctic Biocultural Conservation Program

For more information about the sub-Antarctic region's bryoflora

Bryology: We Need an App for That!

by DB Poli

Smart phones are everywhere these days; Androids, iPhones, Blackberrys, and all of their cousins are becoming the norm in many of our cultures. Downloading documents and programs onto these mobile devices has aided the "technological overload generation" to look up all kinds of material. For example, I have a program that lets me order sushi in proper Japanese!

Everyone has probably experienced the brilliant marketing of Apple Computers with the line, "there's an app for that!" Yet, what I am about to discuss may shock you...it did me.

Due to an IT initiative at Roanoke College, for the past year I have been working with several biologists (representing broad fields across biology) on how to use the iTouch in the classroom. We have found several apps that can be used in introductory courses and in our specialty courses; some apps are more useful than others and it does take some instructor effort to investigate the choices. (if you are interested in learning more about this initiative, please go to the Biology department website at www.roanoke.edu website and click on "iPod app review"). However, Roanoke College is not alone in this venture. In an article on CNN.com titled "The iPad goes to college this fall" (7/27/2010) many colleges and universities are bringing this technology into a pedagogy realm. As I sat assembling a presentation for a conference about technology in the



classroom I realized that what I am going to discuss at that conference is missing for my own professional studies. One major area that is completely missing from app availability for the iPhone and the Android is anything bryologically based! Why?

Bryologists have a lot of information to share with each other and many of us are teachers that are very excited by the world around us. We help each other through listservs and in technique pieces but we do lack resources

that may be most appealing to the youngest generation. Technology is not going to go away, so we should embrace it. Bryophytes are mystical organisms that are usually ignored. Engaging the young biologist is necessary; showing others that bryophytes hold an important stake within our environment is also critical right now. If we don't jump into the technological age, our bryophytes will continue to be ignored at a time when the world needs to learn what they are all about!

I truly believe this is an important area for bryologists to explore, and I have begun to work with a programming professor at Roanoke College to develop a bryophyte glossary and flash card app. I am also working on developing an app to help students with plant evolution. But IAB's biggest

news is that we are going to develop an app for the International Association of Bryologists!! Beyond gaining IAB more exposure, creating this app puts IAB at the forefront of bryological initiatives. Your input is critical for this app development because we want it to represent a tool that will be used by many.

The IAB app will be designed for the Android phone by a collaboration with a Roanoke College class. Programming in this technology is easier than for the iPhone because all of the codes are public and it can be programmed on any computer (rather than only on a Mac); proprietary issues are much easier to manage since anyone

could upload an Android app from a particular website. However, smartphones do not share apps and therefore, similar apps



ANDROID

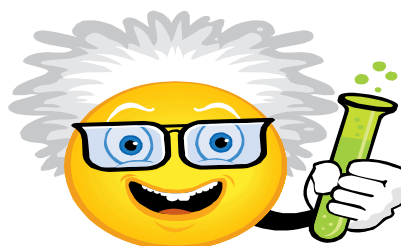
would need to be developed for iPhones!

I will offer my time to help connect people who may want to venture into the world of bryological apps. Please contact me at poli@roanoke.edu if you have ideas, design ability, or just want to learn more. Let's try to make our bryological knowledge available to the masses -- together!

ATTENTION All Bryological Societies...

IAB would like to keep up with all of the Bryological Societies that exist. Please help report your information in *The Bryological Times* by supplying the editors with a contact for your society. Column space is available and we would love to showcase what your group is doing. Report local

meetings, field trips, grants and awards, etc. If you have a BT contact, please have them communicate with DB Poli at poli@roanoke.edu to ensure all contact information is up-to-date. We look forward to hearing from you! Thank you!



...Continued from page 1: Mossin' Annie

This connection is eloquently described in the book, Gathering Moss: A Natural and Cultural History. Dr. Robin Wall-Kimmerer, Syracuse University, captures the elusive quality that compels us to learn not only with our minds but to treasure the spiritual lessons of life gained from mosses. She explains, "I've found mosses to be a vehicle for intimacy with the landscape, like a secret knowledge of the forest." Indeed, as I sit and marvel at moss in the woods or in my own moss garden, my everyday issues fade with the realization of my fleeting life in comparison to the longevity of these miniature plants in the spectrum of time on Planet Earth. It is this spiritual connection that beckons me back again and again to pause and reflect. The purpose of any garden is to lift your spirit and cause your heart to smile. Mosses make my being smile, always!

As I learned more of the science of bryophytes and the extraordinary botanical characteristics that make mosses unique, I began to translate these factors into solutions for environmental concerns for air and water quality. The obsession with grass lawns has contributed significantly to our carbon footprint and compromised the quality of our groundwater. Moss lawns provide an alternative that eliminates the need for chemical additives such as fertilizers, pesticides and herbicides that contribute to this groundwater pollution. Improved air quality can be achieved if you plant mosses, eliminating the need for oil-burning lawnmowers. Did you know that one typical lawnmower running for one hour produces the equivalent carbon footprint of 43 vehicles?

With the recent interest in the cooling benefits of green roofs, bryophytes once again provide solutions. Yet, green roof designers are just beginning to recognize the potential of mosses. Their questions about mosses as viable plant choices indicate the need for more pertinent information and appropriate bryophytes for this application. I am amused when I'm asked if mosses could grow on a green roof since mosses already grow on roofs in my region. The complex systems of layers and structural reinforcement for proposed green roof projects would not be necessary if mosses were the primary plants. The fact that mosses lack roots negates the need for increased soil depths and the correspondingly increased weight loads. To meet anticipated demands from green roofers, moss growers need to be propagating appropriate types and making them available on the market.

Propagation of Mosses for New Green Horticultural Options

Moss gardeners and landscapers want to know which type will grow under what conditions, and most of all, how fast will it spread out in measurable distances in what time frame? Not satisfied with haphazard success, there is a recognized need for more research on growing mosses in landscapes and propagating them in nurseries. With funding from the North Carolina Tobacco Trust Fund and its partners through a Western North Carolina Agricultural Options Grant, this moss advocate will be exploring conditions for propagating bryophytes as a potential revenue-generating crop alternative. In an effort to create some consistency, methodologies are being coordinated with a graduate student, Jill Cooper, The Evergreen State College, Olympia, Washington who is researching green roof applications; and Ann Gordon, The Hillocks, a budding moss grower in Efland, North Carolina. Two of us are certainly not scientists and have no affiliation with an academic institution. Even so, we will strive to collect data using methods that can be replicated and to determine variables that have implications for future scientific research by trained bryologists and professional horticulturists. In the Mountain Moss Nursery study, various bryophytes will be grown in containerized and field production. Mosses that grow the fastest, both sun and shade tolerant types, and that are appropriate for landscaping applications and/or green roofs will be included in the data collection process. Additional variables include substrate used in containers, watering regime and sun exposure to facilitate optimum growth.

We recognize the need for more definitive research beyond the scope of what our studies can assess with our limited resources but we still plan to share what we learn with the academic community and with the general public through educational outreach. Since moss gardening in the West is still in its infancy, and moss myths/misconceptions are prevalent, continued investigation of bryophyte types and their associated nutrient and micronutrient requirements is imperative to determine bryophyte-specific recommendations for attaining desired results for extensive propagation in various settings.

Acquiring Mosses for Gardening

For the environmentally-conscious gardener, mosses make a great sustainable choices for green applications. The first issue for the aspiring moss gardener is to obtain appropriate bryophytes in a responsible manner. Although mosses exist in our national, state and local forests and parks, these areas are off limits. Please do not steal from these public venues which are protected for future generations to enjoy. There are plenty of opportunities to save mosses and other native plants by coordinating rescue operations with land use planners, developers, contractors and property owners. Even in urban areas, mosses can be found around abandoned buildings, parking lots or property designated for residential/commercial property construction. Always ask permission before removing any mosses from areas targeted for destruction. Recently, I rescued *Plagiomnium* from behind the dog pens at the local animal shelter.

...Continued: Mossin' Annie

Of course, if you have bryophytes already growing on your own property, you have your own source. Take a closer look and see what you might find. Relocate mosses from perimeter areas to create a focal feature closer to your home for daily enjoyment.

If you don't wish to gather your own mosses, then you may choose to purchase moss plants locally or on the Internet. Once again, please make sure these mosses have been propagated in nurseries or harvested in an environmentally-responsible manner. In most cases, these mosses will arrive in a dry state (weighs less for shipping) and need to be rehydrated immediately. Another option is to obtain bryophytes available through custom orders with nurseries offering extraordinary specimens, sometimes decades old, and often in sporophytic stages, that are thriving and green upon arrival.

Choosing a Site

If you want to introduce mosses into your landscape, assess locations that will be conducive for different bryophyte types. If you can consult a moss landscape specialist or bryologist, you increase your chances for success. Evaluate sun exposures throughout the day and through the seasons, especially in the early spring when there is no leaf canopy but intense sun. Determine rainfall and supplemental watering needs/surfaces. Analyze soil with attention on the composition and pH level. Most states provide free soil testing through the Department of Agriculture. Consider water features, rock walls and stone patios as well as traditional garden spaces. Please note: Not all mosses need shade and acidic soil; some bryophyte types thrive in direct sun and on calcareous surfaces, even concrete.

Preparing to Plant a Moss Garden

Opinions vary among moss gardeners regarding preparing your site for planting range from simple steps to elaborate methodologies that promote water retention and weed reduction. As with rose gardeners, there are different perspectives on the best moss gardening methods. As my grandmother would say, "Proof is in the pudding." In other words, if your moss garden continues to live season after season and year after year, then you've succeeded. My goal is to share what has worked for me in my own moss garden for the past decade and in moss landscape applications I've installed for others. There is no statistical data to support any one method. Although some of us have succeeded using various methods over a period of time, most scientists would consider our reports more anecdotal than conclusive. First, prepare the soil by removing all leaf litter and debris. If you have ever used bark mulch, I've found it imperative to remove it all until you reach hard-packed soil. In my opinion, bark mulch soaks the moisture out of any mosses trying to grow on it as a substrate. Adjust the pH to the desired level for your mosses. Sulfur or aluminum sulfate can be applied to lower the pH to 5.5 to achieve a more acid base; but, remember that is only for mosses that require higher acidity. Based upon observations, I suspect that some bryophytes may have tolerance for a range of pH acceptability. Usually, there is no need to provide any further soil supplements in the form of fertilizers. Bryophytes require only micro-levels of nutrients and micro-nutrients which are gained from dust particles in the air and rainfall. Specific nutrient requirements have yet to be identified adequately for specific bryophytes. In general, time-released or liquid fertilizers could jeopardize your mosses and should not be applied.

If you wish to modify an existing hardscape, then move your "dirt" around based upon your design plan. Any water drainage ribbons or tubing should be added at this stage. Also, this is the time to add in any planned misting irrigation system. Install any decorative elements such as boulders, benches, fountains or major garden art sculptures prior to planting. If you have a significant weed problem, it could be valuable to use landscape fabric underneath since the rhizoids of mosses will attach to this surface. I have not found it necessary to use this fabric for mosses planted in the shade. However, sun mosses seem to require more weeding and perhaps this groundcover could reduce some maintenance chores. Even so, tiny bryophytes like *Ceratodon* and *Bryums* collect tiny seeds from above and the cloth barrier might not prevent the germination of tiny plants and weeds.

While some moss gardeners recommend the addition of water-absorbing crystals and moisture-wicking substrates, I plant directly on the ground. In a nursery situation, these factors may play a more significant role in optimizing growth. To date, I've found it unnatural and unnecessary to use such labor intensive substrate methods in the landscape.

Planting Your Mosses

Mosses are a natural complement to native plants but they also work well with traditional garden favorites like colorful annuals and perennials. Install these elements first. You may wish to modify the soil for these flowers or ferns. Most often, I use native plants that last into fall and winter months such as "evergreen" ferns like *Polystichum acrostichoides* (Christmas), *Polypodium appalachianum* (Appalachian Polypody), and *Asplenium platyneuron* (Ebony Spleenwort). In creating miniature landscapes, *Goodyera pubescens* (Downy Rattlesnake Plantain), *Chimaphila maculata* (Pipsissewa) and *Iris cristata* (Crested Dwarf Iris) provide additional depth and textures. Moss instead of mulch can be used under shrubs and bushes like azaleas and rhododendrons. In other moss features, daffodils and Stargazer lilies break through the mosses to provide their bright colors and fragrances the

...Continued: Mossin' Annie

to enhance the garden experience.

Most people tend to plant gardens in the spring so that the vascular plants can experience normal growth stages. With mosses, you may plant any season. In fact, since mosses grow in temperatures lower than the typical 65 degrees Fahrenheit, you can plant in the late fall or early winter. In 2008, I installed over 650 sq. ft between Thanksgiving and New Year's Day. A year and a half later, this moss retreat exemplifies that cold weather planting can be successful, even on frozen ground.

In planting pleurocarpus types of bryophytes, I recommend interleaving the edges. This method helps colonies to connect. Please note: It is not necessary for these "carpet" mosses to have original soil attached from the rescue site. By the way, pleurocarpus mosses are called "sheet" mosses by the floraculture industry. Another term for these mosses comes from where they have traditionally been harvested – "log" mosses.

Most acrocarpus "mound" types can be placed directly with any soil or microbial growth that naturally comes attached. Huddle them up closely for moist retention. *Polytrichum commune* colonies have rhizoids that I call "root fak-ers." In my locale, they frequently grow 4-6" deep into clay-based soils.

This is the only type of moss that I actually dig a slight hole or indentation when planting. Other mound mosses like *Dicranum* have surface rhizoids and can be placed by hand without any digging. In the floral industry, *Dicranum* is called "mood" moss.

As I create a moss garden, I select the appropriate bryophytes first. Next, my dynamic design starts to come together as I survey all my individual colony choices. This part of the process is harder to explain because it follows my own spiritual connection with the plants themselves and their natural connection with each other. This creative flow is enhanced by my artistic intuition as well as the drama of contrasting and complementary colors and shapes.

You might moisten the soil before planting. It is desirable for mosses to be wet when planting for pliability. But, most importantly, after planting... WATER and WALK on your mosses. Water thoroughly until mosses are saturated (maximum watering time 5-10 minutes) and then walk barefoot or in flat shoes on your entire area. Repeat this technique several times a day for the first few weeks to help establish the rhizoid connection. While planting, it is okay to sit on freshly planted mosses. You may get a bit wet but they won't mind at all.

Maintaining Your Moss Garden

As a proactive moss gardener, I supplement rainfall whenever the mosses are dry. I am convinced that a supplemental watering regime is valuable in keeping your mosses lush. That guideline does not mean they need to be wet all the time or require wet feet. But, because mosses have no cuticle, they absorb moisture quickly, and conversely, transpire rapidly as well. The best time to water is late afternoon after they have experienced a long, dry, hot day. If I observe dry conditions, I water at any time of the day or night. Unlike vascular plants, my mosses have never "burned" from a high noon watering, nor have they ever gotten "moldy" from watering at night.

Water and walk on your mosses frequently. They rarely require drenching soaks – but rather brief sessions of overhead watering or misting. Utilizing a rainwater harvesting system with a timer is perhaps the best eco-friendly solution. I encourage folks to explore this method of water conservation. If you must use city water, I can testify that I have never experienced negative consequences. Leaf litter and debris should not be allowed to accumulate on your mosses. Although the moisture and nutrients from leaves are somewhat valuable, prolonged coverage will compromise the photosynthesis process. After mosses are established, you should be able to use a leaf blower for this purpose. Sweeping mosses with a broom works. Unless you have a delicate touch, you should avoid any raking. If any moss colonies blow away or become dislodged, just tuck them back in and then... water and walk on them.

Weeds can be minimized prior to the planting stage by "preening" mosses – my term for carefully removing any unwanted grasses or weeds from colonies. Using the landscaper fabric could reduce weeding requirements. Remove weeds by hand periodically. Quarterly weeding is the standard but based on summer conditions, additional weeding could be necessary. "Spot weed killer" chemicals in

diluted solutions have been used successfully without harming mosses. Weeding sun mosses is a chore. Sitting or reclining on a 4" carpet of *Dicranum* and pulling a few stray weeds is a great pleasure in life. Actually, the process of weeding and preening your mosses helps establish that intangible connection and provides hours of fascination with the minute details and transitions of bryophytes. It continues to delight me to observe mosses up close and personal with a hand lens that I always wear around my neck on a silver chain.

To protect mosses from critter digging damage or as a method for leaf removal, mesh nets may be placed on top of moss expanses. Amazingly, these nets seem to disappear in the moss landscape when viewed from a distance. Squirrels and other small animals like skunks or raccoons aren't near as inclined to walk on these thread-like grids. When leaves accumulate in the fall or dead oak blossoms create a brown blanket in the spring, these nets, although a bit labor intensive, still make the job of removal easier. Personally, I don't use any netting or tulle fabric method since I don't want this unnatural netting impeding my natural connection in my moss garden.

Be prepared to repair or fix your mosses back if there has been damage due to the weather or because of critters digging, including your pet dog. My moss friend, Nori Burnet from Richmond, recently commented that, "A moss garden is dynamic, changing from season to season and over the years." Natural transitions, growth patterns, and other variables out of your control will set the stage for a new "mossy" perspective. Once again, I'll emphasize watering and walking on mosses as a consistent method for success. Even if it rains the day before, you may need to water the following day, especially in hotter months when this regime is more critical. The mosses won't die if you miss a few days but they will certainly thrive if kept at peak hydration levels. In fall and winter months, mosses don't transpire as quickly and so supplemental watering can be scaled back. In colder climates with winter snows, please be aware that even "wet" snow is not as "wet" as rain.

Although I live in the mountains, this is the first season in decades where the snow stayed on the ground for months. Usually in this region, the snow melts from spurts of warmer temperatures. After several months of being covered with 6-12" of snow, the mosses were actually quite dry and required far more attention and care than normal for previous springs. Some seemed to suffer temporarily (*Leucobryum* a. and g.) while others (*Bartramia pomiformis*, *Dicranum scoparium*, *Heterophyllum affine*) were brilliant greens from the moment they were revealed from their melted snow blanket. Winter growth was quite apparent in my moss spiral with an invasion of new *Thuidium* plants present in the *Leucobryum* bands, but for some reason, not the *Ceratodon*.

Year-round Green... Almost!

While mosses provide a year-round green appeal, there will be periodic displays of sporophytic color that offer incredible plays of light and dimension. Bryophytes don't follow typical seasons, and therefore, the spectacular sporophytic parade continues throughout the year. In fact, these phases are bryophyte specific, and sometimes, colony specific. There are exceptions to my own "year-round green" claim. While usually green, some mosses, such as *Thuidium* and *Hypnum*, go through a golden stage. Other bryophytes go through asexual reproductive phases or dormant periods. While most stages are still appealing, sometimes their appearance may cause concern. Earlier this spring, I observed *Leucobryum albidum* and *L. glaucum* in five different states of transition and they weren't "green." By May, these colonies are recovering with brilliant new "green-ness." Usually, if you are patient, and nurture them along, the mosses will once again turn green sporting new growth.

Moving beyond the natural occurrence of bryophytes in the landscape to deliberately introducing mosses as a viable horticultural option, it should be recognized that moss gardening is still more of an art than a science at this point. Successes (or failures) could be due to a variety of factors. As further research is conducted with controlled variables for specific bryophytes, we will be able to use more systematic processes with consistent results. To conclude, I hope you, too, will consider the joys and advantages of eco-friendly mosses in your own garden. If you use the right bryophyte for the right place; provide proper maintenance by consistent supplemental watering, leaf removal and periodic weeding; then you can promote long-term benefits to our environment and provide a vehicle to lift your own spirit through mosses.

Author's Bio

Annie Martin is owner of Mountain Moss Enterprises located in Pisgah Forest, NC. Known as "Mossin' Annie," she offers site consultations and innovative moss landscape design services. "Go Green With Moss" workshops and educational programs are available to interested groups. Please visit www.mountainmoss.com; follow her www.mountainmoss.com/blog; and join her Go Green With Moss group on Facebook. Exceptional moss plant specimens from her Mountain Moss Nursery are available upon request. To contact her directly, call 828-577-1321 or 828-223-MOSS (6677) or send an email to: mossinannie@gmail.com.

Tips, Tools, and Techniques: Making Slide Mounts with Glycerine

by David Wagner

In general, when people speak of making slides permanent they expect the end product to be durable and resistant to being tossed around, like old fashioned balsam mounts or ones made with contemporary synthetic resin equivalents like Permount. To make these mounts it is necessary to dehydrate the specimen in an alcohol series until it may be infiltrated with an organic solvent like xylene that is miscible with the resin. This is not a reasonable method for dealing with preserving wet mounts of small objects. And it means working with xylene, far more toxic than we thought 40 years ago.

I make slides permanent using plain glycerine. The mounts are relatively fragile and must be stored flat but are nevertheless permanent in the sense that the material is preserved indefinitely without significant deterioration of the specimen. I have used Hoyer's in the past but find that it is far too likely to distort specimens by drying and/or crystallization. Bryological material in Hoyer's, especially thin cell walled liverworts, is cleared to the point of near transparency and thus becomes nearly invisible.

If I have a slide of leaves or leaf sections I want to preserve, or even a whole mount of a small plant, I simply put a line of glycerine across one side of the coverslip and set it aside overnight. (Label the slide immediately!) As the water evaporates from one side of the coverslip, the glycerine is drawn in and gradually infiltrates the specimen. No special technique is required although the process may be speeded up if the slide is put on a warming tray.

Exactly how much glycerine to apply must be determined by practice and varies depending on the thickness of the object under the coverslip. A single drop is enough for a thin mount consisting mainly of leaf sections. It is important to use enough glycerine at the outset because if there is not enough, air will be drawn under the coverslip as the last of the water evaporates. If more glycerine is added later, bubbles are likely to form which are nearly impossible to eliminate. For this reason I tend to apply glycerine generously at the outset. After the slide is completely infiltrated with glycerine (overnight or longer) if I see there is an excess of glycerine I blot it with little strips (5 mm X 20 mm) of tissue paper. For blotting I prefer strips of toilet paper or something like Kleenex tissue because it absorbs much better than Kimwipes or other lint free industrial wipes. The lint free wipes are critical for cleaning slides and coverslips but just do not wick the glycerine as fast. I keep wicking, using as many strips as needed, until the glycerine just starts to draw back from the edge of the coverslip.

At this point the preparation is as permanent as it will ever be but it is not very robust. The coverslip is easily dislodged as it is floating on a film of glycerine. The preparation can be made quite durable by painting a strip of clear fingernail polish on the two sides of the coverslip facing the length of the slide. I spread it well away from the edge of the coverslip to give the polish traction. It dries quickly and then is really quite durable. I do not completely ring the slides with nail polish; the sides are left open in case some of the glycerine leaks out and needs to be replaced.

The nail polish will not stick to a slide where there is a film of glycerine so it may be necessary to carefully clean up the slide with a cotton swab moistened with alcohol or wetting agent.

Speaking of leaking: glycerine has a nasty habit of creeping out from under coverslips if the edge of the coverslip is too close to the edge of the slide. This happens fast when two slides come in contact side to side. If the coverslip is close, the glycerine will creep to the edge of the slide and then capillarity will pull it down between the slides and under them. It takes only a few weeks (days?) for all the glycerine to be sucked out of a poor mount. The critical point is that the coverslips must be perfectly centered on the slide before the nail polish is painted on. It is best to center the coverslip right after the glycerine has been applied to the coverslip, before it is set aside for drying and infiltration. Remember that the nail polish must not be applied until the glycerine mount has dried thoroughly, at least overnight.

The prepared slides are stored on trays the size of plant press boards so they fit in a herbarium cabinet neatly. Three rows fit in nicely lengthwise down the tray. I made some very nice ones from foam core board: lightweight but sturdy. Zander just uses press cardboards.

I inadvertently tested the durability of this kind of preparation when I dropped a tray of slides in a parking lot. The tray was sandwiched between cardboard press boards held together with rubber bands. When the bundle hit the pavement upside down, only one slide was thrown out and broken. The rest survived unscathed even though tumbled around.

Another advantage of having the coverslip tacked down is that it is much easier to clean. Unless stored under immaculate conditions, dust will accumulate on the preparation after years of storage. I clean the coverslip with a cotton swab (like a Q-tip) moistened with denatured alcohol, being careful to wipe lengthwise and avoiding the open edges of the mount.

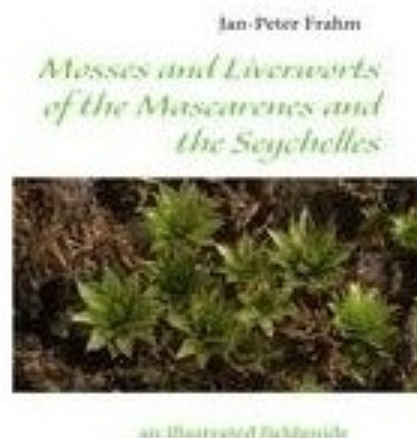
One final note on dealing with slides that get damaged. If the glycerine leaks out or bubbles form that inhibit observation, glycerine mounts can be rehabilitated with fairly high success rates. Apply Pohlstoffe (water with good wetting agent) around the open edges of the coverslip. It will gradually loosen the coverslip so it can be pried off carefully with needle pointed forceps. If nail polish had been used, it will usually come off with the coverslip and can be easily broken off. If left on the slide, the old nail polish can be scraped away. If all the material stays on the slide, a new coverslip can be used. If it appears critical material is stuck to the coverslip, it will be wise to reapply the same coverslip. Simply flood the surface of the mount area with Pohlstoffe and lower the coverslip gently so that no bubbles are captured. Reapply the appropriate amount of glycerine to the edge of the coverslip and set aside to dry and infiltrate, then continue treating as with a fresh mount.

Tips, Tool, Techniques continued...

I should mentioned that the method I use is very similar to that promoted by Zander (<http://www.mobot.org/plantscience/ResBot/Repr/Zander-MountGlycerol1997.pdf>) except he likes solidifying the glycerine. His glycerine jelly method will produce more durable mounts but there is a much more elaborate protocol involved. The quality of glycerine jelly preparations is no better than that obtained with pure glycerine. The main reason I do not use glycerine jelly is that it involves always starting by placing specimens in glycerine. I do a lot of identification work that involves making many wet mounts, most of which are temporary. After observation I discard the specimen and wash off coverslip and slide to use over again. Having glycerine on the slides and coverslips is a pain in the neck to clean up, so I like to stick to water mounts. When I do make a prep I want to keep, it is easily done and I can go on with my work in a minute, after applying the drop of glycerine and labeling the slide I want to keep. I have been using this method for over 30 years and am as happy with it now as when I began.

New Book: Mosses and Liverworts of the Mascarenes and the Seychelles: an illustrated fieldguide

This book is by Jan-Peter Frahm is a good sized book for field use and for work in the laboratory (22x17x1 cm, 144 pp on 200g glossy paper with 399 photographs of 171 species). The book is reasonably priced at Euro 36,90. You can ordered your copy from amazon.de, also directly from the publisher (bod.de), booksellers or mail order companies (kleinsteuber-books@kabelbw.de). The book is printed "on demand" that means the delivery will take 9-14 days.. ISBN-10: 3842300247 ISBN-13: 978-3842300248



Country Contacts Help: Speak up for your part of the World

IAB and the Bryological Times is asking all of you to take on a leadership role to help all bryologists! Help us learn what the world's bryologists are doing by helping to communicate your country's news to DorothyBelle Poli at poli@roanoke.edu. DB is looking to learn which countries are still not represented on our back page and then would like to find people to help with those bryological "holes." Volunteer to help fill-in the world! If your

country is not listed on our list, please DorothyBelle know. If you would be interested in being your country's contact or would like to find a replacement, again, please contact DorothyBelle today!



My-Plant.org - A new social network



Check out the latest way to communicate with the plant community : My-Plant.org. This is a facebook-like social network that has been designed and implemented by the iPlant Collaboration. Signing up is FREE and connects you to people with similar plant interests because you pick the families you want to hear about.

Field Trip at Leigongshan Nature Reserve

By Zhang Zhaohui

The Field Trip for the 2010 National Symposium of the Bryological Society of China was carried out from 25 to 26 August at Mt. Leigongshan Nature Reserve in Guizhou province. 35 bryologists attended the field excursion. Following is some information about our field trip:

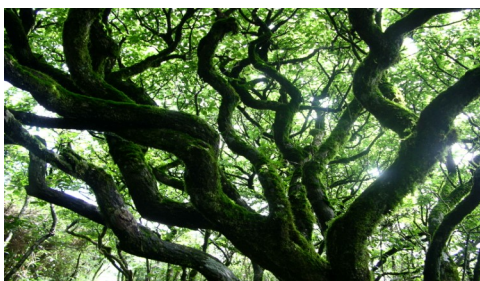
On August 25 : We visited to the Langde Miao Ethnic Minority Village.

About 1:30 pm on August 25, 2010, we left Guiyang city to Leishan County. On the way, we visited the Langde Miao Ethnic Minority Village at 4:30 pm.

Langde Miao Ethnic Minority Village is located in the southeastern area of Kaili, it is a must see place for visitors to savor the unique Miao ethnic culture. As one of the most fascinating ethnic minorities in China, groups of Miao people are everywhere in south-west China, mostly in Guizhou Province. Miao ethnic minority is both mysterious and exciting. But, if you really want to experience the authentic ethnic cultures, go visit Langde Miao Ethnic Minority Village in Kaili. About 50 kilometers north of Kaili, is no doubt a beckoning tourist village. The Miao people are identified by their dialect, dress, location and other customs. In dress we have Long Skirt Miao, Short Skirt Miao, Black Miao, Flowery Miao and Long Horned Miao. By location there are River Miao and Mountain Miao. The villagers in Langde wear long skirts, hence they are "Long Skirt Miao". The Miao style houses "Diaojiaolou" and its featured and creative festivals will leave you spell bound. Around 500 villagers in ten families, the Langde Miao Village is considered small. Entering the village, visitors would find themselves literarily immersed in works of art.

Here we received a special welcoming ceremony from the hospitable Miao people. During the ceremony, a series of ethnic customs such as Miao dancing and folk musical instruments performance were presented whilst we were invited to dance and drink with the local people. In addition, the Miao style houses namely 'Diaojiaolou' represents the typical feature of Miao's architecture. This night about 9 :00 pm, we

arrived and stayed at Leishan County.



On August 26 : We visited at Mt. Leigongshan Nature Reserve.

About 6:30 pm on August 26, 2010, we left Leishan County to Mt. Leigongshan. Situated in the east part of Leishan county, the Mt. Leigongshan is not only a national forest park, but also a national level natural reserve, with 71mu virgin forest. Our field excursion include four parts: the main peak of Miao Ling (altitude 2178.8 m), Moss coppice, subtropical valley and Xiangshuiyan Waterfall. Located 15 kilometers (nine miles) east of Kaili city, Mt. Leigongshan is the most intriguing scenic area of the Miaoling Mountains. It gained its reputation as a National Nature Reserve because of its abundance of overlapping mountain ridges, flourishing verdant plants, valuable and rare mosses, and historical war remains. It is the highest peak in the mountain ranges of Qiandongnan (southeast Guizhou Province), so Leigongshan is rumored as the place where the God of Thunder ("Leigong" in Chinese) lives. Every summer, thunderstorms can be heard resounding on the mountains,

which is why people called it Leigongshan (or Leigong Mountain).

The top of Leigongshan Nature Reserve can be reached at a 2178.8 m. (7148.2-foot), where we enjoyed the sunrise, admire the sunset, and also have a panoramic view of the Miaoling Mountains. At the top of the mountain, with numerous special bryophytes around the virgin forest, we definitely felt in awe of nature. A large number of rare liverworts and mosses among the virgin forests may make one feel one has really returned to nature. The climate on Leigongshan is typically rainy and wet, and changes constantly, making summer as comfortable as spring and autumn. That makes it an ideal summer resort for visitors.

During the field excursion, participants know more bryophytes of Leigongshan Nature Reserve and experience exchange among researchers, teachers and students in Field Bryology, which provide the participants with opportunities for collaboration and networking among Chinese Universities and other scientific institutions to promote research and developing technologies in biodiversity and conservation of bryophytes in China.

This night about 5 :00 pm, we left Mt. Leigongshan Nature Reserve to Guiyang city.



News from Australia

by Rod Seppelt

Several years ago, the herbarium of the School of Biological Sciences at Macquarie University in Sydney received a formal name: The A.J. Downing Herbarium. This was in recognition of the many years of incredible service Alison Downing, a early retiring Senior Technician at the University, had given to the School of Biological Sciences in a multitude of ways. Alison completed a Master of Science degree on Karst Bryophytes in Australia while performing all her other duties. Although retired, Alison is still very active at the University, and has been very much involved in setting up a major Arboretum project, teaching, organizing practical classes, managing the herbarium, working with Chinese colleagues in Mongolia, and a variety of other projects. Just recently, Alison sought to

have the Herbarium officially registered. This has now been accomplished and the herbarium has been assigned the official acronym MQU.

In Melbourne, Helen Jolley is well into her PhD studies on Pottiaceae in Australia. She recently spent time in Spain with Maria Cano and others, learning the finer points of dry land Pottiaceae problems. Helen Ramsay and Rod Seppelt are trying to make sense of *Trematodon* for the Flora of Australia. David Meagher, apart from his interest in sorting out the roots of bryophyte names, has completed his Masters degree studies on *Bazzania* and is now well underway on a study comparing the bryophyte floras of a series of islands to the north of New Zealand.

Jon Shaw, Eric Karlin and Rod Seppelt have been trying to come to terms with

the Australian *Sphagnum* flora and, particularly from Jon's laboratory, investigate the molecular placement in the Sphagnopsid tree of life of *Ambuchanania*.

Chris Cargill, in Canberra, continues her work on the hornworts. Recently, Jeff Duckett visited Australia as part of his studies on the molecular biology of mycorrhizal associates of liverworts, spending time in Tasmania, Victoria, Canberra and New Zealand, where he was accompanied by Chris.

In New Zealand, Jessica Beever, who recently lost her husband, a mycologist but known to many in the bryological world, continues her work on Pottiaceae for the New Zealand Flora. The painstaking work of the Flora is being undertaken by Allan Fife assisted by Jessica.

Recent Bryological Activities in Bolivia by Steve Churchill

This commentary provides an update of our bryological activities in Bolivia since mid 2007 (Churchill 2007). During this period much has been accomplished with regard to fieldwork, continued infrastructural development, student and coworker activities, collaborator efforts, and dissemination of information both in the form of a new web page and publications.

Fieldwork and collections: Bryophyte collections were made from more than 300 localities in the nine Bolivian political departments encompassing all of the 12 ecoregions. More than 20 students and staff have contributed to the inventory of bryophytes. During this period about 7000 specimens were collected. All original collections were retained in one of four Bolivian herbaria (BOLV, HSB, LPB, USZ), the first duplicates set is deposited with the Missouri Botanical Garden (MO). All identified collections were databased in Tropicos system (<http://www.tropicos.org/>) via the Internet from Bolivia; at present there are ca. 16,500 collections available to the scientific community. Additional fieldwork was conducted by three bryological collaborators. Maria Cano and Juan Jiménez from MUB (Spain) focused their collecting in 2007 on the largest Bolivian moss family, the Pottiaceae, resulting in ca. 550 specimens from six departments (Cano et al. 2008a). Denise Costa from Rio de Janeiro (RB), specializing in hepatics with emphasis on the genus *Metzgeria*, conducted field work in 2007 in the Chapare region of Cochabamba resulting in ca. 200 collections. Results of the fieldwork included for the mosses 22 new country records, 12 new synonyms and three new combinations (Cano et al. 2008b, Churchill et al. 2008, 2009); 19 hepatics were also new country re-

cords (Churchill et al. 2008, 2009).

Infrastructural Assistance: The project continued to contribute to the infrastructural development with regard to bryophytes for the four collaborating Bolivian institutions: Cochabamba (BOLV), La Paz (LPB), Santa Cruz (USZ) and Sucre (HSB). This included the basics required for field work (all), herbaria supplies (all), herbarium cases (all), computers and printers (LPB, USZ). Further literature was provided to the four institutional libraries; this included additional general texts on bryophytes, neotropical floras, reprints and photocopies.

Personal: Project personal at the National Herbarium in La Paz included Claudia Aldana and Ninel Sanjines. Both were involved with the coordination and administrative activities with regard to the LPB bryophyte herbarium. Through their efforts the bryophyte herbarium, the largest in the country with nearly 17,000 collections, has been repacked, organized and databased. Both conducted fieldwork in areas previously poorly known in the country. Claudia collected in mid to high montane of La Paz and in the dry and semi-dry puna of Oruro. Ninel collected in the dry and semi-dry puna of Potosí and the Chiquitano region of the Serranías de Santiago de Chiquitos in Santa Cruz. Eliana Calzadilla, associated with the Noel Kempff Mercado Natural History Museum (USZ) in Santa Cruz, has been responsible for the preparation of illustrations and graphics; she also has conducted fieldwork with emphasis on photographing bryophytes and habitats. (go to p. 22)

Bryological Theses 23

by Bill Buck

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As reported in a previous issue of The Bryological Times (99: 17, 1999), the International Association of Bryologists has decided to begin a repository of bryological theses. These theses are being housed in the Library of The New York Botanical Garden. They are available via interlibrary loan. The NYBG Library online catalog (CATALPA) may be viewed at: <http://opac.nybg.org/screens/opacmenu.html>. As theses arrive, bibliographic data and a brief synopsis will be published in this column (see examples below). Bryological theses for any degree, covering any aspect of bryology, in any language, will be included. Please send theses to Bill Buck at the address above. Please refer to the preliminary notice (cited above) for information on financial assistance from IAB for reproduction of theses. The current IAB Treasurer is Jim Shevock (jshevock@calacademy.org).

Ah-Peng, Claudine. 2007. Diversité, distribution et biogéographie des bryophytes des coulées de laves du Piton de la Fournaise (La Réunion). Ph.D. these, Université de La Réunion. xvi + 420 pp. In French with English abstract (on cover 4). Address of author: Faculté des Sciences et Technologies, Université de La Réunion, 15 avenue René Cassin – BP 7151, 97715 Saint-Denis messag cedex 9. E-mail: claudine.ahpeng@univ-reunion.fr.

This doctoral thesis presents data on the measurement and explanation of the diversity of bryophyte communities at different scales on the lava flows of the Piton de la Fournaise. The results confirm that bryophytes represent a major compartment of the biodiversity of Réunion with 753 recorded species. During this 3-year study 100 new records for the island were discovered as well as one species new for science, to be described as *Fissidens ah-pengae* Brugg.-Nann. The natural experimental study site of the lava flows were taken advantage of to study the bryophyte vegetation dynamic and to underline the high bryophyte species diversity along a chronosequence of six lava flows and along an altitudinal gradient on a 1986 lava flow. The diversity is dominated by Lejeuneaceae. Additionally, spatial distribution of bryophytes at a fine scale along these two gradients highlights a turn over of microhabitats and their associated bryoflora. Special attention is paid to the pre-dominant role of the presence and availability of these microhabitats in the structuring of bryophyte communities; 26 bryophyte communities are characterized on the lava flows. The biogeographical pattern of the species on lava flows mainly reflects an African origin, followed by species with a broader distribution.

Barón López, Andrés Felipe. 2006. Aspectos fisiológicos de la

tolerancia a la desecación en *Racomitrium crispipilum* (Grimmiaceae) durante la época seca en el páramo de Chingaza, Colombia. B.Sc. (licenciado) thesis, Universidad Nacional de Colombia, Bogotá. 26 pp. In Spanish. Address of author: Departamento de Biología, Universidad Nacional de Colombia, Bogotá, Colombia. E-mail: andres_baron@hotmail.com.

This baccalaureate thesis examined desiccation tolerance in *Racomitrium crispipilum* in a páramo in the Cordillera Oriental of Colombia. The moss could lose more than 80% of its wet weight without losing the capacity to synthesize proteins during the period of rehydration. It was indicated that proline helps to counteract the effects of desiccation and low temperatures. The results reported in this study present evidence for the first time that this species has the ability to elevate the activities of catalase and peroxidase in response to conditions of water stress.

Benavides Duue, Juan Carlos. 2007. Competitive ability of an epilithic moss, *Thuidium tomentosum* Schimp., under different light treatments in a subtropical lower montane forest in Puerto Rico. M.S. thesis, University of Puerto Rico, Mayagüez, PR. ix + 40 pp. In English with Spanish abstract. Address of author: unknown.

This master's thesis investigated the competitive ability of *Thuidium tomentosum*, as well as the importance of its flagelliform branches and the competitive hierarchy with two epilithic bryophytes, *Ceratolejeunea cornuta* and *Leucoloma cruegerianum*. Relative growth rate of *T. tomentosum* was compared with these taxa at three levels of light and two clipping levels (with and without flagelliform branches) during a 9-month study in secondary forests in Ciales municipality in Puerto Rico. The combination of *T. tomentosum* with only one of the other species showed an effect coherent with the resource competition hypothesis, but the combination of the three species together showed a positive interaction coherent with the facilitation hypothesis. Light intensity modified the competitive ability of *T. tomentosum* with higher growth rates under full and intermediate light than in complete shade. The flagelliform branches have a role in the lateral expansion of *T. tomentosum*, but did not enhance its competitive ability. Changes in the competitive hierarchies across environmental gradients are a new approach to explain the coexistence of numerous bryophyte species in tropical mountains. The thesis is available online at <http://grad.uprm.edu/tesis/benavidesduque.pdf>.

Fuselier, Linda Catherine. 2004. Maintenance of sexually dimorphic patterns of growth and reproduction in *Marchantia inflexa*. Ph.D. dissertation, University of Kentucky, Lexington, KY. X + 200 pp. In English. Address of author: King Hall, Biology Department, Minnesota State University at Moorhead, Moorhead, MN 56563. E-mail: fuselier@mnstate.edu.

Bryological Theses (continued)

This doctoral dissertation examined the roles of natural selection in maintaining sexual dimorphism in the context of impacts on bryophyte population sex ratios, using *Marchantia inflexa* as a model system. Included is an assessment of among-population variation in habitat use by the sexes, comparison of phenotypes between single-sex and both-sex populations, a field study of natural selection, and a comparison of the influence of selection on asexual and sexual fitness components. The sexes of *M. inflexa* were sexually dimorphic in investment in growth, asexual and sexual reproduction. The sexes were spatially separated in populations, but the sexes overlapped in habitat use. Populations differed in growth, asexual reproduction rates, degrees of sexual dimorphism and strength of among-trait correlations. Plants from single-sex and both-sex populations differed in investment in growth and asexual reproduction, but the two population types showed the same degree of sexual dimorphism. Thus, local environment may be more influential than the presence of the opposite sex in maintaining sexual dimorphism. Selection on sexually dimorphic traits was both sex-specific and environmentally dependent. Between-sex correlations were not significant in the greenhouse but were significant in the field. Thus, evolution and expression of sexual dimorphism in nature may be constrained by among-trait and between-sex correlations. Additionally, females incurred a cost of plasticity that males did not. Because there was a negative trade-off between sexual and asexual fitness, overall lifetime selection may result in a different picture of how the sexes experience selection. The combination of sex-specific and environment-dependent selection, and sex-specific costs to plasticity may not only maintain sexually dimorphic traits but also ensure the persistence of both sexes in a population. The dissertation is available online at <http://lib.uky.edu/ETD/ukybiol2004d00154/fuselier.pdf>.

Jerez Jaimes, Javier H. 2003. Composición de tardígrados en el musgo *Calymperes palisotii* Schwaegrichen sobre seis forófitos (árboles) en la Universidad de Puerto Rico, Recinto de Mayagüez. M.S. thesis, Universidad de Puerto Rico, Mayagüez, PR. xiii + 99 pp. In Spanish with English abstract. Address of author: unknown.

This master's thesis examined the influence of the phorophyte (tree) on the composition of the tardigrade communities on *Calymperes palisotii* at the Mayagüez campus of the University of Puerto Rico from February to May of 2003, spanning both the dry and rainy seasons. Two trees of each of the six phorophytes were included. Seven species of tardigrades were found, three of which are new to Puerto Rico. The ecology of the tardigrades was studied using analysis of density, distribution, species richness and diversity. Tardigrade communities from *Mangifera indica* (mango) and *Swietenia macrophylla* (mahogany) presented the highest species richness and diversity. The thesis is available online at <http://grad.uprm.edu/tesis/jerezjaimes.pdf>.

Kreier, Hans-Peter. 2003. Die Pilz-Assoziationen der Aneuraceae (Marchantiophyta). Diplomarbeit, Fakultät für Biologie, Eberhard-Karls Universität, Tübingen, Germany. [iii] 34 pp. In German. E-mail of author: hkreier@gwdg.de.

The results of this study confirm that *Riccardia*, like *Cryptothallus* and *Aneura* are infected with species of *Tulasnella*. Finding the same fungi in *Lobatiriccardia* would be an indication that the Aneuraceae have a more isolate position among the Metzgeriales than previously thought. Segregating the family as a distinct order

could be considered. For a better understanding of the mycorrhizae in the Aneuraceae a critical study of the genus *Tulasnella* is imperative. The identification of the mycorrhizal species would facilitate the understanding of the development of the Aneuraceae-mycorrhizal association and maybe show connection to the mycorrhizae in orchids. If orchids and the Aneuraceae have the same mycorrhizal fungi, then it should be possible to inoculate orchids by using Aneuraceae. An earlier study showed inoculation of vascular plants with mycorrhizae from hepatics. Should one find liverworts that share mycorrhizal fungi with trees (like *Cryptothallus* and *Betula* or *Pinus*) then it may be possible to promote the regeneration of forests by dispersing liverworts. Given the high capacity to regenerate vegetatively and the fast growth of liverworts, this would be a cheap and effective mean of inoculation. A more detailed study of the life cycle of *Tulasnella* species would also be informative. Species of *Tulasnella* decomposing wood may, if they develop mycorrhizae, transmit compounds released from the wood to the liverwort. The species *Riccardia palmata* and *R. latifrons* which were included in this study grew on rotten wood and were well infected by mycorrhizal fungi. There are open questions even with *Riccardia*. For this study no seasonal variation could be included since all local species were gathered in the fall. However, seasonal variation is known to occur in particular with regard to the infection by endophytes. By culturing hepatics with or without the fungus one could find out the extent to which the fungus promotes growth of the plants. Such an experiment remains to be done in *Aneura*; so far the fungi have only been grown in culture. Finally, the phenomenon of rhizoidal bridges in a tropical *Aneura* was discovered.

Kyrkjeeide, Magni Olsen. 2010. Phylogeography of the threatened peat moss *Sphagnum wulfianum* Girg. with emphasis on northern Europe. M.S. thesis, Norwegian University of Science and Technology, Trondheim. ii + 32 pp. In English. Address of author: Seksjon for Naturhistorie, NTNU Vitenskapsmuseet, 7012 Trondheim, Norway. E-mail: magni.kyrkjeeide@gmail.com.

This master's thesis examines species distribution in northern Europe as influenced by the last glaciation. An increasing number of phylogeographic studies reveal possible glacial refugia and colonization patterns for different species, however, little is known of the migration routes of mosses. The phylogeography of *Sphagnum wulfianum* has been studied to determine how genetic variation is distributed in Europe and possible immigrations routes into Scandinavia after the last glaciation. Genetic diversity statistics show that genetic variation in microsatellite loci is extremely low ($He = 0.028 \pm 0.09$) in this species and that populations are highly differentiated ($FST = 0.74$). Low genetic variation may be due to one or several bottlenecks in the past and/or colonization of northern Europe by repeated founder events. Methods based on Bayesian approaches (STRUCTURE) and coalescence theory (IM and MIGRATE) show that there are two main genetic clusters, and that these diverged recently (1812 years ago). There may have been two immigration routes into Scandinavia after the last glaciation, one from the southeast across the Baltic Sea and one from east through Russia and Finland.

Bryological Theses (continued)

Merced Alejandro, Amelia. 2004. A heterochronic sequence for the development of paraphyses in *Neckeropsis* Schimp. (Bryophyta: Neckeraceae). M.S. thesis, University of Puerto Rico, Mayagüez, PR. x + 72 pp. In English with Spanish abstract. Address of author: Herbarium, Biology Department, University of Puerto Rico-Río Piedras Campus, P.O. Box 23360, San Juan, Puerto Rico 00931-3360. E-mail: ameliamerced@yahoo.com.

This master's thesis examines the development of the leaf-like paraphyses, often referred to as ramenta, in *Neckeropsis*, with special emphasis on *N. disticha*. These structures have been variously interpreted as modified perichaetial leaves or multiseriate paraphyses. Using light microscopy and embedding and sectioning, the development of the ramenta is studied. Transitions between uniseriate and multiseriate paraphyses were documented at different times in the development of the fertilized branch. It is shown that the ramenta truly are paraphyses that develop in a heterochronic sequence similar to the heteroblastic sequence in leaf development. The thesis is available online at <http://grad.uprm.edu/tesis/mercedalejandro.pdf>.

Murphy, Susan Ann. 1988. Development of the peristome of *Timmia megapolitana* Hedw. M.S. thesis, University of Iowa, Iowa City. xi + 153 pp. In English. Address of author: 2549 Sunnyside St., Sarasota, FL 34239, U.S.A. E-mail: c/o bholst@selby.org.

This master's thesis examines the development of the peristome in the sporophyte of *Timmia megapolitana*. The peristomial formula is 4:2:8. After overwintering, the peristome teeth are formed as a result of thickening of certain cell walls and the subsequent dissolution of unthickened cell walls. Massive amounts of secondary wall material are deposited on the inner periclinal walls of the OPL (Outer Peristomial Layer), on the outer periclinal and portions of transverse walls of the PPL (Primary PL), and on the outer periclinal walls of the IPL (Inner PL). Thus, the exostome is composed of primary and secondary deposits, and the middle lamellae of the contiguous periclinal walls of the PPL and the OPL, while the endostome is composed mainly of primary and localized secondary deposits on the inner periclinal walls of the PPL, primary and secondary deposits of the outer periclinal walls of the IPL and the middle lamella between these two layers. Although the endostomial processes of *Timmia* usually have been termed "cilia," evolutionarily they may represent divided segments, or an increase in the number of cilia in a typical bryaceous endostome. Uniformity of structure and the presence of appendiculations support the hypothesis of a proliferation of cilia. Aberrations in divisions between some of the processes suggest that these are divided segments. Analyses of the sequence of anticlinal divisions in the IPL should clarify this question. In the lower half of the peristomial region, deposition of a light-staining layer, possibly of a suberin-like substance, on the inner and outer periclinal calls, as well as portions of the transverse walls of the PPL, is documented.

Narváez-Parra, Eliana Ximena. 2003. Brioflora sobre taludes del transecto Mayagüez-Maricao (Puerto Rico). M.S. thesis, Universidad de Puerto Rico, Mayagüez, PR. xii + 115 pp. In Spanish with English abstract. Address of author: unknown.

This master's thesis examined the bryoflora on road-banks along a transect from Mayagüez to Maricao, Puerto Rico, that ranges from 15 m to 472 m. An ecological inventory was carried out at five sampling stations along the transect from February to April 2003. In May 2003 a floristic inventory was conducted at 13 sampling stations along the transect. Analysis of similarity among the stations, variance, distribution and association among species were analyzed. *Dicranella hilariana*, *Fossombronia brasiliensis*, *Lejeunea cladogyna* and *Philonotis uncinata* were the most frequent species. The thesis is available online at <http://grad.uprm.edu/tesis/narvaezparra.pdf>.

Rams Sánchez, Susana. 2007. Estudios briológicos sobre flora, vegetación, taxonomía y conservación en Sierra Nevada (Andalucía, S de España). Ph.D. thesis, Universidad de Murcia, Spain. [xv] 476 pp. In Spanish. Address of author: Universidad de Murcia, Facultad de Biología, Departamento de Biología Vegetal, Campus de Espinardo, 30100-Murcia, Spain. E-mail: rams@um.es.

This doctoral thesis deals with the whole massif of the Spanish Sierra Nevada and all kind of habitats for bryophytes present in it. A total area of 2200 km² were covered with 160 ruled squares of 1 km², scattered through the territory. The work consists of four large units: flora, vegetation, taxonomy and conservation. A study of the bryoflora in Sierra Nevada (Spain) indicated a total of 442 taxa: 2 hornworts, 74 liverworts and 366 mosses. Among them, 15.8% are new for this mountainous area; 10 taxa are new for the province of Almería and 41 for Granada; *Pohlia bolanderi* is new for the European continent; *Tortella alpicola* is new for western Europe; *Hygrohypnum styriacum* and *Tortula bolanderi* are new for the Iberian peninsula; and *Bryum valparaisense* is new for peninsular Spain. A treatment of bryovegetation recognized 34 associations and 4 communities in 13 vegetation classes. The association *Polytricho juniperini-Tortuletum hoppeanae* ass. nova is described as new for acidic soils in high mountains. Taxonomic studies, combining morphological and molecular (*rps4* and *trnL-F*) data, resulted in recognition of *Oreoweisia mulahacenii* Höhn. as *Hymenoloma mulahacenii* (Höhn.) Rams, Ros, O. Werner & Ochrya, with *Dicranoweisia intermedia* J. J. Amann being a synonym. In regard to conservation studies, the status for the bryophytes from Sierra Nevada (Spain) was determined using IUCN criteria. In particular, for the case of *Pohlia bolanderi*, an additional study on the intraspecific genetical variability has been carried out by ISSR molecular markers, that shows high values. Finally, all this information led to delimitation of important areas for bryophytes in the Spanish Sierra Nevada. Three criteria were established for it: specific richness, specific rarity and red listed species presence. Protective measures to preserve habitat quality are pro-

Bryological Theses (continued)

proposed.

Renner, Matt A. M. 2008. Morphological variation informs evolutionary relationships within the *Lejeunea tumida* aggregate (Lejeuneaceae: Marchantiophyta). Ph.D. thesis, University of Sydney, Australia. xx + 492 pp. In English. Address of author: 20A Fairlands Avenue, Waterview, Auckland 1207, New Zealand. E-mail: matt@wildlands.co.nz.

This doctoral thesis presents the first explicit quantification of patterns of size and shape variation within and between species in the Lejeuneaceae performed and presented in an empirical and repeatable manner. As currently applied, the name *Lejeunea tumida* Mitt. encompasses three genetically and morphologically distinct entities, *L. tumida* s. str., *L. colensoana* (Steph.) comb. nov. and *S. oracola* n. sp. The latter is near *L. helmsiana* (*L. pocsii* R. M. Schust., syn. nov.) and may contain two genetically, morphologically and ecologically distinct groups, one from lowland and coastal regions on the upper North Island of New Zealand, and the other from highland and inland regions of the central and southern North Island. All four species exhibit some degree of overlap in size and shape of the sterile gametophyte morphology. However, this neither undermines the utility of morphology as a data-source, nor obviates the possibility of informative morphologically-based species taxa so long as patterns of morphological variation are understood for each and every species under consideration. Molecular data (from ITS1 and *trnL-F*) were used to inform the understanding of relationships. Additionally, *Nephrolejeunea carcharias* is described as new, and a key to the species of *Nephrolejeunea* is presented. [Note: nomenclature presented in theses is not considered effectively published: Art. 30.5.]

Sagar, Tarja. 2007. Bryophytes of the Santa Monica Mountains. Master's thesis, California State University, Northridge. viii + 181 pp. In English. Address of author: Santa Monica Mountains National Recreation Area, 401 West Hillcrest Drive, Thousand Oaks, CA 91360. E-mail: Tarja_Sagar@nps.gov.

This master's thesis examines the bryophytes of a mountain chain in southwestern California, with a Mediterranean climate with a maritime influence on the southern and western slopes. An inventory resulted in 118 species, 3 of which were new to the state. An identification guide is presented with illustrations and notes on ecology and biogeography. After the baseline inventory, 103 mesosites were selected that promised to be rich in bryophytes or to have rare bryophytes. At each site, the microhabitat preferences of the species were contrasted in terms of substrate softness, moisture, slope and shadiness. The common 61 species were arrayed along these four niche axes, resulting in a niche graphic that allows one to distinguish ecologically between species in a guild. Additionally, the mesosites were ordinated, and mesoenvironmental variables were overlain on

the ordination. Insolation, parent rock type and distance to the coast accounted poorly for dissimilarities among sites. Topographic position as represented by elevation was somewhat better. Abundances of bryophytes by niche axes were highly correlated with site separation on the ordination. The bryoflora of the Santa Monica Mountains was compared to that of Santa Cruz County, a macrosite of higher latitude, and to that of Mount San Jacinto, a macrosite of higher elevation. The study site had relatively few species not found in the other two areas, and seemed to have a flora that is generally intermediate between them.

Stamenoff, Pierre. 2007. Géomatique appliquée à l'analyse de la distribution des bryophytes de l'île de la Réunion: Exploitation des collections d'herbiers. Master's thesis, Université de la Réunion. 90 pp. + 4 fold-out maps. In French. Address of author: unknown.

This master's thesis uses GIS technology as applied to herbarium specimens of bryophytes on Réunion. Areas of high diversity were revealed, with mosses found to be more widely distributed than hepatics.

Tsakiri, Evdoxia. 2009. Βρυοφυτική χλωρίδα της Ελλάδας: φυτογεωγραφική και οικολογική έρευνα των βρυοφύτων στο υδάτινο σύστημα του ποταμού Άνω Αλιάκμονα (Δυτική Μακεδονία). [Bryophyte flora of Greece: Phytogeographical and ecological study of bryophytes at the aquatic system of the Ano Aliakmonas River (Western Macedonia). Ph.D. thesis, Aristotle University of Thessaloniki, Greece. [x] vi + 356 + 24 + 7 pp. In Greek with English summary. Address of author: Laboratory of Systematic Botany and Phytogeography, Department of Botany, School of Biology, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece. E-mail: tsakiri@bio.auth.gr.

This doctoral thesis examined the bryoflora of the basin of the Ano Aliakmonas River in northern Greece. This is one of the more temperate areas of Greece, and the forest is dominated by mostly deciduous oak species. About half the bryophytes are of temperate origin. Ecological indicator values (continentality, temperature, reaction, light and moisture) were measured and substrate preferences of bryophytes were recorded, as well as niche position and breadth. Data concerning conservation status of the bryophytes was inventoried. A total of 89 mosses and 12 hepatics were recorded from the study area, with Pottiaceae, Brachytheciaceae and Amblystegiaceae being most speciose. *Brachythecium mildeanum* and *Mnium lycopodioides* are new to Greece. As the flora represents, a large portion of the study area is calcareous, but acidic geological formations are also present. The region is threatened by development as well as naturally occurring phenomenon. For example, a number of collecting sites were destroyed by forest fires in 2007. The thesis emphasizes how poorly the Greek bryoflora is known, and more data are necessary in order to adequately protect it. The full thesis is available online at <http://invenio.lib.auth.gr/record/112400>.

Research funding opportunity for European natural history scientist**Europe's leading centres for systematics-related research invite scientists based at European institutes to access their collections and facilities with support from in-house researchers and curators.**

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The next call for applications will open in August 2010, with a deadline 15 October

Two more calls will be arranged at annual intervals.

Boliva (continued...)

Workshops and Training: A bryophyte workshop, taught by Ninel and Claudia, was given in February 2008 using the facilities in La Paz. Eleven students participated in the workshop. Steve also taught a weekly course for the three students and illustrator in Santa Cruz. The first generation of Bolivian bryology students, five in all, completed their thesis projects (see Buck 2010). The second generation of bryology students, Suely Carreño, Ivan Linneo, and Yanina Inturias, have started or will start their bryological thesis projects.



Presentations at scientific meetings: Ninel and Claudia gave presentations on their bryological activities at La Paz during the 2007 meeting held in Santa Cruz at the “V Congreso Nacional de Biología: Para la Conservación y el Desarrollo Sostenible.” Claudia, Ninel and the Steve presented an overview of Bolivian bryophytes in March 2009 at the “XXX Aniversario Instituto de Ecología” in La Paz. At the end of October 2009 the first botanical congress for Bolivia was held in Cochabamba, “1er Congreso Boliviano de Botánica,” six oral or poster presentations were made by project personal (3) and students (5) on various subjects related to bryophyte investigations.

Web Page. At the beginning of 2009 the Tropicos system initiated a new “project page” for the various on-going investigations at MO. Text and graphics

can be added, changed or deleted via the Internet. *Bryophytes of Bolivia* project web page (Churchill et al. 2010) provides chapters (links) on history, ecoregions, bibliography, checklists, and on-going taxonomic treatments (searching either by family or genus); with the exception of the taxonomic treatment, all other elements are also in Spanish (choose language on project page, upper right). More than 380 images, illustrations and photographs, have been uploaded and available on the project page (also with individual species in Tropicos). Distributional data is represented

by the 16,500 databased collections providing a good resolution for many taxa in the form of lists and maps. Individual species page includes: 1) Species Data: A standardized form which can be accessed and employed as a database for all project species, includes ecoregion (s), elevational range, substrate, frequency. 2) Notes: This is inserted text elaborating on the specifics of: a) ecology, b) elevation, c) distribution, d) paragraph discussing ecology, conservation status, distinguishing features of the species, and synonyms, e) cited specimens. 3) Species description. 4) Images: Line drawings and photographs. 5) Distribution map. 6) Databased specimens.

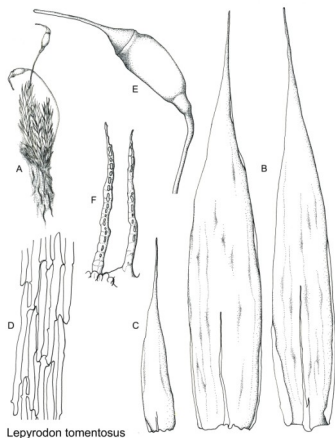


Illustration from the Bolivian moss project by Eliana Calzadilla

Publications: Several articles have been published on Bolivian bryophytes during this time. One of the major publications included the 340 page book *Cátalo de las Briofitas de Bolivia: Diversidad, Distribución y Ecología* (Churchill et al. 2009). The introductory chapters include bryological history, collectors, taxonomic, ecoregion and elevational diversity. The actual checklist contains 1399 accepted species (hepatics represented by 477 species, 109 genera, 35 families; hornworts 4 species, 3 genera, 2 families, mosses 918 species, 275 genera, 69 families). The most recent publication, *Las Briofitas* (Calzadilla et al. 2010), provides an introduction to the bryophytes intended for high school and university students, and the general public interested in natural history; this booklet is fully illustrated with photographs and water-color drawing. Overviews were presented for the tropical Andes (Churchill 2009a) and for Bolivia (Aldana et al. 2010). Floristic papers include those by Cano et al. (2008b), Churchill (2009b), Churchill & Linneo (2009), Churchill & Lozano (2009), and Churchill et al. (2008). Three papers were published by the MUB group: two new mosses were described from Bolivia, *Indusiella stellata* (Cano & Jiménez 2009) and *Syntrichia boliviana* (Gallego & Cano 2009), and one new combination, *Pseudocrossidium linearifolium*, with a review of the species (Jiménez et al. 2009).

Support for our activities was made possible in part by a grant from National Science Foundation and the Taylor Fund for Ecological Research through the Missouri Botanical Garden.

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Boliva (continued...)

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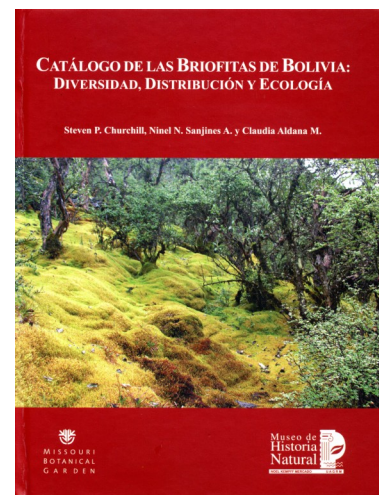
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Don't let this space be ignored! Drop us a note and let us know what your part of the world is doing. ALL things bryological are wanted. Keep us posted on your latest grants, projects, or who is in your lab. Send us the latest news from your local societies. Announce a website or a new book. Send us a review of a new book.



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In other words...let us know about anything that is exciting to you (about bryophytes, of course) because we want to know about

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it.

Got an idea for *The Bryological Times*? Email DorothyBelle a to see what she says...your editor loves having submissions from all of you. Contact her at poli@roanoke.edu today!

Computers and Bryophytes: Look Here

A website on the bryophyte genus *Grimmia* Hedw. has been published: www.grimmiasoftheworld.com <<http://www.grimmiasoftheworld.com>>

with more than 2000 macro- and micro-
scopic photos of all 96 recognized species. The site also contains a European checklist, a world checklist, a table with the world distribution and major ecological and morphological characters of all recognized 96 *Grimmia* species. (Submitted by Henk Greven)

Interesting bryological rap music video on YouTube <http://www.youtube.com/watch?v=PsqGFer6-iM&feature> (Submitted by Marshall Robert Crosby)

An article about *Physcomitrella* becoming the moss model system <http://www.bio-pro.de/magazin/wirtschaft/>

index.html?lang=en&artikelid=/artikel/05167/index.html

(submitted by Ralf Reski)



Send us your bryophyte links today!

A web gallery of photos of bryophytes that are either rare or scarce within Britain. These are species that have been recorded from less than 100 10x10km

squares since 1950 (i.e. <3.5% of the possible 2837 hectads). The images are located at: <http://www.flickr.com/photos/bryophytes>. All images are free for anyone to use for whatever purpose. High-resolution versions of the images are also available for free upon request.

(submitted by Des Callaghan
[des.callaghan@ecostudy.co.uk])

Keep up with the latest at the International Botanical Congress. Visit <http://www.abc2011.com/Symposia.htm> for more information

Free to download. It is "Mosses Liverworts and Hornworts" By Hallingback and Hodgetts <http://data.iucn.org/dbtw-wpd/edocs/2000-074.pdf> (submitted by Jack Honeycutt)

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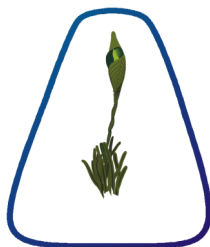
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<http://bryology.org>

IAB



The International Association of Bryologists (IAB) is an organization open for all interested in bryophytes. For membership contact Jim Shevock at

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