

## **Curriculum Vitae:**

Name:

Graeme Pierce Berlyn  
E.H. Harriman Professor of Anatomy and Physiology of Trees and Forest Management,  
Founding and Senior Editor, Journal of Sustainable Forestry  
Fellow of the International Academy of Wood Science  
Lifetime Achievement Award, Botanical Society of America  
Yale University School of Forestry and Environmental Studies

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Education:

1952-1956 Iowa State University, Ames, Iowa, B.S. 1956 (Forestry)  
1956-1960 Iowa State University, Ames, Iowa, Ph.D. 1960 (Botany-Forestry)  
1969 Northeastern University, Boston, Massachusetts  
Certificate in biological electron microscopy  
1978 Yale University, New Haven, Connecticut, M.A. (Hon.)

## **RESEARCH FOCI:**

Our main goal is to deepen knowledge of the ways in which plants respond to the environment in terms of different traits (genetic, physiological, anatomical, and morphological). We examine these traits at different levels of biological organization: molecular, cellular, organ, and organismal. We look at different modes of response such as phenotypic plasticity, the capacity of an organism to change in morphology and physiology in response to environmental signals, and genetic mechanisms as revealed in common garden experiments and DNA analysis. The techniques we have used are cellular (cytophotometry, DNA microsatellites & microarrays, and image analysis of cellular and tissue level changes), light and carbon processing (photosynthesis, reflectivity analyses, fluorescence monitoring, stable isotopes, etc), water relations, and growth analysis. One of the ways we investigate these responses is to use natural gradients of environmental stress such as along elevational gradients in mountains. High elevation sites are indicator ecosystems. Because of their high stress loads they provide indications of stressors impacting landscapes such as acid rain, heavy metals, overgrazing by domestic animals and wildlife, and impact of recreation and development. Another system is to look at changes along microtopographic transects such as ridge tops, midslope and bottomland sites. Even these finer environmental differences are recorded in the structure and function of leaves, enabling determination which species are optimally adapted to each of these types of habitats. Within the crowns of trees and in

cross sections of the forest canopy there are environmental gradients which are reflected in the way these aggregate structures process light. In turn structural and changes mirror these gradients and can be studied using invasive and non-invasive techniques. We, along with colleagues and students, have conducted studies in New England, Canada, Sri Lanka, Panama, Peru, Mexico, Costa Rica, Puerto Rico, Africa, and India. In addition to the field components we also conduct controlled experiments in the Greenhouse and controlled growth rooms in order to more precisely isolate effects of environmental factors such as light quantity and quality, nutrition, competition, and water relations.

A second, more applied goal, is to develop plant growth enhancers. These natural organic substances can reduce fertilizer augmentation by up to 50% and increase insect and water stress resistance while maintaining optimal plant growth. Although plants are deemed to be the ultimate autotrophs they do not grow optimally in many stressful environments. For example if you wish to grow roots in culture it is necessary to supply B vitamins to the culture medium. In the intact plant B vitamins are largely synthesized in the leaves and transported to the roots. Under stress the leaves may not be able to provide the roots with sufficient amounts of vitamins and root growth suffers. Thus one of the components of our plant growth enhancers is vitamins and antioxidants. Some of our plant growth enhancers contain beneficial microorganisms like mycorrhizae that enhance nutrient and water uptake by plants.

### **Recent Doctoral Dissertations from the Berlyn Laboratory**

**Marshall, Philip.** 2011. Ecophysiological and historical aspects of eastern white pine in New England in relation to human societies (in collaboration with Paul Draghi and Gordon Whitney)

**Dylan James Craven.** 2012. Dynamics of tropical secondary forests in central Panama: Linking functional traits with ecological performance during succession.

**Marshall, Philip.** 2011. The historical and physiological ecology of eastern white pine (*Pinus strobus* L.) in Northeastern Connecticut 1700-2000.

**Goodale, Uromi.** 2009. Forest restoration using native species in Sinharaja Forest Reserve in Sri Lanka.

**Liptak, David.** 2007. Developmental plasticity of *Arabidopsis thaliana*: Physiology, Anatomy, and differential gene expression kinetics in response to red/far red light and photosynthetic photon flux density.

**Richardson, Andrew.** 2003. Responses of balsam fir and red spruce to elevation and the canopy light gradient (in collaboration with Xuhui Lee).

**Rodriguez, Helga.** 2000. New tools for the conservation of forest genetic resources: genetic diversity of tree species in forest fragments by DNA microsatellites.

**Sivaramakrishnan, Saroj.** 2000. Feeding effects of the hemlock woolly adelgid on eastern hemlock anatomy, morphology and physiology: Bio-remediation through the use of Organic biostimulants.

**Thadani, Rajesh.** 1999. Disturbance, microclimate, and the competitive dynamics of tree seedlings in banj oak (*Quercus leucotrichophora*) forests of the central Himalaya India.

Professional Experience:

- 1960-62     Instructor and Curator, Samuel James Record Collection of Tropical Woods, Yale University.
- 1962-67     Assistant Professor and Curator, Samuel James Record Collection of Tropical Woods, Yale University
- 1963-1965   Research Collaborator and Visiting Scientist (summers) Department of Biology, Brookhaven National Laboratory, Upton, Long Island, New York. Autoradiography, tissue culture, microspectrophotometry, electron microscopy, interference and fluorescence microscopy. Sensitivity of plants to radionuclides in the environment.
- 1966     Summer Visiting Scientist. Northern Institute of Forest Genetics, U.S. Forest Service, Rhinelander, Wisconsin. Autoradiography, root regeneration, anatomy of germination, radiosensitivity studies on pines.
- 1967-1978   Associate Professor, Yale University
- 1969     Summer Visiting Professor. University of Kentucky, Lexington, Kentucky. Ultrastructural studies of plant cell wall formation.
- 1971        Visiting Scientist. Cornell University, Ithaca, New York. Electron microscopy of yeast chromosomes.
- 1978-        Professor of Anatomy and Physiology of Trees, Yale University
- 1980-1988   Director of Doctoral Studies, School of Forestry and Environmental Studies, Yale University and Director of Graduate Studies, Yale University Graduate School.
- 2000-        The E. H. Harriman Professor of Forest Management, Yale University
- 2000-2001   Co-Director of Doctoral Studies, op. cit.

Professional Activities:

- 1966-68     Tree Physiology Committee of the Society of American Foresters.

- 1967-79 Thesis Abstract Committee of the Society of Wood Science and Technology
- 1968-73 Chairman, Physiological Section, Botanical Society of America
- 1976 Co-Chairman, Xylem Physiology Group. IUFRO
- 1978 Elected Fellow, The International Academy of Wood Science
- 1979-80 Member of a Committee organizing an international workshop on the "Control of shoot growth in trees" held in July, 1980 in Fredericton, N.B. Canada sponsored by IUFRO
- 1979-80 Co-Chairman of an international symposium on "Age and growth rate determination in tropical trees: New directions for research" held March 30 - April 14 in Petersham, Mass. USA. Sponsored by the U.S. National Research Council, U.S.D.A. Forest Service, FAO (ROME), the Instituto Nacional de Investigaciones sobre Recursos Bioticos (MEXICO), and Harvard and Yale Universities
- 1986- Biological Stain Commission - representative of Botanical Society of America
- 1986-1988 Board of Directors, Organization of Tropical Studies, Costa Rica
- 1986-1989 Member, Editorial Review Board, Tree Physiology
- 1989-2009 Member, Editorial Board, Biotechnic and Histochemistry  
1990- Editor, Journal of Sustainable Forestry
- 1992-2008 Elected Trustee, Biological Stain Commission
- 2000 Elected Vice President, Biological Stain Commission
- 2004-2007 Elected President, Biological Stain Commission
- 2007-2008 Elected Vice-President, Biological Stain Commission

#### Honors:

Fellow, The International Academy of Wood Science  
 Phi Kappa Phi (highest scholastic award of ISU)  
 Gamma Sigma Delta (Scholastic Honor Society of Agriculture)  
 Dean's list of outstanding students (ISU)  
 Sigma Xi, Distinguished military graduate (ISU)  
 Trustee, Biological Stain Commission (1992)  
 Vice President, Biological Stain Commission  
 President, Biological Stain Commission  
 Awarded for most innovated product in SOM all Yale competition (Shoots team)  
 Service Award, Yale School of Forestry and Environmental Studies  
 Lifetime achievement award from the Botanical Society of America 2013

### Current Teaching

- F&ES 654a Anatomy of Trees & Forests
- F&ES 655b Research Methods in Anatomy and Physiology of woody plants
- F&ES 656a Physiology of Trees and Forests
- F&ES 611b Advanced topics in tree physiology and Ecosystem Ecology
- F&ES 700b Seminar in Alpine, Arctic and Boreal Ecosystems

### PATENTS:

Co-holder of two patents for organic biostimulants that increase plant growth while decreasing fertilizer requirements by up to 50% and increase drought resistance.

## BIBLIOGRAPHY

## BIBLIOGRAPHY OF GRAEME PIERCE BERLYN, 5/17/13

- Berlyn, G.P. 1959. A biometric technique for reaction tissue research. Proc. Iowa Academy of Science, 66:98-102.
- Berlyn, G.P. 1961. Factors affecting the incidence of reaction tissue in *Populus deltoides* Bartr. Iowa State Jour. Sci., 35: 367-424.
- Berlyn, G.P. 1962. Developmental patterns in pine polyembryony. Amer. Jour. Bot., 79:327-333.
- Berlyn, G.P. 1962. Some size and shape relationships between tree stems and crowns. Iowa State Jour. Sci., 37:7-15.
- Berlyn, G.P. 1963. Methacrylate as an embedding medium for woody tissues. Stain Tech. 38: 23-28.
- Berlyn, G.P. 1964. Recent advances in wood anatomy: The cell walls in secondary xylem. For. Prod. Jour. XIV: 467-476.
- Greenwood, M.S. and G.P. Berlyn. 1965. Regeneration of active root meristems in vitro by hypocotyl sections from dormant *Pinus lambertiana* embryos. Can. Jour. Bot. 43: 173-174.
- Berlyn, G.P. and P.E. Passof. 1965. Cytoplasmic fibrils in proembryo formation in *Pinus*. Can. Jour. Bot. 43: 175-176.
- Berlyn, G.P. and R.E. Mark. 1965. Lignin distribution in wood cell walls. Forest Products Jour. 15: 140-141.
- Berlyn, G.P. and J.P. Miksche. 1965. Growth of excised pine embryos and the role of the cotyledons during germination in vitro. Amer. Jour. Bot., 52: 730-736.
- Berlyn, G.P. 1967. The structure of germination in *Pinus lambertiana* Dougl. Bulletin No. 71. Yale University School of Forestry, New Haven, Conn.
- Berlyn, G.P. 1967. A hypothesis for cell wall density. 1968. For. Prod. Jour. 18: 334-336.
- Berlyn, G.P. 1968. Biophysical investigations of free space in tracheid cell walls. Amer. Jour. Bot. 55: 728.
- Greenwood, M.S. and G.P. Berlyn. 1968. Feulgen cytophotometry of pine nuclei: Effects of fixation, role of formalin. 1968. Stain Tech. 43: 111-117.
- Berlyn, G.P. 1969. Microspectrophotometric investigations of free-space in plant cell walls. Amer. Jour. Bot. 56: 498-506.
- Berlyn, G.P. 1970. Ultrastructural and molecular concepts of cell wall formation. Wood & Fiber 2: 196-227.
- Berlyn, G.P. 1972. Germination and morphogenesis. In T. Koslowski (ed.), Seed biology. Academic Press, New York. pp. 223-311.
- Berlyn, G. P. 1972. John E. Sass. Botanical Gazette 133:85-86l.
- Greenwood, M.S. and G.P. Berlyn. 1973. Sucrose-indole-3-acetic acid interactions on root regeneration by *Pinus lambertiana* embryo cuttings. Amer. Jour. Bot. 60: 42-47.
- Cataldo, D.A. and G.P. Berlyn. 1974. An evaluation of selected physical characteristics and metabolism of enzymatically separated mesophyll cell and minor veins of tobacco. Amer. Jour. Bot. 61: 957-963.
- Berlyn, G.P. and R.A. Cecich. 1976. Optical techniques for measuring DNA quantity. In J.P. Miksche (ed.) Modern Methods in Forest Genetics. Springer Verlag, New York. pp. 1-18.
- Berlyn, G.P. and J.P. Miksche. 1976. Botanical microtechnique and cytochemistry. Iowa State University Press. Ames, Iowa.
- Dhillon, S.S., G.P. Berlyn, and J.P. Miksche. 1977. Requirement of an internal standard for microspectrophotometric measurements of DNA. Amer. J. Bot., 64: 117-121.
- Dhillon, S.S., G.P. Berlyn, and J.P. Miksche. 1978. Nuclear DNA content in populations of *Pinus rigida*. Amer. J. Bot. 65: 192-196.
- Berlyn, G.P. 1979. Physiological control of differentiation of xylem elements. 1979. Wood and Fiber 11: 109-126.
- Berlyn, G.P., S.S. Dhillon and J.P. Miksche. 1979. Feulgen cytophotometry of pine nuclei II: Effect of pectinase used in cell separation. Stain Tech. 54: 201-204.
- Berlyn, G.P., S.S. Dhillon, and E.E. Koslow. 1979. Technitium, a toxic waste product of the nuclear fuel cycle: Effects on soybean growth and development. Environmental Management 4: 149- 156.
- Berlyn, G.P., S.S. Dhillon, and E.E. Koslow. 1979. Nuclear Energy: Production and problems. Environmental Management. 4: 95-102.

- Miksche, J.P., S.S. Dhillon, G.P. Berlyn, and K. Landauer. 1979. Nonspecific light loss and intrinsic DNA variation problems associated with feulgen DNA cytophotometry. *Jour. Histochem. & Cytochem.* 27: 1377-1379.
- Berlyn, G. P., K. Paw U and E. E. Kozlow. 1980. Nuclear Energy: Production and problems - Answering the rebuttal. *Environmental Management* 4: 189-191.
- Berlyn, G.P. and R.C. Beck. 1980. Tissue culture as a technique for studying meristematic activity. In C.H.A. Little (ed.) *Control of shoot growth in trees* p. 305-324. Proc. IUFRO Conf. Maritimes Forest Research Centre, Fredericton, New Brunswick, Canada.
- Bormann, F.H. and Berlyn, G.P. (eds.). 1981. Determination of age and growth rate in tropical trees: New directions for research. *Yale Univ. Sch. Forestry Environ. Stud. Bull.* 94.
- Patel, K.R. and G.P. Berlyn. 1982. Genetic instability of multiple buds of *Pinus coulteri* regenerated from tissue culture. 1982. *Can. Jour. of For. Research.* 12: 93-101
- Berlyn, G.P. 1982. Morphogenetic factors in wood formation and differentiation. In P. Baas (ed.) *New Perspectives in Wood Anatomy.* p. 123-150. Martinus Nijhoff. The Hague.
- Patel, K.R. and Berlyn, G.P. 1982. Influence of kinetin and histone composition and endogenous RNA level in differentiating metaxylem of *Zea mays* root tips. *Caryologia* 35: 217-222.
- Patel, K.R. and Berlyn, G.P. 1983. Cytochemical investigations on multiple bud formation in tissue cultures of *Pinus coulteri* *Can. Jour. Bot.* 61: 575-585.
- Renfroe, M.H. and G.P. Berlyn. 1983. Genetic screening of tissue cultures for use in tree improvement programs. Proc. 3rd North Central Tree Improvement Association Conference.
- Renfroe, M.H. and G. P. Berlyn. 1984. Stability of nuclear DNA content during adventitious shoot formation in *Pinus taeda* L. tissue culture. *Amer. Jour. Bot.* 71: 268-292.
- Patel, K.R., N.S. Shekhawat, G.P. Berlyn and T.A. Thorpe. 1984. Isolation and culture of protoplasts from cotyledons of *Pinus coulteri* D. Don. *Plant Cell Tissue and Organ Culture* 3: 85-90.
- DeLucia, E.H. and G.P. Berlyn. 1984. The effect of increasing elevation on leaf cuticle thickness and cuticular transpiration in balsam fir. *Can. J. Bot.* 62:2423-2431.
- Berlyn, G.P. and Y.C. Battey. 1985. Metabolism and synthetic function of cambial tissue. In T. Higuchi (ed.) pp. 63-85. In *Biosynthesis and biodegradation of wood components.* Acad. Press, New York.
- Renfroe, M.H. and G.P. Berlyn. 1985. Variation in nuclear DNA content in *Pinus taeda* L. tissue cultures. *J. Plant Physiol.* 121: 131-139
- Berlyn, G. P., M. K. Berlyn, and R. C. Beck. 1986. A comparison of internal standards for plant cytophotometry. *Stain Tech.* 61: 297-302.
- Berlyn, G.P., R.C. Beck, and M.H. Renfroe. 1986. Tissue culture and the propagation and genetic improvement of conifers: problems and possibilities. *Tree Physiol.* 1: 227-240
- Berlyn, G. P., A. O. Anoruo, R. C. Beck and J. Cheng. 1987. DNA content polymorphism and tissue culture regeneration in Caribbean pine. *Can. J. Bot.* 65:954-961
- Boyce, R. L. and G. P. Berlyn. 1988. Measuring the contact angle of water droplets on foliar surfaces. *Can. J. Bot.* 66: 2599-2602.
- Berlyn, G.P., A.O. Anoruo, J.L. Royte, R.L. Boyce, W.L. Silver, A.H. Johnson, and D.L Vann. 1989. Genetic characterization of high elevation spruce populations of the northeast and its possible relationship to air pollution as measured by branch chamber experiments P, II-16-62 In Adams, M. B. & Eagar, C. (eds.) *Air Pollution and Winter Injury of Red Spruce.* U.S.D.A. Forest Service. Northeastern Forest Experiment Station, 370 Reed Road, Broomall, PA 19008.
- Russo, R. O. and G. P. Berlyn. 1989. Leaf callus induction in *Gliricidia sepium* (Jacq.) Steud. *NFTRR* 7: 103-105.
- Berlyn, G.P., B. Albers, and A. Letourneau. 1989. Measuring photosynthetic potential. *Belowground Ecology* 1: 15.
- Berlyn, G. P., A. O. Anoruo, and R. C. Beck. 1990. Optical techniques to measure genetic instability in cell and tissue cultures, In Y. P. S. Bajaj (ed.). *Biotechnology in Agriculture and Forestry* Vol. 2. Springer-Verlag, Berlin, Heidelberg, New York.
- Berlyn, G. P., S. Kohls, and A.O. Anoruo. 1990. *Biotechnology of Caribbean pine.* In Y. P. S. Bajaj (ed.). *Biotechnology in Agriculture and Forestry* Vol. 3. Springer-Verlag, Berlin, Heidelberg, New York, Tokyo.
- Berlyn, G. P. 1990. The status and consequences of acid rain on forested ecosystems. p. 35-74. In *Published Proceedings, Symposium on Conservation of Ecosystems for a Clean Environment.* National Institute of Environmental Research, Seoul, Korea (in Korean and English).

- Berlyn, G. P., J. L. Royte, and A. O. Anoruo. 1990. Cytophotometric differentiation of high elevation spruces: Physiological and ecological implications. *Stain Technology* 65 : 1-13.
- Berlyn, G.P. and R. O. Russo. 1990. The use of organic biostimulants in nitrogen fixing trees. *NIFTRR*. 8: 1-2.
- Berlyn, G. P. and R. O. Russo. 1990. The use of organic biostimulants to promote root growth. *Below Ground Ecology* 1: 12-13.
- Russo, R. O. and G. P. Berlyn. 1990. The use of organic biostimulants to help low input sustainable agriculture. *Journal of Sustainable Agriculture* 1: 19-42.
- Jasso Mata, J. and G. P. Berlyn. 1990. Variacion geografica y genetica en algunas poblaciones de *Pinus montezumae* en México. p 420 in Resumenes de XII Congreso Nacional de Fitogenetica. Sociedad Mexicana de Fitogenética, A. C., Chapingo, México
- Boyce, R. L., D. C. McCune, and G. P. Berlyn. 1991. A comparison of foliar wettability of red spruce and balsam fir growing at high elevation. *New Phytol.* 117: 543-555.
- Anoruo, A. O. and G. P. Berlyn. 1991. Ontogeny of elevated nuclear DNA during embryogenesis in *Pinus rigida* Mill. *Nigerian Journal of Biotechnology* 7: 209-220.
- Ashton, P. M. S and G. P. Berlyn. 1992. Leaf adaptations of some *Shorea* species to sun and shade. *New Phytol.* 121: 587-596.
- Russo, R. O. and G. P. Berlyn. 1992. Vitamin-humic acid-algal biostimulant increases yield of green bean. *HortScience* 27: 847.
- Russo, R. O. and G. P. Berlyn. 1992. The effect of an organic biostimulant (Roots™) on the growth of loblolly pine (*Pinus taeda*) seedlings in greenhouse conditions. *Agrociencia serie Recursos Naturales Renovables* 2: 7-13.
- Berlyn, G. P. 1993. Trees. *Encyclopaedia Britannica* 15th Ed. Vol. 28: 903-913. Chicago
- Berlyn, G. P. 1993. Defining sustainable forestry. *Agribusiness Outlook* Jan/Feb.: 7-10.
- Anoruo, A. O. and G. P. Berlyn. 1993. Caribbean pine in sustainable tropical forestry: Distribution, taxonomy, ecology, biotechnology and silvics. *J. Sustainable Forestry* 1: 1-24.
- Anoruo, A. O. and G. P. Berlyn. 1993. Effect of rate of growth and development on needle photosynthate and phloem transport in Caribbean pine (*Pinus caribaea* Mor.). *J. Sustainable Forestry* 1: 127-141.
- Berlyn, G. P., A. O. Anoruo, A. H. Johnson, D. R. Vann, R. Strimbeck, R. L. Boyce and W. L. Silver. 1993. Effects of filtered air and misting treatments on cuticles of red spruce needles on Whiteface Mountain, N. Y. *J. Sustainable Forestry* 1: 25-47.
- Bhaskar, V., G. P. Berlyn, and J. H. Connolly. 1993. Root hairs as specialized respiratory cells: A new hypothesis. *J. Sustainable Forestry* 1: 107-125.
- Russo, R. O., J. C. Gordon, and G. P. Berlyn. 1993. Evaluating alder-endophyte (*Alnus accuminata*-*Frankia*-*Mycorrhizae*) interactions: II. Growth response of *Alnus accuminata* seedlings to inoculation with *Frankia* strain ArI3 and *Glomus* intra-radices, under three different phosphorus levels. *J. Sustainable Forestry* 1: 93-110.
- Russo, R. O., R.P. Poincelot, and G. P. Berlyn. 1994. The use of a commercial organic biostimulant for improved production of marigold cultivars. *J. Home & Consumer Hort.* 1: 83-93.
- Ashton, P. M. S. and G. P. Berlyn. 1994. A comparison of leaf physiology and anatomy of *Quercus* (section *Erythroblanus-Fagaceae*) species in different light environments. *Amer. J. Bot.* 81: 589-597.
- Strauss-Debenedetti, S. and G. P. Berlyn. 1994. Leaf anatomical responses to light in five tropical Moraceae of different successional status. *Amer. J. Bot.* 81: 1582-1591.
- Berlyn, G. P., R. C. Beck, and K. E. Wolter. 1995. Cell wall structure, function, and degradation In M. Iqbal (ed.) *Cambial derivatives*. *Handbuch der Pflanzenanatomie* p. 131-148. Gebrüder Borntraeger, Stuttgart.
- Young, R. F., K. S. Shields, and G. P. Berlyn. 1996. Hemlock woolly adelgid (Homoptera: Adelgidae): Stylet Bundle insertion and feeding sites. *Annals of the Entomological Society of America* 88: 827-835.
- Li, Wan-liang, Berlyn, Graeme P. and P. Mark S. Ashton. 1996. Polyploids and their adaptations to water deficit in *Betula papyrifera*. *Amer. J. Bot.* 83: 59-64.
- Berlyn, G. P. and P. M. S. Ashton. 1996. Sustainability of forests. *Journal of Sustainable Forestry* 3: 77-89.
- Goltsova, N. J. and G. P. Berlyn. 1996. Effect of radiation on forests, p 286-304, In S. K. Majumdar, E. W. Miller, and F. J. Brenner (eds.). *Forests-A Global Perspective*, The Pennsylvania Academy of Science, Philadelphia.



- Connolly, J. H. and G. P. Berlyn. 1996. Cytochemical assay for differential respiratory activity in roots and root hairs. *Biotechnic and Histochemistry*. 71: 197-201.
- Berlyn, G. P., B. L. Albers, and R. Thadani. 1996. A cytophotometric technique for measuring photosynthetic potential of leaves: Preliminary research and development. *Biotechnic and Histochemistry*. *Biotechnic & Histochem.* 71:251-257.
- Bryan, J. A., G. P. Berlyn, and J. C. Gordon. 1996. Toward a new concept of the evolution of symbiotic nitrogen fixation in the Leguminosae. *Plant and Soil* 6:1-9.
- Connolly, J. H. and G. P. Berlyn. 1996. The plant extracellular matrix. *Can. Jour. Bot.*: 74: 1545-1546.
- Berlyn, G. P. and S. Sivaramakrishnan. 1996. The use of organic biostimulants to reduce fertilizer use, increase stress resistance, and promote growth, p 106-112 in T. D. Landis and D. B. South (eds). National Proceedings, Forest and Conservation Nursery Associations. Gen. Tech. Rep. PNW - GTR-389, Portland, OR: Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Lolle, S, J., G. P. Berlyn, E. M. Engstrom, K. A. Krolkowski, W-D Reiter, and R. E. Pruitt. 1997. Developmental regulation of epidermal cell interactions in the fiddlehead-1 mutant: A role for the epidermal cell wall and cuticle. *Developmental Biology* 189: 311-321.
- Ahearn-Meyerson, L., J. E. T. McLain, A. E. Mayfield, and G. P. Berlyn. 1997. Bioassays suggest that glyphosate persists in soil long enough to kill seedlings. *Restoration and Management Notes* 15: 200-201.
- Berlyn, G. P. and P. M. S. Ashton. 1998. Forests and the ecosystem paradigm. *Journal of Sustainable Forestry* 7 (1/2): 141-157.
- Berlyn, G. P. 1998. Some thoughts on forestry and the environment. *Journal of Sustainable Forestry* 7(3/4): 1-4. (editorial)
- Berlyn, G. P. and P.M.S. Ashton. Montane forests. 1998. *Encyclopedia of Ecology and Management*, Blackwell Science, Oxford.
- Ashton, P. M. S., L. Olander, R Thadani, G. P. Berlyn, and I. R. Cameron. 1998. Changes in leaf structure in relation to crown position and tree size of *Betula papyrifera* within fire-origin stands of interior cedar-hemlock. *Can. Jour. Bot.*76: 1180-1187.
- Ashton P. M. S, H. S.Yoon, R. Thadani, and G, P. Berlyn. 1999. Seedling leaf structure of New England maples (*Acer*) relative to light environment. *Forest Science* 45: 512-517.
- Sivaramakrishnan, S. and G. P. Berlyn. 1999. The role of site conditions in survival of hemlocks infested with hemlock woolly adelgid: Amelioration through the use of organic biostimulants. P. 201-204. Proceedings: Symposium on Sustainable management of Hemlock Ecosystems in Eastern North America, Durham, NH. U.S. Forest Service. Gen. Tech Report N-267, Newtown Square, PA.
- Berlyn, G. P. and J. Cho. 2000. Light, moisture, and nutrient use by plants in agroforestry. pp. 9-39, In M. S. Ashton and F. Montagnini (eds.). *The silvicultural basis for agroforestry systems*. CRC Press, Boca Raton, FL.
- Rodriguez, H., J. Geistlinger, G. Berlyn, G. Kahl, and K. Weising. 2000. Characterization of novel microsatellite loci isolated from the tropical dioecious tree *Simarouba amara*. *Molecular Ecology* 9: 489-500.
- Richardson, A. D., G.P. Berlyn, P.M.S. Ashton, R. Thadani, and I.R. Cameron. 2000. Foliar plasticity of hybrid spruce in relation to crown position and stand structure. *Canadian Jour. Bot.* 78: 305-317.
- Berlyn, G. P., A.D. Richardson. 2001. Wood: Its Properties in Relation to its Use in Turning., pp 152-161 In *Wood Turning in North America Since 1930*. Wood Turning Center, Philadelphia and Yale University Art Gallery, New Haven.
- Richardson, A.D., T. Gregoire, and G.P. Berlyn. 2001. Spectral reflectance of *Picea rubens* (Pinaceae) and *Abies balsamea* (Pinaceae) needles along an elevational gradient, Mt. Moosilauke, New Hampshire". *Amer. Jour. Bot.* 88: 667-676.
- Richardson, A. D., P.M.S. Ashton, G.P.Berlyn, M.E. McGroddy and I. R. Cameron. 2001. Within-crown foliar plasticity of western hemlock, *Tsuga heterophylla*, in relation to stand age. *Annals of Botany* 88: 1007-1015.
- Richardson, A. D. and G. P. Berlyn. 2002. Spectral reflectance and photosynthetic properties of *Betula papyrifera* (Betulaceae) leaves along an elevational gradient on Mt. Mansfield, Vermont, USA. *American Journal of Botany* 89:88-94.

- Richardson, A. D., S. Duigan, and G. P. Berlyn. 2002. Leaf chlorophyll content as determined by extraction, chlorophyll metering, and spectral reflectance. *New Phytologist* 153: 185-194.
- Richardson, A. D. and G. P. Berlyn. 2002. Changes in foliar spectral reflectance and chlorophyll reflectance of four temperate species following branch cutting. *Tree Physiology* 22: 499-506.
- Hall, J. S., M. S. Ashton, G. P. Berlyn. 2003. Differential seedling growth of three co-occurring *Entandrophragma* (Meliaceae) species under simulated light environments: implications for forest management in Central Africa. *Forest Ecology and Management* 179: 135-144.
- Hall, J.S., M.S. Ashton, and G.P. Berlyn. 2003. Seedling performance of four sympatric *Entandrophragma* species (Meliaceae) under simulated fertility and moisture regimes of a Central African forest. *Journal of Tropical Ecology* 19: 55-66.
- Richardson, A.D., G.P. Berlyn, and S.P. Duigan. 2003. Reflectance of Alaskan black spruce and white spruce foliage in relation to elevation and latitude. *Tree Physiology* 23: 537-544.
- Richardson, A.D., P. Marshall, M. Aikens, and G.P. Berlyn. 2004. Detection of drought stress in paper birch (*Betula papyrifera*) seedlings using non-invasive methods. *J. Arboriculture* 30: 52-61.
- Griscom, H.P., P.M.S. Ashton, and G. P. Berlyn. 2005. Seedling survival and growth of native tree species in pastures: Implications for dry tropical forest rehabilitation in central Panama. *Forest Ecology & Management* 218: 306-318.
- Thorhaug, A., A.D. Richardson, and G.P. Berlyn. 2006. Spectral reflectance of *Thalassia testudinum* (Hydrocharitaceae) seagrass: low salinity effects. *American Journal of Botany* 93: 110-117.
- Craven, D., D. Braden, M.S. Ashton, G.P. Berlyn, M. Wishnie, and D. Dent. 2007. Between and within-site comparisons of structural and physiological characteristics and foliar nutrient content of 14 tree species at a wet, fertile site and a dry, infertile site in Panamá. *Forest Ecology & Management* 238: 335-346.
- Thorhaug, A., A.D. Richardson, and G.P. Berlyn. 2007. Spectral reflectance of the seagrasses: *Thalassia testudinum*, *Halodule wrightii*, *Syringodium filiforme* and five marine algae. *Journal of Remote Sensing* 28: 1487-1501.
- Poulos, H.M., U. M. Goodale, and G. P. Berlyn. 2007. Drought response of two Mexican oak species, *Quercus laceyi* and *Quercus sideroxyla* (Fagaceae), in relation to elevational position. 2007. *American Journal of Botany* 94: 809-818.
- Poulos, H. M. and G. P. Berlyn. 2007. Phenotypic plasticity in needle morphology and water status of *Pinus cembroides* across an elevational gradient in the Davis Mountains of west Texas, USA. *Bulletin of the Torrey Botanical Society*. 134: 281-288.
- Poulos, H. M., G. P. Berlyn, and U. M. Goodale. 2008. Physiological and structural mechanisms of niche differentiation for three Sky Island oaks in relation to light and temperature. *Desert Plants* 24: 3-12.
- Berlyn, G. P. 2008. Review of *Aldo Leopold's Odyssey* by Julianne Lutz Newton. *Journal of Sustainable Forestry* 26: 344-347.
- Goodale, U. M., G. P. Berlyn, T. G. Gregoire, and M. S. Ashton. 2009. Ecological significance of crown functional traits across size classes and disturbance environments in eight pioneer species of a Sri Lankan rainforest. *Journal of Sustainable Forestry* 28: 22-47.
- Greenwood, Michael S., M. E. Day, and Graeme P. Berlyn. 2009. Regulation of foliar plasticity in conifers: Developmental and environmental factors. *Journal of Sustainable Forestry* 28:48-62
- Thadani, Rajesh, Graeme P. Berlyn, and Mark S. Ashton. 2009. A comparison of leaf physiology and anatomy of two Himalayan oaks in response to different light treatments. *Journal of Sustainable Forestry* 28: 74-91.
- Thorhaug, A. and G. P. Berlyn. 2009. A tribute to Lawrence Rogers Blinks (1900-1989): light and algae. *Photosynthesis Research* 100 (3):129-141.
- Craven, D., Gulamhussein, S., and G.P. Berlyn. 2010. Physiological and anatomical responses of *Acacia koa* (Gray) seedlings to varying light and drought conditions. *Environmental and Experimental Botany* 69:205-213.
- Craven, D. Braden, D. Dent, M.S. Ashton, G.P. Berlyn, and J.S. Hall. 2011. Seasonal variability of photosynthetic characteristics influences growth of eight tropical tree species at two sites with contrasting precipitation in Panama. *Forest Ecology and Management* 261:1643-1653.

- Craven, D., D. Dent, D. Braden, M. S. Ashton, G. P. Berlyn, and J. S. Hall. 2011. Seasonal variability of photosynthetic characteristics influences growth of eight tropical tree species at two sites with contrasting precipitation in Panama. *Forest Ecology and Management* 261:1643-1653
- Goodale, U. M., Berlyn, G. P., Gretoire, T. G. and M. S. Ashton. 2011. Ecological significance of crown functional traits across size classes and disturbance environments in eight pioneer species in a Sri Lankan rainforest. *J. Sustain. Forest.* 28; 22–47.
- Paul, G., Montagnini, F., Berlyn, G., Craven, D., van Breugel, M., and Hall, J. 2012. Foliar herbivory and leaf traits of five native tree species in a young plantation of Central Panama. *New Forests*: 43:69-87.
- Poulos, Helen, Graeme P. Berlyn, and Sara Mills. 2012. Differential stress tolerance of four pines (Pinaceae) across the elevational gradient of the San Bernardino Mountains of Southern California, USA. *Jour. Torrey Bot. Society* 139:95-107.
- Goodale, Uromi M., Mark S. Ashton, Graeme P. Berlyn, Timothy G. Gregoire, B.M.P. Singhakumara, Kushan U. Tennakoon. 2012. Disturbance and tropical pioneer species: Patterns of association across life history stages. *Forest Ecology and Management* 277: 54–66.
- Cheng, Wei, Yajie Song, Junting Liu, Haibao Yu, Yuanyuang Xing, Graeme Berlyn. 2012. Environment and development: The prospective for early- and late-developed countries. *Journal of Environmental Economics* 3:101-110.
- Craven, D., J. S. Hall, M. S. Ashton, and G. P. Berlyn. 2013. Water-use efficiency and whole-plant performance of nine tropical tree species at two sites with contrasting water availability in Panama. *Trees* 27:639-653.
- Uromi M. Goodale, Graeme P. Berlyn, Timothy G. Gregoire. Kushan U. Tennakoon, and Mark S. Ashton. 2014. Differences in Survival and Growth Among Tropical Rain Forest Pioneer Tree Seedlings in Relation to Canopy Openness and Herbivory. *Biotropica* 46(2):183-193.
- Marshall, Philip, Graeme P. Berlyn, and Chadwick D. Oliver. 2014. The role of the species concept in sustainable forestry. *Journal of Sustainable Forestry* 33: 195-210.
- Thorhaug, Anita, Helen Mills Poulos, and Graeme P. Berlyn. 2015. Pollutant Tracking for 3 Western North Atlantic Seagrasses by Remote Sensing: Preliminary diminishing white light responses of *Thalassia testudinum*, *Halodule wrightii*, and *Zostera marina*. *Marine Pollution Bulletin*. In Press.
- Craven, D.J., M. van Breugel, J. Hall, G.P. Berlyn, and M. Ashton. 2015. Changing gears during succession: shifting ecological strategies in young tropical secondary forests. *Oecologia*. 179:293=305.
- Thorhaug, A., H.M. Poulos, J. Lopez-Portillo, T.C.W. Ku, G.P. Berlyn. 2017. Seagrass blue carbon dynamics in the Gulf of Mexico: Stocks, losses, from anthropogenic disturbance, and gains through seagrass restoration. *Science of the Total Environment*. 605:626-636

Anitra L. Thorhauga<sup>a,\*</sup>, Helen M. Poulos , Jorge López-Portillo , Jordan Barr , Ana Laura Lara-Domínguez ,Tim C. Ku , Graeme P. Berlyn. 2019. Gulf of Mexico estuarine blue carbon stock, extent and flux: Mangroves,marshes, and seagrasses: A North American hotspot. *Science of the Total Environment*. 653:1253-1261.

Nathan E. Rutenbeck, Brent R. Frey, Kristofer R. Covey, Graeme P. Berlyn, Oswald J. Schmitz, Bruce C. Larson, Mark S. Ashton,<sup>\*</sup> 2018. Influence of gap position and competition control on the leaf physiology of planted *Picea glauca* and natural regeneration of *Populus tremuloides*. *Forest Ecology and Management*. 424:228-235.

Craven, D., J. Hall, G. Berlyn, M.S. Ashton, M. van Breugel. 2018. Environmental filtering Habitat filtering limits functional diversity during succession in a wet tropical secondary forest. *Journal of Vegetation Science* 29 (3):.

Acheampong Atta-Boatenga, Graeme P. Berlyna, Corey S. O'Hernc, Alexander J. Felsonb.2018. Suitability of wetland macrophyte in green cooling tower performance. *Ecological Engineering* In Press.

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**MANUSCRIPTS IN PREPARATION**

Craven, D., J.S. Hall, M.S. Ashton, and G.P. Berlyn. Efficiency-safe trade-off mediates drought stress response of ten tree species across a seasonality gradient in Panama. *Tree Physiology*. *Submitted*.

Craven, D., M.v. Breugel, M.S. Ashton, J.S. Hall, and G.P. Berlyn. Coordination of life history and leaf functional traits in predicting post-establishment success of 42 tree and shrub species in a tropical secondary forest in Panama. *In preparation*.

Thorhaug, A., H. Poulos, J. Lopez-Portillo, J. Barr, T. C. Ku, and G. P. Berlyn. Gulf of Mexico Estuarine Blue Carbon Stock, Extent and Flux: Mangroves, Marshes, and Seagrasses: A North American Hotspot

Berlyn, G. P., A. Atta-Boateng, H. Poulos, and E. Sigman. The effects of leaf free space and leaf density on leaf function.