

## **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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New Haven, Connecticut 06511\

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. As the world's population increases the arable lands are decreasing due to constructions and climate change. Also potable water is decreasing in part due to inorganic fertilizers that rapidly leach down into the ground water. Our non-hormonal plant biostimulants do not rapidly leach out to the soil and will be increasingly necessary for a sustainable world.

Professor Berlyn is also involved in studying the effects of wild fires with a team led by alumna Dr. Helen Poulos of Wesleyan University and works with an international

team led by Dr. Anitra Thorhaug that is studying carbon sequestration by seagrasses and mangroves.

### 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, 12/05/19

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- Berlyn, G.P. 1962. Developmental patterns in pine polyembryony. Amer. Jour. Bot., 79:327-333.
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- Berlyn, G.P. and P.E. Passof. 1965. Cytoplasmic fibrils in proembryo formation in *Pinus*. Can. Jour. Bot. 43: 175-176.
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- 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.
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**MANUSCRIPTS IN PREPARATION**

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